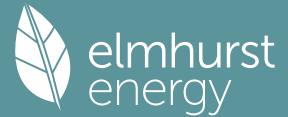


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Plot Reference	B2 1B2P Mid exp				Issued on Date	19/12/2025	
Assessment Reference	1B2P		Plot Type Ref		1B2P		
Plot Address					SAP Version	10.2	
SAP Rating	79 C		DER	4.10		TER	13.08
Environmental	97 A		% DER < TER				68.65
CO ₂ Emissions (t/year)	0.2		DFEE	26.56		TFEE	27.05
Compliance Check	See BREL		% DFEE < TFEE				1.83
% DPER < TPER	37.92		DPER	43.21		TPER	69.61
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	53.8800 (1b)	2.5000 (2b)	134.7000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.8800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	134.7000 (5)

2. Ventilation rate

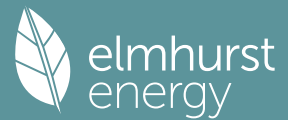
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000 (23c)
Effective ac	0.3026	0.2994	0.2962	0.2802	0.2771	0.2611	0.2611	0.2579	0.2675	0.2771	0.2834	0.2898 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			8.4300	0.9615	8.1058		(27)
Exposed Floor			53.8800	0.1200	6.4656	0.0000	0.0000 (28b)
External Wall	17.0800	10.3200	6.7600	0.1600	1.0816	14.0000	94.6400 (29a)
Communal Wall	14.3300		14.3300	0.2100	3.0093	14.0000	200.6200 (29a)
Total net area of external elements Aum(A, m ²)			85.2900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.5523		(33)
Main dwelling							
Party Wall			52.0500	0.0000	0.0000	20.0000	1041.0000 (32)
Party Ceiling			53.8800			100.0000	5388.0000 (32b)
Stud			80.0000			9.0000	720.0000 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		7444.2600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							138.1637 (35)
List of Thermal Bridges							

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K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	4.5300	0.0500	0.2265
E4 Jamb	13.9800	0.0500	0.6990
E7 Party floor between dwellings (in blocks of flats)	9.3400	0.0700	0.6538
E16 Corner (normal)	2.5000	0.0900	0.2250
E18 Party wall between dwellings	10.0000	0.0600	0.6000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	20.8200	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.3900	0.0200	0.1078
E20 Exposed floor (normal)	7.1700	0.3200	2.2944
P7 Party Wall - Exposed floor (normal)	8.0500	0.1600	1.2880
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.8695 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	26.4218 (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	13.4492	13.3075	13.1658	12.4574	12.3157	11.6073	11.6073	11.4656	11.8906	12.3157	12.5991	12.8825	(38)
Heat transfer coeff	39.8710	39.7293	39.5876	38.8792	38.7375	38.0290	38.0290	37.8873	38.3124	38.7375	39.0208	39.3042	(39)
Average = Sum(39)m / 12 =												38.8437	
HLP	0.7400	0.7374	0.7347	0.7216	0.7190	0.7058	0.7058	0.7032	0.7111	0.7190	0.7242	0.7295	(40)
HLP (average)												0.7209	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.8045 (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	23.5491	23.1994	22.7069	21.7988	21.1188	20.3648	19.9576	20.4466	20.9791	21.7859	22.7127	23.4695	(42b)
Hot water usage for other uses	33.1096	31.9056	30.7016	29.4977	28.2937	27.0897	27.0897	28.2937	29.4977	30.7016	31.9056	33.1096	(42c)
Average daily hot water use (litres/day)												51.9334	(43)
Daily hot water use	56.6587	55.1050	53.4085	51.2964	49.4125	47.4545	47.0473	48.7403	50.4768	52.4875	54.6183	56.5791	(44)
Energy conte	89.7336	78.4688	82.0869	70.2222	66.5187	58.3509	56.8996	60.3507	62.2429	71.2251	77.8138	88.5892	(45)
Energy content (annual)										Total = Sum(45)m =		862.5023	
Distribution loss (46)m = 0.15 x (45)m	13.4600	11.7703	12.3130	10.5333	9.9778	8.7526	8.5349	9.0526	9.3364	10.6838	11.6721	13.2884	(46)
Water storage loss (or HIU loss):													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	145.0104	128.3962	137.3637	123.7159	121.7955	111.8445	112.1764	115.6275	115.7366	126.5019	131.3075	143.8660	(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	145.0104	128.3962	137.3637	123.7159	121.7955	111.8445	112.1764	115.6275	115.7366	126.5019	131.3075	143.8660	(64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1513.3421	(64)
Electric shower(s)	43.6251	38.8703	42.4449	40.5046	41.2647	39.3625	40.6746	41.2647	40.5046	42.4449	41.6468	43.6251	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												496.2328	(64a)
Heat gains from water heating, kWh/month	84.9641	75.7504	82.1266	76.2700	76.6551	72.0372	73.3092	74.6042	73.6169	78.5150	79.0797	84.5836	(65)

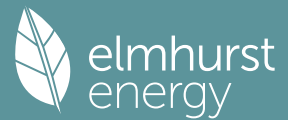
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	83.1417	92.0498	83.1417	85.9131	83.1417	85.9131	83.1417	83.1417	85.9131	83.1417	85.9131	83.1417	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	157.2947	158.9269	154.8138	146.0574	135.0039	124.6153	117.6750	116.0428	120.1560	128.9124	139.9658	150.3545	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224	(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)	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	(71)
Water heating gains (Table 5)	114.1991	112.7238	110.3852	105.9306	103.0310	100.0517	98.5339	100.2745	102.2457	105.5309	109.8330	113.6877	(72)
Total internal gains	404.7026	413.7676	398.4078	387.9681	371.2438	360.6472	349.4177	349.5261	358.3818	367.6521	385.7790	397.2510	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
South	8.4300	46.7521	0.4000	0.7000	0.7700	76.4750 (78)

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Solar gains	76.4750	125.2464	159.5417	180.3167	187.9012	180.8293	176.6813	171.5820	166.6601	135.0900	90.6490	66.0815 (83)
Total gains	481.1777	539.0140	557.9494	568.2849	559.1450	541.4766	526.0990	521.1081	525.0420	502.7421	476.4280	463.3324 (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	51.8635	52.0485	52.2348	53.1866	53.3811	54.3756	54.3756	54.5789	53.9734	53.3811	52.9935	52.6114
alpha	4.4576	4.4699	4.4823	4.5458	4.5587	4.6250	4.6250	4.6386	4.5982	4.5587	4.5329	4.5074
util living area	0.9215	0.8796	0.8290	0.7348	0.6105	0.4433	0.3170	0.3331	0.4926	0.7194	0.8680	0.9296 (86)
MIT	20.2258	20.4234	20.6114	20.8150	20.9337	20.9882	20.9980	20.9975	20.9799	20.8557	20.5494	20.1982 (87)
Th 2	20.3056	20.3079	20.3103	20.3218	20.3241	20.3357	20.3357	20.3380	20.3311	20.3241	20.3195	20.3149 (88)
util rest of house	0.9111	0.8651	0.8092	0.7067	0.5731	0.3992	0.2696	0.2857	0.4480	0.6862	0.8502	0.9201 (89)
MIT 2	19.6104	19.7999	19.9783	20.1732	20.2764	20.3288	20.3348	20.3369	20.3187	20.2130	19.9321	19.5918 (90)
Living area fraction	19.8137	20.0059	20.1874	20.3853	20.4935	20.5467	20.5539	20.5551	20.5372	20.4253	20.1360	19.7922 (92)
MIT	19.8137	20.0059	20.1874	20.3853	20.4935	20.5467	20.5539	20.5551	20.5372	20.4253	20.1360	19.7922 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8137	20.0059	20.1874	20.3853	20.4935	20.5467	20.5539	20.5551	20.5372	20.4253	20.1360	19.7922 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9028	0.8582	0.8054	0.7095	0.5827	0.4133	0.2852	0.3013	0.4619	0.6914	0.8450	0.9120 (94)
Useful gains	434.4167	462.5738	449.3885	403.1786	325.7934	223.8068	150.0361	156.9998	242.5119	347.5775	402.5895	422.5446 (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	618.5468	600.1464	541.8525	446.5370	340.6392	226.1457	150.3640	157.4264	246.6229	380.6090	508.6757	612.8378 (97)
Space heating kWh	136.9928	92.4488	68.7932	31.2180	11.0453	0.0000	0.0000	0.0000	0.0000	24.5755	76.3820	141.5781 (98a)
Space heating requirement - total per year (kWh/year)												583.0338
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	136.9928	92.4488	68.7932	31.2180	11.0453	0.0000	0.0000	0.0000	0.0000	24.5755	76.3820	141.5781 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												583.0338
Space heating per m2										(98c) / (4) =		10.8210 (99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space and Water												1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500 (305)
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system												1.5000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement												
	136.9928	92.4488	68.7932	31.2180	11.0453	0.0000	0.0000	0.0000	0.0000	24.5755	76.3820	141.5781 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	215.7637	145.6069	108.3493	49.1684	17.3963	0.0000	0.0000	0.0000	0.0000	38.7064	120.3017	222.9856
Space heating requirement												
	215.7637	145.6069	108.3493	49.1684	17.3963	0.0000	0.0000	0.0000	0.0000	38.7064	120.3017	222.9856 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement												
	145.0104	128.3962	137.3637	123.7159	121.7955	111.8445	112.1764	115.6275	115.7366	126.5019	131.3075	143.8660 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	217.5155	192.5943	206.0455	185.5739	182.6932	167.7668	168.2646	173.4412	173.6049	189.7529	196.9612	215.7990
Water heating fuel												
	217.5155	192.5943	206.0455	185.5739	182.6932	167.7668	168.2646	173.4412	173.6049	189.7529	196.9612	215.7990 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	10.7470	9.7070	10.7470	10.4003	10.7470	10.4003	10.7470	10.7470	10.4003	10.7470	10.4003	10.7470 (331)
Lighting	17.2379	13.8289	12.4514	9.1224	7.0464	5.7570	6.4280	8.3553	10.8528	14.2394	16.0834	17.7170 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-12.5750	-21.0857	-36.4274	-47.7630	-56.6284	-54.8783	-54.0551	-48.2099	-38.3272	-26.6290	-14.7841	-10.3861 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												918.2782 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2270.0131 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												9.1828 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7700)												
mechanical ventilation fans (SFP = 0.7700)												126.5372 (330a)
Total electricity for the above, kWh/year												126.5372 (331)
Electricity for lighting (calculated in Appendix L)												139.1199 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-421.7491 (333)

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Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	3528.4322 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			280.0000 (367)
Space and Water heating from Heat pump	1138.6755	0.1570	51.4813 (367)
Electrical energy for heat distribution (space & water)	9.1828	0.0000	4.6273 (372)
Overall CO2 factor for heat network			0.0533 (386)
Total CO2 associated with community systems			169.8890 (373)
Energy for instantaneous electric shower(s)	496.2328	0.1391	69.0370 (264a)
Space and water heating			169.8890 (376)
Pumps, fans and electric keep-hot	126.5372	0.1387	17.5523 (378)
Energy for lighting	139.1199	0.1443	20.0793 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-421.7491	0.1316	-55.5097
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-55.5097 (380)
Total CO2, kg/year			221.0479 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.1000 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	1138.6755	1.5811	518.5379 (467)
Electrical energy for heat distribution (space & water)	9.1828	0.0000	48.9987 (472)
Overall CO2 factor for heat network			0.5642 (486)
Total CO2 associated with community systems			1798.9514 (473)
Energy for instantaneous electric shower(s)	496.2328	1.5143	751.4623 (278a)
Space and water heating			1798.9514 (476)
Pumps, fans and electric keep-hot	126.5372	1.5128	191.4254 (478)
Energy for lighting	139.1199	1.5338	213.3868 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-421.7491	1.4863	-626.8334
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-626.8334 (480)
Total Primary energy kWh/year			2328.3925 (483)
Dwelling Primary energy Rate (DPER)			43.2100 (484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	53.8800 (1b)	2.5000 (2b)	134.7000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.8800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	134.7000 (5)

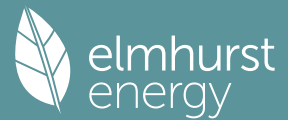
2. Ventilation rate

	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	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1485 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3985	(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) =		0.3387 (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)

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Adj infilt rate	0.4319	0.4234	0.4149	0.3726	0.3641	0.3218	0.3218	0.3133	0.3387	0.3641	0.3810	0.3980 (22b)
Effective ac	0.5932	0.5896	0.5861	0.5694	0.5663	0.5518	0.5518	0.5491	0.5574	0.5663	0.5726	0.5792 (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
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			8.4300	1.1450	9.6527		(27)
Exposed Floor			53.8800	0.1300	7.0044		(28b)
External Wall	17.0800	10.3200	6.7600	0.1800	1.2168		(29a)
Communal Wall	14.3300		14.3300	0.1800	2.5794		(29a)
Total net area of external elements Aum(A, m2)			85.2900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	22.3433		(33)
Main dwelling							
Party Wall			52.0500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							138.1637 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value		Total
E2 Other lintels (including other steel lintels)				4.5300	0.0500		0.2265
E4 Jamb				13.9800	0.0500		0.6990
E7 Party floor between dwellings (in blocks of flats)				9.3400	0.0700		0.6538
E16 Corner (normal)				2.5000	0.0900		0.2250
E18 Party wall between dwellings				10.0000	0.0600		0.6000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				20.8200	0.0000		0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation				5.3900	0.0200		0.1078
E20 Exposed floor (normal)				7.1700	0.3200		2.2944
P7 Party Wall - Exposed floor (normal)				8.0500	0.1600		1.2880
E17 Corner (inverted - internal area greater than external area)				2.5000	-0.0900		-0.2250
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.8695 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	28.2128 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	26.3704	26.2095	26.0517	25.3107	25.1721	24.5267	24.5267	24.4071	24.7753	25.1721	25.4525	25.7458 (38)
Heat transfer coeff	54.5832	54.4223	54.2645	53.5235	53.3848	52.7394	52.7394	52.6199	52.9880	53.3848	53.6653	53.9585 (39)
Average = Sum(39)m / 12 =												53.5228
HLP	1.0131	1.0101	1.0071	0.9934	0.9908	0.9788	0.9788	0.9766	0.9834	0.9908	0.9960	1.0015 (40)
HLP (average)												0.9934
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

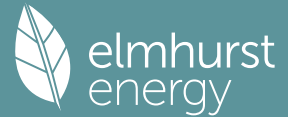
4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.8045 (42)
Hot water usage for mixer showers	54.4746	53.6560	52.4630	50.1806	48.4962	46.6178	45.5501	46.7340	48.0317	50.0486	52.3801	54.2659 (42a)
Hot water usage for baths	23.5491	23.1994	22.7069	21.7988	21.1188	20.3648	19.9576	20.4466	20.9791	21.7859	22.7127	23.4695 (42b)
Hot water usage for other uses	33.1096	31.9056	30.7016	29.4977	28.2937	27.0897	27.0897	28.2937	29.4977	30.7016	31.9056	33.1096 (42c)
Average daily hot water use (litres/day)												102.1571 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	111.1333	108.7610	105.8715	101.4770	97.9087	94.0723	92.5973	95.4743	98.5085	102.5361	106.9984	110.8450 (44)
Energy content (annual)	176.0080	154.8742	162.7206	138.9170	131.8039	115.6728	111.9884	118.2171	121.4709	139.1406	152.4388	173.5565 (45)
Distribution loss (46)m = 0.15 x (45)m	26.4012	23.2311	24.4081	20.8375	19.7706	17.3509	16.7983	17.7326	18.2206	20.8711	22.8658	26.0335 (46)
Water storage loss (or HIU loss):												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (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												
WWHRS	222.6029	196.9599	209.3155	184.0088	178.3988	160.7647	158.5833	164.8120	166.5627	185.7355	197.5307	220.1514 (62)
PV diverter	-24.9035	-22.0249	-23.0632	-19.0972	-17.7979	-15.2298	-14.2755	-15.1806	-15.7574	-18.5762	-21.0446	-24.4423 (63a)
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 (63b)
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 (63c)
Output from w/h	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)
	197.6994	174.9350	186.2523	164.9116	160.6009	145.5349	144.3078	149.6314	150.8054	167.1593	176.4861	195.7090 (64)
12Total per year (kWh/year)												2014.0331 (64)
Electric shower(s)												2014 (64)
	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)
												0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												
Heat gains from water heating, kWh/month												
	95.7986	85.1642	91.3805	82.2634	81.1007	74.5347	74.5121	76.5831	76.4625	83.5402	86.7594	94.9835 (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	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	83.1417	92.0498	83.1417	85.9131	83.1417	85.9131	83.1417	83.1417	85.9131	83.1417	85.9131	83.1417 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	157.2947	158.9269	154.8138	146.0574	135.0039	124.6153	117.6750	116.0428	120.1560	128.9124	139.9658	150.3545 (68)

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

	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224 (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 (70)
Losses e.g. evaporation (negative values) (Table 5)	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790 (71)
Water heating gains (Table 5)	128.7615	126.7325	122.8233	114.2547	109.0063	103.5204	100.1506	102.9343	106.1980	112.2852	120.4992 (72)
Total internal gains	422.2651	430.7763	413.8459	399.2922	380.2191	364.1159	351.0345	352.1859	362.3341	377.4064	399.4452 (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	8.4300		46.7521		0.6300		0.7000		0.7700		120.4482 (78)
Solar gains	120.4482	197.2631	251.2781	283.9989	295.9444	284.8062	278.2730	270.2416	262.4897	212.7667	104.0783 (83)
Total gains	542.7133	628.0394	665.1241	683.2911	676.1635	648.9221	629.3075	622.4275	624.8238	590.1731	518.3075 (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
tau	37.8844	37.9964	38.1069	38.6344	38.7348	39.2088	39.2088	39.2979	39.0249	38.7348	38.5323
alpha	3.5256	3.5331	3.5405	3.5756	3.5823	3.6139	3.6139	3.6199	3.6017	3.5823	3.5688
util living area	0.9281	0.8879	0.8401	0.7600	0.6490	0.4954	0.3624	0.3810	0.5467	0.7573	0.8860
MIT	19.6942	19.9791	20.2686	20.5868	20.8143	20.9481	20.9870	20.9841	20.9223	20.6511	20.1455
Th 2	20.0725	20.0750	20.0774	20.0889	20.0910	20.1010	20.1010	20.1029	20.0972	20.0910	20.0867
util rest of house	0.9171	0.8720	0.8178	0.7273	0.6022	0.4333	0.2909	0.3098	0.4857	0.7187	0.8672
MIT 2	18.5803	18.9309	19.2838	19.6677	19.9224	20.0638	20.0945	20.0945	20.0378	19.7497	19.1505
Living area fraction	18.9483	19.2772	19.6092	19.9714	20.2171	20.3560	20.3894	20.3884	20.3300	20.0475	19.4792
MIT	18.9483	19.2772	19.6092	19.9714	20.2171	20.3560	20.3894	20.3884	20.3300	20.0475	19.4792
Temperature adjustment											0.0000
adjusted MIT	18.9483	19.2772	19.6092	19.9714	20.2171	20.3560	20.3894	20.3884	20.3300	20.0475	19.4792

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9009	0.8561	0.8052	0.7228	0.6090	0.4513	0.3141	0.3328	0.5019	0.7167	0.8527	0.9108 (94)
Useful gains	488.9254	537.6735	535.5459	493.8577	411.7774	292.8702	197.6788	207.1340	313.5970	422.9734	462.3749	472.0582 (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	799.5513	782.4393	711.3619	592.5785	454.6820	303.5656	199.8497	209.8702	330.1168	504.3534	664.3337	793.0900 (97)
Space heating kWh	231.1057	164.4826	130.8071	71.0790	31.9210	0.0000	0.0000	0.0000	0.0000	60.5467	145.4103	238.8477 (98a)
Space heating requirement - total per year (kWh/year)												1074.2000
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	231.1057	164.4826	130.8071	71.0790	31.9210	0.0000	0.0000	0.0000	0.0000	60.5467	145.4103	238.8477 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1074.2000
Space heating per m2										(98c) / (4) =		19.9369 (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	231.1057	164.4826	130.8071	71.0790	31.9210	0.0000	0.0000	0.0000	0.0000	60.5467	145.4103	238.8477 (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)	250.3854	178.2044	141.7195	77.0086	34.5840	0.0000	0.0000	0.0000	0.0000	65.5977	157.5410	258.7732 (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	197.6994	174.9350	186.2523	164.9116	160.6009	145.5349	144.3078	149.6314	150.8054	167.1593	176.4861	195.7090 (64)
Efficiency of water heater (217)m	84.4108	83.9218	83.2824	82.3127	81.1639	79.8000	79.8000	79.8000	79.8000	82.0101	83.6288	79.8000 (216)
Fuel for water heating, kWh/month	234.2110	208.4499	223.6396	200.3476	197.8722	182.3745	180.8369	187.5080	188.9791	203.8277	211.0351	231.5875 (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	17.2752	13.8588	12.4783	9.1422	7.0617	5.7694	6.4419	8.3734	10.8762	14.2702	16.1182	17.7553 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-14.5693	-21.6563	-32.8054	-38.9470	-43.8307	-41.6046	-41.1190	-37.9173	-32.5755	-25.6799	-16.4161	-12.4707 (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)

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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	-5.1534	-11.0898	-22.5077	-34.4918	-46.2748	-46.7226	-46.1516	-38.7510	-27.9934	-16.0593	-6.9456	-4.0554	(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												1163.8137	(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												2450.6692	(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)												139.4208	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-665.7885	(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												3174.1152	(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	1163.8137	0.2100	244.4009	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2450.6692	0.2100	514.6405	(264)
Space and water heating			759.0414	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	139.4208	0.1443	20.1227	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-359.5921	0.1335	-47.9959	
PV Unit electricity exported	-306.1964	0.1253	-38.3732	
Total			-86.3691	(269)
Total CO2, kg/year			704.7243	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.0800	(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	1163.8137	1.1300	1315.1095	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2450.6692	1.1300	2769.2562	(278)
Space and water heating			4084.3657	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	139.4208	1.5338	213.8483	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-359.5921	1.4932	-536.9539	
PV Unit electricity exported	-306.1964	0.4600	-140.8481	
Total			-677.8019	(283)
Total Primary energy kWh/year			3750.5129	(286)
Target Primary Energy Rate (TPER)			69.6100	(287)

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Plot Reference	B2 1B2P Mid exp			Issued on Date	19/12/2025
Assessment Reference	1B2P	Plot Type Ref	1B2P		
Plot Address				SAP Version	10.2
SAP Rating	79 C	DER	4.10	TER	13.08
Environmental	97 A	% DER < TER			68.65
CO ₂ Emissions (t/year)	0.2	DFEE	26.56	TFEE	27.05
Compliance Check	See BREL	% DFEE < TFEE			1.83
% DPER < TPER	37.92	DPER	43.21	TPER	69.61
Assessor Details	Mr. Matthew Stainrod			Assessor ID	AU83-0001
Client	ROK, Wilf Foster				

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	53.8800 (1b)	2.5000 (2b)	134.7000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.8800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	134.7000 (5)

2. Ventilation rate

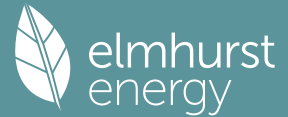
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	20.0000 / (5) = 0.1485 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2985 (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) = 0.2537 (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	0.3235	0.3171	0.3108	0.2791	0.2727	0.2410	0.2410	0.2347	0.2537	0.2727	0.2854	0.2981 (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	0.5523	0.5503	0.5483	0.5389	0.5372	0.5290	0.5290	0.5275	0.5322	0.5372	0.5407	0.5444 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			8.4300	0.9615	8.1058		(27)
Exposed Floor			53.8800	0.1200	6.4656	0.0000	0.0000 (28b)
External Wall	17.0800	10.3200	6.7600	0.1600	1.0816	14.0000	94.6400 (29a)
Communal Wall	14.3300		14.3300	0.2100	3.0093	14.0000	200.6200 (29a)
Total net area of external elements Aum(A, m ²)			85.2900				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	20.5523	(33)
Main dwelling							
Party Wall			52.0500	0.0000	0.0000	20.0000	1041.0000 (32)
Party Ceiling			53.8800			100.0000	5388.0000 (32b)
Stud			80.0000			9.0000	720.0000 (32c)
Heat capacity Cm = Sum (A x k)						(28)...(30) + (32) + (32a)...(32e) =	7444.2600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							138.1637 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				4.5300	0.0500	0.2265	
E4 Jamb				13.9800	0.0500	0.6990	

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E7 Party floor between dwellings (in blocks of flats)	9.3400	0.0700	0.6538
E16 Corner (normal)	2.5000	0.0900	0.2250
E18 Party wall between dwellings	10.0000	0.0600	0.6000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	20.8200	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.3900	0.0200	0.1078
E20 Exposed floor (normal)	7.1700	0.3200	2.2944
P7 Party Wall - Exposed floor (normal)	8.0500	0.1600	1.2880
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250

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

Point Thermal bridges

Total fabric heat loss

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	24.5511	24.4608	24.3723	23.9565	23.8787	23.5166	23.5166	23.4495	23.6561	23.8787	24.0361	24.2006	(38)
Average = Sum(39)m / 12 =	50.9729	50.8826	50.7940	50.3783	50.3005	49.9384	49.9384	49.8713	50.0779	50.3005	50.4579	50.6224	(39)
	50.3779												
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9460	0.9444	0.9427	0.9350	0.9336	0.9268	0.9268	0.9256	0.9294	0.9336	0.9365	0.9395	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)													
Assumed occupancy													1.8045 (42)
Hot water usage for mixer showers													
Hot water usage for baths	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 other uses	23.5491	23.1994	22.7069	21.7988	21.1188	20.3648	19.9576	20.4466	20.9791	21.7859	22.7127	23.4695	(42b)
Average daily hot water use (litres/day)	33.1096	31.9056	30.7016	29.4977	28.2937	27.0897	27.0897	28.2937	29.4977	30.7016	31.9056	33.1096	(42c)
												51.9334	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	56.6587	55.1050	53.4085	51.2964	49.4125	47.4545	47.0473	48.7403	50.4768	52.4875	54.6183	56.5791	(44)
Distribution loss (46)m = 0.15 x (45)m	89.7336	78.4688	82.0869	70.2222	66.5187	58.3509	56.8996	60.3507	62.2429	71.2251	77.8138	88.5892	(45)
Water storage loss (or HIU 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	(46)
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	76.2735	66.6985	69.7738	59.6889	56.5409	49.5982	48.3646	51.2981	52.9065	60.5413	66.1417	75.3008	(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	76.2735	66.6985	69.7738	59.6889	56.5409	49.5982	48.3646	51.2981	52.9065	60.5413	66.1417	75.3008	(64)
12Total per year (kWh/year)													733 (64)
Electric shower(s)	43.6251	38.8703	42.4449	40.5046	41.2647	39.3625	40.6746	41.2647	40.5046	42.4449	41.6468	43.6251	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												496.2328	(64a)
Heat gains from water heating, kWh/month	29.9747	26.3922	28.0547	25.0484	24.4514	22.2402	22.2598	23.1407	23.3528	25.7466	26.9471	29.7315	(65)

5. Internal gains (see Table 5 and 5a)													
Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	83.1417	92.0498	83.1417	85.9131	83.1417	85.9131	83.1417	83.1417	85.9131	83.1417	85.9131	83.1417	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	157.2947	158.9269	154.8138	146.0574	135.0039	124.6153	117.6750	116.0428	120.1560	128.9124	139.9658	150.3545	(68)
Pumps, fans	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224	(69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Water heating gains (Table 5)	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	(71)
Total internal gains	40.2885	39.2741	37.7079	34.7894	32.8648	30.8891	29.9191	31.1031	32.4344	34.6056	37.4266	39.9617	(72)
	330.7921	340.3179	325.7305	316.8270	301.0775	291.4847	280.8030	280.3547	288.5706	296.7268	313.3726	323.5250	(73)

6. Solar gains													
[Jan]													
South	Area	Solar flux	g	FF	Access	Gains							
	m2	Table 6a	W/m2	Specific data	factor	W							
				or Table 6b	Table 6d								
	8.4300	46.7521	0.4000	0.7000	0.7700	76.4750	(78)						
Solar gains	76.4750	125.2464	159.5417	180.3167	187.9012	180.8293	176.6813	171.5820	166.6601	135.0900	90.6490	66.0815	(83)
Total gains	407.2671	465.5643	485.2722	497.1437	488.9787	472.3140	457.4842	451.9367	455.2307	431.8168	404.0216	389.6064	(84)

7. Mean internal temperature (heating season)

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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	40.5677	40.6397	40.7105	41.0465	41.1099	41.4080	41.4080	41.4637	41.2927	41.1099	40.9817	40.8485
alpha	3.7045	3.7093	3.7140	3.7364	3.7407	3.7605	3.7605	3.7642	3.7528	3.7407	3.7321	3.7232
util living area	0.9649	0.9429	0.9158	0.8610	0.7712	0.6170	0.4640	0.4873	0.6700	0.8574	0.9416	0.9696 (86)
MIT	19.5034	19.7577	20.0451	20.4051	20.7028	20.9074	20.9755	20.9699	20.8670	20.4988	19.9489	19.4533 (87)
Th 2	20.1285	20.1300	20.1313	20.1378	20.1391	20.1447	20.1447	20.1458	20.1426	20.1391	20.1366	20.1340 (88)
util rest of house	0.9590	0.9337	0.9017	0.8369	0.7300	0.5509	0.3802	0.4045	0.6085	0.8285	0.9305	0.9644 (89)
MIT 2	18.7691	19.0182	19.2983	19.6460	19.9177	20.0899	20.1346	20.1327	20.0586	19.7390	19.2135	18.7242 (90)
Living area fraction									fLA = Living area / (4) =			0.3304 (91)
MIT	19.0117	19.2625	19.5450	19.8968	20.1771	20.3600	20.4124	20.4092	20.3257	19.9900	19.4564	18.9650 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0117	19.2625	19.5450	19.8968	20.1771	20.3600	20.4124	20.4092	20.3257	19.9900	19.4564	18.9650 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9495	0.9226	0.8906	0.8293	0.7320	0.5683	0.4070	0.4307	0.6224	0.8229	0.9200	0.9556 (94)
Useful gains	386.7152	429.5236	432.2070	412.2968	357.9335	268.4079	186.2076	194.6611	283.3292	355.3426	371.7073	372.3190 (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	749.8981	730.8004	662.6091	553.9994	426.4018	287.6447	190.3846	199.9464	311.7681	472.3214	623.4791	747.4411 (97)
Space heating kWh	270.2081	202.4580	171.4192	102.0258	50.9404	0.0000	0.0000	0.0000	0.0000	87.0322	181.2757	279.0908 (98a)
Space heating requirement - total per year (kWh/year)											1344.4502	
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	270.2081	202.4580	171.4192	102.0258	50.9404	0.0000	0.0000	0.0000	0.0000	87.0322	181.2757	279.0908 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)											1344.4502	
Space heating per m2											(98c) / (4) =	24.9527 (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	469.4207	369.5440	379.0220	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8278	0.8922	0.8829	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	388.5920	329.7054	334.6565	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	519.2364	503.6453	498.7897	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	94.0640	129.4113	122.1151	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	23.5160	32.3528	30.5288	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												86.3976 (107)
Energy for space heating												24.9527 (99)
Energy for space cooling												1.6035 (108)
Total												26.5562 (109)
Fabric Energy Efficiency (DFEE)												26.6 (109)

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

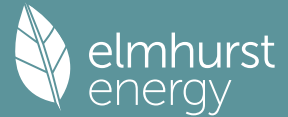
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	53.8800 (1b)	x 2.5000 (2b)	= 134.7000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.8800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	134.7000 (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	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) = 0.1485 (8)
Pressure test	Yes
Pressure Test Method	Blower Door

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Measured/design AP50 5.0000 (17)
 Infiltration rate 0.3985 (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) = 0.3387 (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	0.4319	0.4234	0.4149	0.3726	0.3641	0.3218	0.3218	0.3133	0.3387	0.3641	0.3810	0.3980	(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	0.5932	0.5896	0.5861	0.5694	0.5663	0.5518	0.5518	0.5491	0.5574	0.5663	0.5726	0.5792	(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	
Main dwelling								
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type			8.4300	1.1450	9.6527			(27)
Exposed Floor			53.8800	0.1300	7.0044			(28b)
External Wall	17.0800	10.3200	6.7600	0.1800	1.2168			(29a)
Communal Wall	14.3300		14.3300	0.1800	2.5794			(29a)
Total net area of external elements Aum(A, m2)			85.2900					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	22.3433		(33)
Main dwelling								
Party Wall			52.0500	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								138.1637 (35)

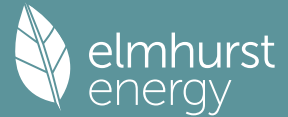
List of Thermal Bridges													
K1 Element													
E2 Other lintels (including other steel lintels)													
E4 Jamb													
E7 Party floor between dwellings (in blocks of flats)													
E16 Corner (normal)													
E18 Party wall between dwellings													
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)													
E23 Balcony within or between dwellings, balcony support penetrates wall insulation													
E20 Exposed floor (normal)													
P7 Party Wall - Exposed floor (normal)													
E17 Corner (inverted - internal area greater than external area)													
Thermal bridges (Sum(L x Psi) calculated using Appendix K)													5.8695 (36)
Point Thermal bridges													(36a) = 0.0000
Total fabric heat loss													(33) + (36) + (36a) = 28.2128 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	26.3704	26.2095	26.0517	25.3107	25.1721	24.5267	24.5267	24.4071	24.7753	25.1721	25.4525	25.7458	(38)
Heat transfer coeff	54.5832	54.4223	54.2645	53.5235	53.3848	52.7394	52.7394	52.6199	52.9880	53.3848	53.6653	53.9585	(39)
Average = Sum(39)m / 12 =													53.5228
HLP	1.0131	1.0101	1.0071	0.9934	0.9908	0.9788	0.9788	0.9766	0.9834	0.9908	0.9960	1.0015	(40)
HLP (average)													0.9934
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.8045 (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													
23.5491 23.1994 22.7069 21.7988 21.1188 20.3648 19.9576 20.4466 20.9791 21.7859 22.7127 23.4695													(42b)
Hot water usage for other uses													
33.1096 31.9056 30.7016 29.4977 28.2937 27.0897 27.0897 28.2937 29.4977 30.7016 31.9056 33.1096													(42c)
Average daily hot water use (litres/day)													51.9334 (43)
Daily hot water use													
56.6587 55.1050 53.4085 51.2964 49.4125 47.4545 47.0473 48.7403 50.4768 52.4875 54.6183 56.5791													(44)
Energy conte 89.7336 78.4688 82.0869 70.2222 66.5187 58.3509 56.8996 60.3507 62.2429 71.2251 77.8138 88.5892													(45)
Energy content (annual)													862.5023
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 (or HIU 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													(59)
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)
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													(62)
Total heat required for water heating calculated for each month													
76.2735 66.6985 69.7738 59.6889 56.5409 49.5982 48.3646 51.2981 52.9065 60.5413 66.1417 75.3008													(63a)
WWHRS													(63b)
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)
PV diverter													(63d)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000													
Solar 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													
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													
Output from w/h													
76.2735 66.6985 69.7738 59.6889 56.5409 49.5982 48.3646 51.2981 52.9065 60.5413 66.1417 75.3008													(64)
12Total per year (kWh/year)													733.1270 (64)
Electric shower(s)													733 (64)
43.6251 38.8703 42.4449 40.5046 41.2647 39.3625 40.6746 41.2647 40.5046 42.4449 41.6468 43.6251													(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													496.2328 (64a)
Heat gains from water heating, kWh/month													
29.9747 26.3922 28.0547 25.0484 24.4514 22.2402 22.2598 23.1407 23.3528 25.7466 26.9471 29.7315													(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	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	83.1417	92.0498	83.1417	85.9131	83.1417	85.9131	83.1417	83.1417	85.9131	83.1417	85.9131	83.1417	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	157.2947	158.9269	154.8138	146.0574	135.0039	124.6153	117.6750	116.0428	120.1560	128.9124	139.9658	150.3545	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224	(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)	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	(71)
Water heating gains (Table 5)	40.2885	39.2741	37.7079	34.7894	32.8648	30.8891	29.9191	31.1031	32.4344	34.6056	37.4266	39.9617	(72)
Total internal gains	330.7921	340.3179	325.7305	316.8270	301.0775	291.4847	280.8030	280.3547	288.5706	296.7268	313.3726	323.5250	(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					8.4300	46.7521	0.6300	0.7000					0.7700	120.4482 (78)

Solar gains	120.4482	197.2631	251.2781	283.9989	295.9444	284.8062	278.2730	270.2416	262.4897	212.7667	142.7722	104.0783	(83)	
Total gains	451.2402	537.5810	577.0087	600.8259	597.0219	576.2908	559.0759	550.5963	551.0603	509.4935	456.1447	427.6033	(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	37.8844	37.9964	38.1069	38.6344	38.7348	39.2088	39.2088	39.2979	39.0249	38.7348	38.5323	38.3230		
alpha	3.5256	3.5331	3.5405	3.5756	3.5823	3.6139	3.6139	3.6199	3.6017	3.5823	3.5688	3.5549		
util living area	0.9558	0.9228	0.8823	0.8098	0.7048	0.5473	0.4048	0.4268	0.6034	0.8140	0.9249	0.9622	(86)	
MIT	19.4625	19.7819	20.1092	20.4812	20.7560	20.9285	20.9814	20.9771	20.8931	20.5474	19.9573	19.4096	(87)	
Th 2	20.0725	20.0750	20.0774	20.0889	20.0910	20.1010	20.1010	20.1029	20.0972	20.0910	20.0867	20.0821	(88)	
util rest of house	0.9484	0.9107	0.8639	0.7802	0.6588	0.4816	0.3262	0.3485	0.5402	0.7796	0.9111	0.9558	(89)	
MIT 2	18.6863	18.9973	19.3130	19.6698	19.9150	20.0603	20.0937	20.0933	20.0322	19.7382	19.1813	18.6420	(90)	
Living area fraction	18.9427	19.2565	19.5761	19.9379	20.1929	20.3471	20.3869	20.3853	20.3166	20.0055	19.4377	18.8956	(91)	
MIT	18.9427	19.2565	19.5761	19.9379	20.1929	20.3471	20.3869	20.3853	20.3166	20.0055	19.4377	18.8956	(92)	
Temperature adjustment												0.0000		
adjusted MIT	18.9427	19.2565	19.5761	19.9379	20.1929	20.3471	20.3869	20.3853	20.3166	20.0055	19.4377	18.8956	(93)	

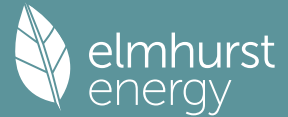
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9373	0.8980	0.8525	0.7748	0.6643	0.5002	0.3516	0.3736	0.5562	0.7760	0.8994	0.9454	(94)
Useful gains	422.9288	482.7621	491.8883	465.5317	396.5993	288.2430	196.5829	205.7152	306.4929	395.3821	410.2446	404.2714	(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	799.2483	781.3126	709.5657	590.7862	453.3895	303.0997	199.7209	209.7046	329.4055	502.1118	662.1049	792.9534	(97)
Space heating kWh	279.9818	200.6259	161.9520	90.1832	42.2519	0.0000	0.0000	0.0000	0.0000	79.4069	181.3394	289.1794	(98a)
Space heating requirement - total per year (kWh/year)												1324.9206	
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	279.9818	200.6259	161.9520	90.1832	42.2519	0.0000	0.0000	0.0000	0.0000	79.4069	181.3394	289.1794	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1324.9206	
Space heating per m ²										(98c) / (4) =		24.5902	(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	495.7506	390.2717	399.9113	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8710	0.9219	0.9144	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	431.7849	359.7872	365.6628	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	640.7678	622.3888	614.1062	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	150.4677	195.3756	184.8419	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	37.6169	48.8439	46.2105	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												132.6713	(107)
Energy for space heating												24.5902	(99)
Energy for space cooling												2.4623	(108)
Total												27.0526	(109)
Fabric Energy Efficiency (TFEE)												27.1	(109)

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Plot Reference	B2 1B2P Mid exp				Issued on Date	19/12/2025	
Assessment Reference	1B2P		Plot Type Ref		1B2P		
Plot Address					SAP Version	10.2	
SAP Rating	79 C		DER	4.10		TER	13.08
Environmental	97 A		% DER < TER				68.65
CO ₂ Emissions (t/year)	0.2		DFEE	26.56		TFEE	27.05
Compliance Check	See BREL		% DFEE < TFEE				1.83
% DPER < TPER	37.92		DPER	43.21		TPER	69.61
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	53.8800 (1b)	2.5000 (2b)	134.7000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.8800		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	134.7000 (5)

2. Ventilation rate

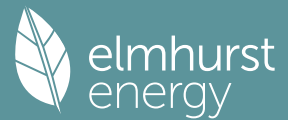
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000 (23c)
Effective ac	0.3026	0.2994	0.2962	0.2802	0.2771	0.2611	0.2611	0.2579	0.2675	0.2771	0.2834	0.2898 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			8.4300	0.9615	8.1058		(27)
Exposed Floor			53.8800	0.1200	6.4656	0.0000	0.0000 (28b)
External Wall	17.0800	10.3200	6.7600	0.1600	1.0816	14.0000	94.6400 (29a)
Communal Wall	14.3300		14.3300	0.2100	3.0093	14.0000	200.6200 (29a)
Total net area of external elements Aum(A, m ²)			85.2900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.5523		(33)
Main dwelling							
Party Wall			52.0500	0.0000	0.0000	20.0000	1041.0000 (32)
Party Ceiling			53.8800			100.0000	5388.0000 (32b)
Stud			80.0000			9.0000	720.0000 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		7444.2600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							138.1637 (35)
List of Thermal Bridges							

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K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	4.5300	0.0500	0.2265
E4 Jamb	13.9800	0.0500	0.6990
E7 Party floor between dwellings (in blocks of flats)	9.3400	0.0700	0.6538
E16 Corner (normal)	2.5000	0.0900	0.2250
E18 Party wall between dwellings	10.0000	0.0600	0.6000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	20.8200	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.3900	0.0200	0.1078
E20 Exposed floor (normal)	7.1700	0.3200	2.2944
P7 Party Wall - Exposed floor (normal)	8.0500	0.1600	1.2880
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.8695 (36)
Point Thermal Bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	26.4218 (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	13.4492	13.3075	13.1658	12.4574	12.3157	11.6073	11.6073	11.4656	11.8906	12.3157	12.5991	12.8825 (38)
Heat transfer coeff	39.8710	39.7293	39.5876	38.8792	38.7375	38.0290	38.0290	37.8873	38.3124	38.7375	39.0208	39.3042 (39)
Average = Sum(39)m / 12 =												38.8437
HLP	0.7400	0.7374	0.7347	0.7216	0.7190	0.7058	0.7058	0.7032	0.7111	0.7190	0.7242	0.7295 (40)
HLP (average)												0.7209
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.8045 (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	23.5491	23.1994	22.7069	21.7988	21.1188	20.3648	19.9576	20.4466	20.9791	21.7859	22.7127	23.4695 (42b)
Hot water usage for other uses	33.1096	31.9056	30.7016	29.4977	28.2937	27.0897	27.0897	28.2937	29.4977	30.7016	31.9056	33.1096 (42c)
Average daily hot water use (litres/day)												51.9334 (43)
Daily hot water use	56.6587	55.1050	53.4085	51.2964	49.4125	47.4545	47.0473	48.7403	50.4768	52.4875	54.6183	56.5791 (44)
Energy conte	89.7336	78.4688	82.0869	70.2222	66.5187	58.3509	56.8996	60.3507	62.2429	71.2251	77.8138	88.5892 (45)
Energy content (annual)										Total = Sum(45)m =		862.5023
Distribution loss (46)m = 0.15 x (45)m	13.4600	11.7703	12.3130	10.5333	9.9778	8.7526	8.5349	9.0526	9.3364	10.6838	11.6721	13.2884 (46)
Water storage loss (or HIU loss):												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	145.0104	128.3962	137.3637	123.7159	121.7955	111.8445	112.1764	115.6275	115.7366	126.5019	131.3075	143.8660 (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	145.0104	128.3962	137.3637	123.7159	121.7955	111.8445	112.1764	115.6275	115.7366	126.5019	131.3075	143.8660 (64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1513.3421 (64)
Electric shower(s)	43.6251	38.8703	42.4449	40.5046	41.2647	39.3625	40.6746	41.2647	40.5046	42.4449	41.6468	43.6251 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												496.2328 (64a)
Heat gains from water heating, kWh/month	84.9641	75.7504	82.1266	76.2700	76.6551	72.0372	73.3092	74.6042	73.6169	78.5150	79.0797	84.5836 (65)

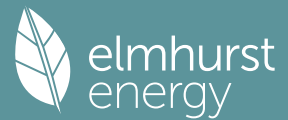
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	83.1417	92.0498	83.1417	85.9131	83.1417	85.9131	83.1417	83.1417	85.9131	83.1417	85.9131	83.1417 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	157.2947	158.9269	154.8138	146.0574	135.0039	124.6153	117.6750	116.0428	120.1560	128.9124	139.9658	150.3545 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224 (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)	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790 (71)
Water heating gains (Table 5)	114.1991	112.7238	110.3852	105.9306	103.0310	100.0517	98.5339	100.2745	102.2457	105.5309	109.8330	113.6877 (72)
Total internal gains	404.7026	413.7676	398.4078	387.9681	371.2438	360.6472	349.4177	349.5261	358.3818	367.6521	385.7790	397.2510 (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	8.4300	46.7521	0.4000	0.7000	0.7700	76.4750 (78)

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Solar gains	76.4750	125.2464	159.5417	180.3167	187.9012	180.8293	176.6813	171.5820	166.6601	135.0900	90.6490	66.0815 (83)
Total gains	481.1777	539.0140	557.9494	568.2849	559.1450	541.4766	526.0990	521.1081	525.0420	502.7421	476.4280	463.3324 (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	51.8635	52.0485	52.2348	53.1866	53.3811	54.3756	54.3756	54.5789	53.9734	53.3811	52.9935	52.6114
alpha	4.4576	4.4699	4.4823	4.5458	4.5587	4.6250	4.6250	4.6386	4.5982	4.5587	4.5329	4.5074
util living area	0.9215	0.8796	0.8290	0.7348	0.6105	0.4433	0.3170	0.3331	0.4926	0.7194	0.8680	0.9296 (86)
MIT	20.2258	20.4234	20.6114	20.8150	20.9337	20.9882	20.9980	20.9975	20.9799	20.8557	20.5494	20.1982 (87)
Th 2	20.3056	20.3079	20.3103	20.3218	20.3241	20.3357	20.3357	20.3380	20.3311	20.3241	20.3195	20.3149 (88)
util rest of house	0.9111	0.8651	0.8092	0.7067	0.5731	0.3992	0.2696	0.2857	0.4480	0.6862	0.8502	0.9201 (89)
MIT 2	19.6104	19.7999	19.9783	20.1732	20.2764	20.3288	20.3348	20.3369	20.3187	20.2130	19.9321	19.5918 (90)
Living area fraction	19.8137	20.0059	20.1874	20.3853	20.4935	20.5467	20.5539	20.5551	20.5372	20.4253	20.1360	19.7922 (92)
MIT	19.8137	20.0059	20.1874	20.3853	20.4935	20.5467	20.5539	20.5551	20.5372	20.4253	20.1360	19.7922 (93)
Temperature adjustment												0.0000
adjusted MIT	19.8137	20.0059	20.1874	20.3853	20.4935	20.5467	20.5539	20.5551	20.5372	20.4253	20.1360	19.7922 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9028	0.8582	0.8054	0.7095	0.5827	0.4133	0.2852	0.3013	0.4619	0.6914	0.8450	0.9120 (94)
Useful gains	434.4167	462.5738	449.3885	403.1786	325.7934	223.8068	150.0361	156.9998	242.5119	347.5775	402.5895	422.5446 (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	618.5468	600.1464	541.8525	446.5370	340.6392	226.1457	150.3640	157.4264	246.6229	380.6090	508.6757	612.8378 (97)
Space heating kWh	136.9928	92.4488	68.7932	31.2180	11.0453	0.0000	0.0000	0.0000	0.0000	24.5755	76.3820	141.5781 (98a)
Space heating requirement - total per year (kWh/year)												583.0338
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	136.9928	92.4488	68.7932	31.2180	11.0453	0.0000	0.0000	0.0000	0.0000	24.5755	76.3820	141.5781 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												583.0338
Space heating per m2										(98c) / (4) =		10.8210 (99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space and Water												1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500 (305)
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system												1.5000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	136.9928	92.4488	68.7932	31.2180	11.0453	0.0000	0.0000	0.0000	0.0000	24.5755	76.3820	141.5781 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	215.7637	145.6069	108.3493	49.1684	17.3963	0.0000	0.0000	0.0000	0.0000	38.7064	120.3017	222.9856
Space heating requirement	215.7637	145.6069	108.3493	49.1684	17.3963	0.0000	0.0000	0.0000	0.0000	38.7064	120.3017	222.9856 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement	145.0104	128.3962	137.3637	123.7159	121.7955	111.8445	112.1764	115.6275	115.7366	126.5019	131.3075	143.8660 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	217.5155	192.5943	206.0455	185.5739	182.6932	167.7668	168.2646	173.4412	173.6049	189.7529	196.9612	215.7990
Water heating fuel	217.5155	192.5943	206.0455	185.5739	182.6932	167.7668	168.2646	173.4412	173.6049	189.7529	196.9612	215.7990 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	10.7470	9.7070	10.7470	10.4003	10.7470	10.4003	10.7470	10.7470	10.4003	10.7470	10.4003	10.7470 (331)
Lighting	17.2379	13.8289	12.4514	9.1224	7.0464	5.7570	6.4280	8.3553	10.8528	14.2394	16.0834	17.7170 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-12.5750	-21.0857	-36.4274	-47.7630	-56.6284	-54.8783	-54.0551	-48.2099	-38.3272	-26.6290	-14.7841	-10.3861 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												918.2782 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2270.0131 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												9.1828 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7700)												
mechanical ventilation fans (SFP = 0.7700)												126.5372 (330a)
Total electricity for the above, kWh/year												126.5372 (331)
Electricity for lighting (calculated in Appendix L)												139.1199 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-421.7491 (333)

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Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	3528.4322 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			280.0000 (367)
Space and Water heating from Heat pump	1138.6755	0.1570	51.4813 (367)
Electrical energy for heat distribution (space & water)	9.1828	0.0000	4.6273 (372)
Overall CO2 factor for heat network			0.0533 (386)
Total CO2 associated with community systems			169.8890 (373)
Energy for instantaneous electric shower(s)	496.2328	0.1391	69.0370 (264a)
Space and water heating			169.8890 (376)
Pumps, fans and electric keep-hot	126.5372	0.1387	17.5523 (378)
Energy for lighting	139.1199	0.1443	20.0793 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-421.7491	0.1316	-55.5097
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-55.5097 (380)
Total CO2, kg/year			221.0479 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.1000 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	1138.6755	1.5811	518.5379 (467)
Electrical energy for heat distribution (space & water)	9.1828	0.0000	48.9987 (472)
Overall CO2 factor for heat network			0.5642 (486)
Total CO2 associated with community systems			1798.9514 (473)
Energy for instantaneous electric shower(s)	496.2328	1.5143	751.4623 (278a)
Space and water heating			1798.9514 (476)
Pumps, fans and electric keep-hot	126.5372	1.5128	191.4254 (478)
Energy for lighting	139.1199	1.5338	213.3868 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-421.7491	1.4863	-626.8334
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-626.8334 (480)
Total Primary energy kWh/year			2328.3925 (483)
Dwelling Primary energy Rate (DPER)			43.2100 (484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	53.8800 (1b)	2.5000 (2b)	134.7000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.8800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	134.7000 (5)

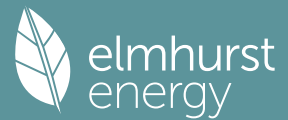
2. Ventilation rate

	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	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1485 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3985	(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) =		0.3387 (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)

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Adj infilt rate	0.4319	0.4234	0.4149	0.3726	0.3641	0.3218	0.3218	0.3133	0.3387	0.3641	0.3810	0.3980 (22b)
Effective ac	0.5932	0.5896	0.5861	0.5694	0.5663	0.5518	0.5518	0.5491	0.5574	0.5663	0.5726	0.5792 (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
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			8.4300	1.1450	9.6527		(27)
Exposed Floor			53.8800	0.1300	7.0044		(28b)
External Wall	17.0800	10.3200	6.7600	0.1800	1.2168		(29a)
Communal Wall	14.3300		14.3300	0.1800	2.5794		(29a)
Total net area of external elements Aum(A, m2)			85.2900				(31)
Fabric heat loss, W/K = Sum (A x U)					(26) ... (30) + (32) =	22.3433	(33)
Main dwelling							
Party Wall			52.0500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							138.1637 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				4.5300	0.0500	0.2265	
E4 Jamb				13.9800	0.0500	0.6990	
E7 Party floor between dwellings (in blocks of flats)				9.3400	0.0700	0.6538	
E16 Corner (normal)				2.5000	0.0900	0.2250	
E18 Party wall between dwellings				10.0000	0.0600	0.6000	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				20.8200	0.0000	0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation				5.3900	0.0200	0.1078	
E20 Exposed floor (normal)				7.1700	0.3200	2.2944	
P7 Party Wall - Exposed floor (normal)				8.0500	0.1600	1.2880	
E17 Corner (inverted - internal area greater than external area)				2.5000	-0.0900	-0.2250	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.8695 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	28.2128 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	26.3704	26.2095	26.0517	25.3107	25.1721	24.5267	24.5267	24.4071	24.7753	25.1721	25.4525	25.7458 (38)
Heat transfer coeff	54.5832	54.4223	54.2645	53.5235	53.3848	52.7394	52.7394	52.6199	52.9880	53.3848	53.6653	53.9585 (39)
Average = Sum(39)m / 12 =												53.5228
HLP	1.0131	1.0101	1.0071	0.9934	0.9908	0.9788	0.9788	0.9766	0.9834	0.9908	0.9960	1.0015 (40)
HLP (average)												0.9934
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

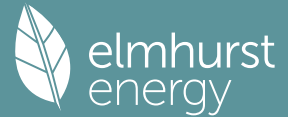
4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.8045 (42)
Hot water usage for mixer showers	54.4746	53.6560	52.4630	50.1806	48.4962	46.6178	45.5501	46.7340	48.0317	50.0486	52.3801	54.2659 (42a)
Hot water usage for baths	23.5491	23.1994	22.7069	21.7988	21.1188	20.3648	19.9576	20.4466	20.9791	21.7859	22.7127	23.4695 (42b)
Hot water usage for other uses	33.1096	31.9056	30.7016	29.4977	28.2937	27.0897	27.0897	28.2937	29.4977	30.7016	31.9056	33.1096 (42c)
Average daily hot water use (litres/day)												102.1571 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	111.1333	108.7610	105.8715	101.4770	97.9087	94.0723	92.5973	95.4743	98.5085	102.5361	106.9984	110.8450 (44)
Energy content (annual)	176.0080	154.8742	162.7206	138.9170	131.8039	115.6728	111.9884	118.2171	121.4709	139.1406	152.4388	173.5565 (45)
Distribution loss (46)m = 0.15 x (45)m	26.4012	23.2311	24.4081	20.8375	19.7706	17.3509	16.7983	17.7326	18.2206	20.8711	22.8658	26.0335 (46)
Water storage loss (or HIU loss):												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (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	222.6029	196.9599	209.3155	184.0088	178.3988	160.7647	158.5833	164.8120	166.5627	185.7355	197.5307	220.1514 (62)
WWHRS	-24.9035	-22.0249	-23.0632	-19.0972	-17.7979	-15.2298	-14.2755	-15.1806	-15.7574	-18.5762	-21.0446	-24.4423 (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	197.6994	174.9350	186.2523	164.9116	160.6009	145.5349	144.3078	149.6314	150.8054	167.1593	176.4861	195.7090 (64)
12Total per year (kWh/year)												2014.0331 (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)
												0.0000 (64a)
Heat gains from water heating, kWh/month	95.7986	85.1642	91.3805	82.2634	81.1007	74.5347	74.5121	76.5831	76.4625	83.5402	86.7594	94.9835 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237	90.2237 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
83.1417	92.0498	83.1417	85.9131	83.1417	85.9131	83.1417	83.1417	83.1417	85.9131	83.1417	85.9131	83.1417 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
157.2947	158.9269	154.8138	146.0574	135.0039	124.6153	117.6750	116.0428	120.1560	128.9124	139.9658	150.3545	150.3545 (68)

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

	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224	32.0224 (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 (70)
Losses e.g. evaporation (negative values) (Table 5)	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790	-72.1790 (71)
Water heating gains (Table 5)	128.7615	126.7325	122.8233	114.2547	109.0063	103.5204	100.1506	102.9343	106.1980	112.2852	120.4992 (72)
Total internal gains	422.2651	430.7763	413.8459	399.2922	380.2191	364.1159	351.0345	352.1859	362.3341	377.4064	399.4452 (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					8.4300	46.7521	0.6300		0.7000	0.7700		120.4482 (78)	
Solar gains	120.4482	197.2631	251.2781	283.9989	295.9444	284.8062	278.2730	270.2416	262.4897	212.7667	142.7722	104.0783 (83)	
Total gains	542.7133	628.0394	665.1241	683.2911	676.1635	648.9221	629.3075	622.4275	624.8238	590.1731	542.2173	518.3075 (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	37.8844	37.9964	38.1069	38.6344	38.7348	39.2088	39.2088	39.2979	39.0249	38.7348	38.5323	38.3230
alpha	3.5256	3.5331	3.5405	3.5756	3.5823	3.6139	3.6139	3.6199	3.6017	3.5823	3.5688	3.5549
util living area	0.9281	0.8879	0.8401	0.7600	0.6490	0.4954	0.3624	0.3810	0.5467	0.7573	0.8860	0.9363 (86)
MIT	19.6942	19.9791	20.2686	20.5868	20.8143	20.9481	20.9870	20.9841	20.9223	20.6511	20.1455	19.6468 (87)
Th 2	20.0725	20.0750	20.0774	20.0889	20.0910	20.1010	20.1010	20.1029	20.0972	20.0910	20.0867	20.0821 (88)
util rest of house	0.9171	0.8720	0.8178	0.7273	0.6022	0.4333	0.2909	0.3098	0.4857	0.7187	0.8672	0.9264 (89)
MIT 2	18.5803	18.9309	19.2838	19.6677	19.9224	20.0638	20.0945	20.0945	20.0378	19.7497	19.1505	18.5288 (90)
Living area fraction	18.9483	19.2772	19.6092	19.9714	20.2171	20.3560	20.3894	20.3884	20.3300	20.0475	19.4792	18.8981 (91)
MIT	18.9483	19.2772	19.6092	19.9714	20.2171	20.3560	20.3894	20.3884	20.3300	20.0475	19.4792	18.8981 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9483	19.2772	19.6092	19.9714	20.2171	20.3560	20.3894	20.3884	20.3300	20.0475	19.4792	18.8981 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9009	0.8561	0.8052	0.7228	0.6090	0.4513	0.3141	0.3328	0.5019	0.7167	0.8527	0.9108 (94)
Useful gains	488.9254	537.6735	535.5459	493.8577	411.7774	292.8702	197.6788	207.1340	313.5970	422.9734	462.3749	472.0582 (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	799.5513	782.4393	711.3619	592.5785	454.6820	303.5656	199.8497	209.8702	330.1168	504.3534	664.3337	793.0900 (97)
Space heating kWh	231.1057	164.4826	130.8071	71.0790	31.9210	0.0000	0.0000	0.0000	0.0000	60.5467	145.4103	238.8477 (98a)
Space heating requirement - total per year (kWh/year)												1074.2000
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	231.1057	164.4826	130.8071	71.0790	31.9210	0.0000	0.0000	0.0000	0.0000	60.5467	145.4103	238.8477 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1074.2000
Space heating per m2										(98c) / (4) =		19.9369 (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	231.1057	164.4826	130.8071	71.0790	31.9210	0.0000	0.0000	0.0000	0.0000	60.5467	145.4103	238.8477 (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)	250.3854	178.2044	141.7195	77.0086	34.5840	0.0000	0.0000	0.0000	0.0000	65.5977	157.5410	258.7732 (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	197.6994	174.9350	186.2523	164.9116	160.6009	145.5349	144.3078	149.6314	150.8054	167.1593	176.4861	195.7090 (64)
Efficiency of water heater (217)m	84.4108	83.9218	83.2824	82.3127	81.1639	79.8000	79.8000	79.8000	79.8000	82.0101	83.6288	79.8000 (216)
Fuel for water heating, kWh/month	234.2110	208.4499	223.6396	200.3476	197.8722	182.3745	180.8369	187.5080	188.9791	203.8277	211.0351	231.5875 (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	17.2752	13.8588	12.4783	9.1422	7.0617	5.7694	6.4419	8.3734	10.8762	14.2702	16.1182	17.7553 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-14.5693	-21.6563	-32.8054	-38.9470	-43.8307	-41.6046	-41.1190	-37.9173	-32.5755	-25.6799	-16.4161	-12.4707 (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)

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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	-5.1534	-11.0898	-22.5077	-34.4918	-46.2748	-46.7226	-46.1516	-38.7510	-27.9934	-16.0593	-6.9456	-4.0554	(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												1163.8137	(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												2450.6692	(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)												139.4208	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-665.7885	(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												3174.1152	(238)

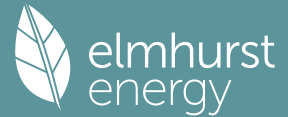
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1163.8137	0.2100	244.4009	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2450.6692	0.2100	514.6405	(264)
Space and water heating			759.0414	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	139.4208	0.1443	20.1227	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-359.5921	0.1335	-47.9959	
PV Unit electricity exported	-306.1964	0.1253	-38.3732	
Total			-86.3691	(269)
Total CO2, kg/year			704.7243	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.0800	(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	1163.8137	1.1300	1315.1095	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2450.6692	1.1300	2769.2562	(278)
Space and water heating			4084.3657	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	139.4208	1.5338	213.8483	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-359.5921	1.4932	-536.9539	
PV Unit electricity exported	-306.1964	0.4600	-140.8481	
Total			-677.8019	(283)
Total Primary energy kWh/year			3750.5129	(286)
Target Primary Energy Rate (TPER)			69.6100	(287)

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Plot Reference	B2 1B2P Mid				Issued on Date	19/12/2025	
Assessment Reference	1B2P			Plot Type Ref	1B2P		
Plot Address					SAP Version	10.2	
SAP Rating	81 B	DER	3.37	TER	11.39		
Environmental	98 A	% DER < TER				70.41	
CO ₂ Emissions (t/year)	0.16	DFEE	15.35	TFEE	16.30		
Compliance Check	See BREL	% DFEE < TFEE				5.85	
% DPER < TPER	41.26	DPER	35.81	TPER	60.97		
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	51.3200 (1b)	2.5000 (2b)	128.3000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.3200		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	128.3000 (5)

2. Ventilation rate

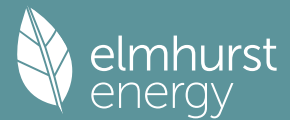
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000 (23c)
Effective ac	0.3026	0.2994	0.2962	0.2802	0.2771	0.2611	0.2611	0.2579	0.2675	0.2771	0.2834	0.2898 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			8.4300	0.9615	8.1058		(27)
External Wall	25.0600	10.3200	14.7400	0.1600	2.3584	14.0000	206.3600 (29a)
Total net area of external elements Aum(A, m ²)			25.0600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	12.3542		(33)
Main dwelling							
Party Wall			47.6000	0.0000	0.0000	20.0000	952.0000 (32)
Party Floor			51.3200			80.0000	4105.6000 (32d)
Party Ceiling			51.3200			100.0000	5132.0000 (32b)
Stud			80.0000			9.0000	720.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11115.9600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							216.6009 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

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E2 Other lintels (including other steel lintels)	5.4300	0.0500	0.2715
E4 Jamb	18.1800	0.0500	0.9090
E7 Party floor between dwellings (in blocks of flats)	14.3300	0.0700	1.0031
E18 Party wall between dwellings	10.0000	0.0600	0.6000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	38.0800	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.2400	0.0200	0.1448
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			2.9284 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	15.2826 (37)

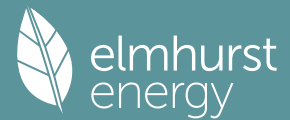
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	12.8102	12.6752	12.5403	11.8655	11.7305	11.0558	11.0558	10.9208	11.3257	11.7305	12.0005	12.2704 (38)
Average = Sum(39)m / 12 =	28.0928	27.9578	27.8229	27.1481	27.0131	26.3383	26.3383	26.2034	26.6083	27.0131	27.2830	27.5529 (39)
												27.1143
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.5474	0.5448	0.5421	0.5290	0.5264	0.5132	0.5132	0.5106	0.5185	0.5264	0.5316	0.5369 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												1.7290 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	23.0050 (42b)
Hot water usage for other uses	23.0050	22.6633	22.1822	21.2951	20.6308	19.8943	19.4964	19.9742	20.4944	21.2825	22.1879	22.9272 (42c)
Average daily hot water use (litres/day)	32.3368	31.1609	29.9850	28.8091	27.6333	26.4574	26.4574	27.6333	28.8091	29.9850	31.1609	50.7263 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	55.3418	53.8242	52.1672	50.1042	48.2641	46.3517	45.9538	47.6074	49.3035	51.2675	53.3488	55.2640 (44)
Energy content (annual)	87.6478	76.6450	80.1791	68.5902	64.9727	56.9948	55.5771	58.9480	60.7962	69.5696	76.0051	86.5300 (45)
Distribution loss	13.1472	11.4967	12.0269	10.2885	9.7459	8.5492	8.3366	8.8422	9.1194	10.4354	11.4008	12.9795 (46)
Water storage loss (or HIU loss):												110.0000 (47)
Store volume												0.0152 (51)
b) If manufacturer declared loss factor is not known :												1.0294 (52)
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.6000 (53)
Volume factor from Table 2a												1.0327 (55)
Temperature factor from Table 2b												
Enter (49) or (54) in (55)												
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	142.9246	126.5724	135.4559	122.0839	120.2495	110.4884	110.8539	114.2248	114.2898	124.8464	129.4988	141.8069 (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	142.9246	126.5724	135.4559	122.0839	120.2495	110.4884	110.8539	114.2248	114.2898	124.8464	129.4988	141.8069 (64)
12Total per year (kWh/year)												1493.2953 (64)
Electric shower(s)	42.6118	37.9675	41.4590	39.5638	40.3062	38.4482	39.7298	40.3062	39.5638	41.4590	40.6794	42.6118 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												484.7066 (64a)
Heat gains from water heating, kWh/month	84.0173	74.9183	81.2457	75.4921	75.9014	71.3578	72.6333	73.8982	72.9006	77.7181	78.2365	83.6456 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	78.8767	87.3277	78.8767	81.5059	78.8767	81.5059	78.8767	78.8767	81.5059	78.8767	81.5059	78.8767 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	150.6615	152.2249	148.2852	139.8980	129.3107	119.3602	112.7126	111.1492	115.0889	123.4761	134.0634	144.0139 (68)
Pumps, fans	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604 (71)
Total internal gains	112.9265	111.4855	109.2013	104.8502	102.0181	99.1080	97.6254	99.3255	101.2509	104.4598	108.6618	112.4269 (72)
	391.3998	399.9733	385.2982	375.1892	359.1406	348.9092	338.1498	338.2865	346.7808	355.7476	373.1662	384.2526 (73)

6. Solar gains												
[Jan]												
	Area											
	m2											
	Solar flux											
	Table 6a											
	W/m2											
	Specific data											
	or Table 6b											
	Specific data											
	or Table 6c											
	Access											
	factor											
	Table 6d											
South	8.4300											
Solar gains	76.4750	125.2464	159.5417	180.3167	187.9012	180.8293	176.6813	171.5820	166.6601	135.0900	90.6490	66.0815 (83)
Total gains	467.8748	525.2197	544.8399	555.5060	547.0418	529.7385	514.8311	509.8685	513.4409	490.8376	463.8152	450.3341 (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	109.9132	110.4438	110.9795	113.7380	114.3062	117.2347	117.2347	117.8385	116.0455	114.3062	113.1754	112.0667	
alpha	8.3275	8.3629	8.3986	8.5825	8.6204	8.8156	8.8156	8.8559	8.7364	8.6204	8.5450	8.4711	
util living area	0.8940	0.8129	0.7241	0.5887	0.4589	0.3182	0.2251	0.2364	0.3576	0.5704	0.7864	0.9063 (86)	
MIT	20.8646	20.9383	20.9762	20.9960	20.9996	21.0000	21.0000	21.0000	21.0000	20.9974	20.9613	20.8539 (87)	
Th 2	20.4776	20.4800	20.4823	20.4943	20.4967	20.5087	20.5087	20.5111	20.5039	20.4967	20.4919	20.4871 (88)	
util rest of house	0.8794	0.7935	0.7014	0.5647	0.4342	0.2938	0.2000	0.2113	0.3319	0.5433	0.7635	0.8928 (89)	
MIT 2	20.3630	20.4299	20.4641	20.4915	20.4965	20.5087	20.5087	20.5111	20.5039	20.4950	20.4619	20.3626 (90)	
Living area fraction									fLA = Living area / (4) =				0.3468 (91)
MIT	20.5370	20.6062	20.6417	20.6665	20.6709	20.6791	20.6791	20.6807	20.6760	20.6692	20.6351	20.5330 (92)	
Temperature adjustment												0.0000	
adjusted MIT	20.5370	20.6062	20.6417	20.6665	20.6709	20.6791	20.6791	20.6807	20.6760	20.6692	20.6351	20.5330 (93)	

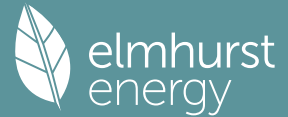
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8811	0.7983	0.7085	0.5729	0.4428	0.3022	0.2087	0.2200	0.3408	0.5526	0.7701	0.8941 (94)
Useful gains	412.2476	419.3030	386.0101	318.2564	242.2125	160.1109	107.4373	112.1686	174.9652	271.2511	357.1701	402.6459 (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	456.1411	439.1110	393.4624	319.4380	242.3333	160.1138	107.4374	112.1687	174.9747	272.0014	369.2778	450.0213 (97)
Space heating kWh	32.6568	13.3110	5.5445	0.8508	0.0899	0.0000	0.0000	0.0000	0.0000	0.5582	8.7176	35.2473 (98a)
Space heating requirement - total per year (kWh/year)												96.9760
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	32.6568	13.3110	5.5445	0.8508	0.0899	0.0000	0.0000	0.0000	0.0000	0.5582	8.7176	35.2473 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												96.9760
Space heating per m2										(98c) / (4) =		1.8896 (99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space and Water												1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500 (305)
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system												1.5000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	32.6568	13.3110	5.5445	0.8508	0.0899	0.0000	0.0000	0.0000	0.0000	0.5582	8.7176	35.2473 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	51.4344	20.9648	8.7325	1.3400	0.1416	0.0000	0.0000	0.0000	0.0000	0.8792	13.7301	55.5145
Space heating requirement	51.4344	20.9648	8.7325	1.3400	0.1416	0.0000	0.0000	0.0000	0.0000	0.8792	13.7301	55.5145 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement	142.9246	126.5724	135.4559	122.0839	120.2495	110.4884	110.8539	114.2248	114.2898	124.8464	129.4988	141.8069 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	214.3869	189.8586	203.1838	183.1258	180.3743	165.7327	166.2809	171.3371	171.4348	187.2696	194.2482	212.7103
Water heating fuel	214.3869	189.8586	203.1838	183.1258	180.3743	165.7327	166.2809	171.3371	171.4348	187.2696	194.2482	212.7103 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	10.2364	9.2458	10.2364	9.9062	10.2364	9.9062	10.2364	10.2364	9.9062	10.2364	9.9062	10.2364 (331)
Lighting	16.3536	13.1195	11.8127	8.6545	6.6850	5.4617	6.0982	7.9267	10.2960	13.5089	15.2583	16.8082 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-12.5132	-20.9352	-36.0754	-47.1729	-55.8169	-54.0576	-53.2594	-47.5641	-37.8940	-26.4066	-14.6994	-10.3398 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												152.7373 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2239.9430 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												1.5274 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7700)												
mechanical ventilation fans (SFP = 0.7700)												120.5250 (330a)
Total electricity for the above, kWh/year												120.5250 (331)
Electricity for lighting (calculated in Appendix L)												131.9833 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-416.7344 (333)
Wind generation												0.0000 (334)
Hydro-electric generation (Appendix N)												0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)
Appendix Q - special features												
Energy saved or generated												-0.0000 (336)

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Energy used 0.0000 (337)
Total delivered energy for all uses 2713.1607 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			280.0000 (367)
Space and Water heating from Heat pump	854.5287	0.1606	8.7594 (367)
Electrical energy for heat distribution (space & water)	1.5274	0.0000	3.3885 (372)
Overall CO2 factor for heat network			0.0520 (386)
Total CO2 associated with community systems			124.4078 (373)
Energy for instantaneous electric shower(s)	484.7066	0.1391	67.4334 (264a)
Space and water heating			124.4078 (376)
Pumps, fans and electric keep-hot	120.5250	0.1387	16.7183 (378)
Energy for lighting	131.9833	0.1443	19.0493 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-416.7344	0.1317	-54.8676
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-54.8676 (380)
Total CO2, kg/year			172.7412 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.3700 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	854.5287	1.5943	86.9670 (467)
Electrical energy for heat distribution (space & water)	1.5274	0.0000	36.4566 (472)
Overall CO2 factor for heat network			0.5594 (486)
Total CO2 associated with community systems			1338.4766 (473)
Energy for instantaneous electric shower(s)	484.7066	1.5143	734.0077 (278a)
Space and water heating			1338.4766 (476)
Pumps, fans and electric keep-hot	120.5250	1.5128	182.3302 (478)
Energy for lighting	131.9833	1.5338	202.4403 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-416.7344	1.4864	-619.4477
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-619.4477 (480)
Total Primary energy kWh/year			1837.8072 (483)
Dwelling Primary energy Rate (DPER)			35.8100 (484)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	51.3200 (1b)	x 2.5000 (2b)	= 128.3000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.3200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 128.3000 (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	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1559 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4059 (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) = 0.3450 (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	0.4399	0.4313	0.4226	0.3795	0.3709	0.3278	0.3278	0.3191	0.3450	0.3709	0.3881	0.4054 (22b)
Effective ac	0.5967	0.5930	0.5893	0.5720	0.5688	0.5537	0.5537	0.5509	0.5595	0.5688	0.5753	0.5822 (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	
Main dwelling								
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type			8.4300	1.1450	9.6527			(27)
External Wall	25.0600	10.3200	14.7400	0.1800	2.6532			(29a)
Total net area of external elements Aum(A, m2)			25.0600					(31)
Fabric heat loss, W/K = Sum (A x U)								(33)
Main dwelling								
Party Wall			47.6000	0.0000	0.0000			(32)

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

216.6009 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element	5.4300	0.0500	0.2715	
E2 Other lintels (including other steel lintels)	18.1800	0.0500	0.9090	
E4 Jamb	14.3300	0.0700	1.0031	
E7 Party floor between dwellings (in blocks of flats)	10.0000	0.0600	0.6000	
E18 Party wall between dwellings	38.0800	0.0000	0.0000	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.2400	0.0200	0.1448	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				2.9284 (36)
Point Thermal bridges				(36a) = 0.0000
Total fabric heat loss				(33) + (36) + (36a) = 17.1243 (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	25.2656	25.1066	24.9507	24.2184	24.0814	23.4436	23.4436	23.3254	23.6892	24.0814	24.3585	24.6483	(38)
Heat transfer coeff	42.3899	42.2308	42.0749	41.3426	41.2056	40.5678	40.5678	40.4497	40.8135	41.2056	41.4828	41.7726	(39)
Average = Sum(39)m / 12 =												41.3420	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8260	0.8229	0.8199	0.8056	0.8029	0.7905	0.7905	0.7882	0.7953	0.8029	0.8083	0.8140	(40)
HLP (average)												0.8056	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

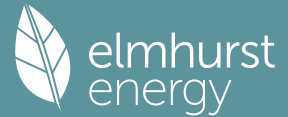
Assumed occupancy													1.7290 (42)
Hot water usage for mixer showers	53.2093	52.4097	51.2444	49.0150	47.3697	45.5349	44.4921	45.6485	46.9161	48.8861	51.1634	53.0054	(42a)
Hot water usage for baths	23.0050	22.6633	22.1822	21.2951	20.6308	19.8943	19.4964	19.9742	20.4944	21.2825	22.1879	22.9272	(42b)
Hot water usage for other uses	32.3368	31.1609	29.9850	28.8091	27.6333	26.4574	26.4574	27.6333	28.8091	29.9850	31.1609	32.3368	(42c)
Average daily hot water use (litres/day)												99.7835	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	108.5511	106.2339	103.4117	99.1192	95.6338	91.8866	90.4459	93.2559	96.2196	100.1536	104.5122	108.2694	(44)
Energy conte	171.9183	151.2756	158.9399	135.6893	128.7415	112.9853	109.3864	115.4703	118.6484	135.9075	148.8968	169.5238	(45)
Energy content (annual)												1657.3831	(45)
Distribution loss (46)m = 0.15 x (45)m	25.7878	22.6913	23.8410	20.3534	19.3112	16.9478	16.4080	17.3205	17.7973	20.3861	22.3345	25.4286	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(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	218.5133	193.3614	205.5348	180.7811	175.3364	158.0771	155.9813	162.0652	163.7402	182.5024	193.9887	216.1187	(62)
WWHRS	-24.3251	-21.5133	-22.5275	-18.6536	-17.3845	-14.8761	-13.9439	-14.8280	-15.3913	-18.1447	-20.5557	-23.8746	(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	194.1882	171.8481	183.0073	162.1275	157.9519	143.2011	142.0374	147.2372	148.3489	164.3577	173.4329	192.2440	(64)
12Total per year (kWh/year)												1979.9822	(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	94.4388	83.9677	90.1234	81.1902	80.0825	73.6411	73.6469	75.6698	75.5241	82.4652	85.5817	93.6426	(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	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	78.8767	87.3277	78.8767	81.5059	78.8767	81.5059	78.8767	78.8767	81.5059	78.8767	81.5059	78.8767	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	150.6615	152.2249	148.2852	139.8980	129.3107	119.3602	112.7126	111.1492	115.0889	123.4761	134.0634	144.0139	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	(71)
Water heating gains (Table 5)	126.9338	124.9520	121.1336	112.7641	107.6377	102.2793	98.9878	101.7067	104.8945	110.8403	118.8634	125.8637	(72)
Total internal gains	408.4071	416.4397	400.2306	386.1032	367.7603	352.0805	339.5122	340.6677	350.4245	365.1282	386.3678	400.6894	(73)

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6. Solar gains

[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
South	8.4300				46.7521	0.6300		0.7000		0.7700	120.4482 (78)
Solar gains	120.4482	197.2631	251.2781	283.9989	295.9444	284.8062	278.2730	270.2416	262.4897	212.7667	104.0783 (83)
Total gains	528.8553	613.7028	651.5088	670.1020	663.7047	636.8867	617.7852	610.9093	612.9142	577.8949	504.7677 (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	72.8420	73.1164	73.3873	74.6872	74.9355	76.1137	76.1137	76.3359	75.6555	74.9355	74.4349	73.9185
alpha	5.8561	5.8744	5.8925	5.9791	5.9957	6.0742	6.0742	6.0891	6.0437	5.9957	5.9623	5.9279
util living area	0.9470	0.8945	0.8254	0.7086	0.5681	0.4066	0.2888	0.3044	0.4572	0.7051	0.8904	0.9557 (86)
MIT	20.4821	20.6723	20.8189	20.9363	20.9846	20.9983	20.9998	20.9998	20.9965	20.9471	20.7353	20.4500 (87)
Th 2	20.2309	20.2335	20.2362	20.2485	20.2508	20.2616	20.2616	20.2636	20.2574	20.2508	20.2461	20.2412 (88)
util rest of house	0.9363	0.8764	0.7991	0.6730	0.5252	0.3602	0.2404	0.2558	0.4089	0.6635	0.8690	0.9465 (89)
MIT 2	19.6528	19.8814	20.0520	20.1898	20.2387	20.2606	20.2615	20.2635	20.2552	20.2049	19.9706	19.6225 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.9405	20.1557	20.3180	20.4487	20.4974	20.5165	20.5176	20.5189	20.5123	20.4623	20.2358	19.9095 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.9405	20.1557	20.3180	20.4487	20.4974	20.5165	20.5176	20.5189	20.5123	20.4623	20.2358	19.9095 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9316	0.8745	0.8021	0.6827	0.5395	0.3762	0.2572	0.2726	0.4256	0.6756	0.8686	0.9418 (94)
Useful gains	492.7068	536.6553	522.5697	457.4929	358.0590	239.6201	158.8975	166.5624	260.8321	390.4173	459.6296	475.4103 (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	662.9973	644.2621	581.3923	477.4541	362.5022	240.0191	158.9285	166.6068	261.7100	406.3843	544.9116	656.2270 (97)
Space heating kWh	126.6961	72.3118	43.7640	14.3721	3.3058	0.0000	0.0000	0.0000	0.0000	11.8794	61.4030	134.5276 (98a)
Space heating requirement - total per year (kWh/year)	468.2597											
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	126.6961	72.3118	43.7640	14.3721	3.3058	0.0000	0.0000	0.0000	0.0000	11.8794	61.4030	134.5276 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	468.2597											
Space heating per m2	(98c) / (4) = 9.1243 (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	126.6961	72.3118	43.7640	14.3721	3.3058	0.0000	0.0000	0.0000	0.0000	11.8794	61.4030	134.5276 (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)	137.2656	78.3443	47.4150	15.5710	3.5815	0.0000	0.0000	0.0000	0.0000	12.8705	66.5255	145.7504 (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	194.1882	171.8481	183.0073	162.1275	157.9519	143.2011	142.0374	147.2372	148.3489	164.3577	173.4329	192.2440 (64)
Efficiency of water heater (217)m	83.1265	82.2695	81.3920	80.4641	79.9661	79.8000	79.8000	79.8000	79.8000	80.3489	81.9723	79.8000 (216)
Fuel for water heating, kWh/month	233.6057	208.8844	224.8468	201.4905	197.5234	179.4500	177.9917	184.5078	185.9009	204.5550	211.5750	230.8555 (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	16.3890	13.1479	11.8382	8.6732	6.6994	5.4735	6.1114	7.9439	10.3183	13.5382	15.2913	16.8445 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-11.4838	-17.2825	-26.5020	-31.8632	-36.2126	-34.5024	-34.1006	-31.2732	-26.6125	-20.6626	-13.0126	-9.8063 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-3.5448	-7.6698	-15.6460	-24.0965	-32.4468	-32.8021	-32.3987	-27.1472	-19.5404	-11.1422	-4.7888	-2.7864 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												

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(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												507.3237	(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												2441.1867	(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)												132.2687	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-507.3239	(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												2659.4552	(238)

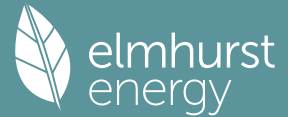
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	507.3237	0.2100	106.5380	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2441.1867	0.2100	512.6492	(264)
Space and water heating			619.1872	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	132.2687	0.1443	19.0905	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-293.3143	0.1332	-39.0766	
PV Unit electricity exported	-214.0096	0.1252	-26.7902	
Total			-65.8667	(269)
Total CO2, kg/year			584.3402	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.3900	(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	507.3237	1.1300	573.2757	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2441.1867	1.1300	2758.5410	(278)
Space and water heating			3331.8167	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	132.2687	1.5338	202.8782	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-293.3143	1.4923	-437.7119	
PV Unit electricity exported	-214.0096	0.4595	-98.3312	
Total			-536.0431	(283)
Total Primary energy kWh/year			3128.7526	(286)
Target Primary Energy Rate (TPER)			60.9700	(287)

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Plot Reference	B2 1B2P Mid				Issued on Date	19/12/2025	
Assessment Reference	1B2P		Plot Type Ref	1B2P			
Plot Address					SAP Version	10.2	
SAP Rating	81 B	DER	3.37	TER	11.39		
Environmental	98 A	% DER < TER				70.41	
CO ₂ Emissions (t/year)	0.16	DFEE	15.35	TFEE	16.30		
Compliance Check	See BREL	% DFEE < TFEE				5.85	
% DPER < TPER	41.26	DPER	35.81	TPER	60.97		
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	51.3200 (1b)	2.5000 (2b)	128.3000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.3200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	128.3000 (5)

2. Ventilation rate

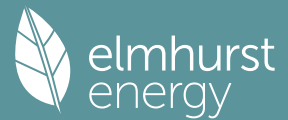
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1559 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.3059 (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) = 0.2600 (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)
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	0.3315	0.3250	0.3185	0.2860	0.2795	0.2470	0.2470	0.2405	0.2600	0.2795	0.2925	0.3055 (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	0.5549	0.5528	0.5507	0.5409	0.5391	0.5305	0.5305	0.5289	0.5338	0.5391	0.5428	0.5467 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			8.4300	0.9615	8.1058		(27)
External Wall	25.0600	10.3200	14.7400	0.1600	2.3584	14.0000	206.3600 (29a)
Total net area of external elements Aum(A, m ²)			25.0600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 12.3542		(33)
Main dwelling							
Party Wall			47.6000	0.0000	0.0000	20.0000	952.0000 (32)
Party Floor			51.3200			80.0000	4105.6000 (32d)
Party Ceiling			51.3200			100.0000	5132.0000 (32b)
Stud			80.0000			9.0000	720.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11115.9600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							216.6009 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				5.4300	0.0500	0.2715	
E4 Jamb				18.1800	0.0500	0.9090	
E7 Party floor between dwellings (in blocks of flats)				14.3300	0.0700	1.0031	

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E18 Party wall between dwellings	10.0000	0.0600	0.6000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	38.0800	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.2400	0.0200	0.1448
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			2.9284 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	15.2826 (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	
23.4959	23.4056	23.3170	22.9011	22.8233	22.4610	22.4610	22.3940	22.6006	22.8233	22.9807	23.1453	(38)
(38)m												
Heat transfer coeff	38.7785	38.6881	38.5996	38.1837	38.1059	37.7436	37.7436	37.6765	37.8831	38.1059	38.2633	38.4279 (39)
Average = Sum(39)m / 12 =												38.1833
HLP	0.7556	0.7539	0.7521	0.7440	0.7425	0.7355	0.7355	0.7341	0.7382	0.7425	0.7456	0.7488 (40)
HLP (average)												0.7440
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7290 (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	23.0050	22.6633	22.1822	21.2951	20.6308	19.8943	19.4964	19.9742	20.4944	21.2825	22.1879	22.9272 (42b)
Hot water usage for other uses	32.3368	31.1609	29.9850	28.8091	27.6333	26.4574	26.4574	27.6333	28.8091	29.9850	31.1609	32.3368 (42c)
Average daily hot water use (litres/day)												50.7263 (43)
Daily hot water use	55.3418	53.8242	52.1672	50.1042	48.2641	46.3517	45.9538	47.6074	49.3035	51.2675	53.3488	55.2640 (44)
Energy conte	87.6478	76.6450	80.1791	68.5902	64.9727	56.9948	55.5771	58.9480	60.7962	69.5696	76.0051	86.5300 (45)
Energy content (annual)										Total = Sum(45)m =		842.4556
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 (or HIU 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												
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 (57)
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 (59)
Total heat required for water heating calculated for each month	74.5006	65.1482	68.1522	58.3017	55.2268	48.4455	47.2406	50.1058	51.6767	59.1341	64.6044	73.5505 (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	74.5006	65.1482	68.1522	58.3017	55.2268	48.4455	47.2406	50.1058	51.6767	59.1341	64.6044	73.5505 (64)
12Total per year (kWh/year)									Total per year (kWh/year) = Sum(64)m =			716.0872 (64)
Electric shower(s)	42.6118	37.9675	41.4590	39.5638	40.3062	38.4482	39.7298	40.3062	39.5638	41.4590	40.6794	42.6118 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												484.7066 (64a)
Heat gains from water heating, kWh/month	29.2781	25.7789	27.4028	24.4664	23.8833	21.7234	21.7426	22.6030	22.8101	25.1483	26.3209	29.0406 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	78.8767	87.3277	78.8767	81.5059	78.8767	81.5059	78.8767	78.8767	81.5059	78.8767	81.5059	78.8767 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	150.6615	152.2249	148.2852	139.8980	129.3107	119.3602	112.7126	111.1492	115.0889	123.4761	134.0634	144.0139 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450 (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)	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604 (71)
Water heating gains (Table 5)	39.3523	38.3615	36.8317	33.9811	32.1012	30.1714	29.2239	30.3804	31.6807	33.8015	36.5569	39.0330 (72)
Total internal gains	317.8256	326.8493	312.9287	304.3201	289.2237	279.9727	269.7483	269.3414	277.2107	285.0893	301.0613	310.8588 (73)

6. Solar gains

[Jan]												Gains
				Area	Solar flux		g		FF		Access	
				m2	Table 6a		Specific data		Specific data		factor	W
					W/m2		or Table 6b		or Table 6c		Table 6d	
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
South				8.4300	46.7521		0.4000		0.7000		0.7700	76.4750 (78)
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Solar gains	76.4750	125.2464	159.5417	180.3167	187.9012	180.8293	176.6813	171.5820	166.6601	135.0900	90.6490	66.0815 (83)
Total gains	394.3006	452.0956	472.4704	484.6369	477.1249	460.8020	446.4296	440.9234	443.8708	420.1793	391.7102	376.9402 (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	79.6258	79.8117	79.9948	80.8661	81.0313	81.8090	81.8090	81.9546	81.5077	81.0313	80.6979	80.3523
alpha	6.3084	6.3208	6.3330	6.3911	6.4021	6.4539	6.4539	6.4636	6.4338	6.4021	6.3799	6.3568

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util living area	0.9824	0.9600	0.9251	0.8432	0.7107	0.5203	0.3716	0.3925	0.5807	0.8383	0.9582	0.9861 (86)
MIT	20.3392	20.5202	20.6884	20.8641	20.9611	20.9954	20.9995	20.9994	20.9907	20.8878	20.6016	20.3035 (87)
Th 2	20.2920	20.2935	20.2950	20.3021	20.3034	20.3096	20.3096	20.3108	20.3072	20.3034	20.3007	20.2979 (88)
util rest of house	0.9783	0.9513	0.9095	0.8142	0.6664	0.4658	0.3135	0.3340	0.5256	0.8039	0.9476	0.9828 (89)
MIT 2	19.6967	19.8732	20.0338	20.1983	20.2782	20.3074	20.3095	20.3106	20.3025	20.2219	19.9600	19.6668 (90)
Living area fraction	19.9195	20.0976	20.2608	20.4292	20.5151	20.5461	20.5488	20.5495	20.5412	20.4529	20.1825	19.8876 (91)
MIT												0.3468 (91)
Temperature adjustment												19.8876 (92)
adjusted MIT	19.9195	20.0976	20.2608	20.4292	20.5151	20.5461	20.5488	20.5495	20.5412	20.4529	20.1825	19.8876 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9757	0.9486	0.9087	0.8198	0.6802	0.4846	0.3337	0.3543	0.5444	0.8117	0.9456	0.9804	(94)
Useful gains	384.7096	428.8557	429.3129	397.3075	324.5479	223.3124	148.9594	156.2133	241.6454	341.0593	370.4036	369.5683	(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	605.7020	587.9666	531.1626	440.2284	335.9060	224.4260	149.0430	156.3374	244.0124	375.4530	500.5798	602.8421	(97)
Space heating kWh	164.4183	106.9225	75.7762	30.9030	8.4504	0.0000	0.0000	0.0000	0.0000	25.5889	93.7269	173.5557	(98a)
Space heating requirement - total per year (kWh/year)												679.3420	
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	164.4183	106.9225	75.7762	30.9030	8.4504	0.0000	0.0000	0.0000	0.0000	25.5889	93.7269	173.5557	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												679.3420	
Space heating per m2										(98c) / (4) =		13.2374	(99)

8c. Space cooling requirement

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

Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	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	354.7900	279.3028	286.3417	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9681	0.9888	0.9866	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	343.4868	276.1678	282.5065	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	508.2646	493.1027	488.2015	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	118.6400	161.3996	153.0371	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	29.6600	40.3499	38.2593	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												108.2692	(107)
Energy for space heating												13.2374	(99)
Energy for space cooling												2.1097	(108)
Total												15.3471	(109)
Fabric Energy Efficiency (DFEE)												15.3	(109)

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

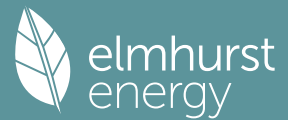
1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	51.3200 (1b)	x 2.5000 (2b)	= 128.3000 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.3200			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	128.3000 (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	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) =	0.1559 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4059	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)

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Infiltration rate adjusted to include shelter factor

(21) = (18) x (20) = 0.3450 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	(22)
Adj infilt rate	0.4399	0.4313	0.4226	0.3795	0.3709	0.3278	0.3278	0.3191	0.3450	0.3709	0.3881	0.4054	(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	0.5967	0.5930	0.5893	0.5720	0.5688	0.5537	0.5537	0.5509	0.5595	0.5688	0.5753	0.5822	(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	
Main dwelling								
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type			8.4300	1.1450	9.6527			(27)
External Wall	25.0600	10.3200	14.7400	0.1800	2.6532			(29a)
Total net area of external elements Aum(A, m2)			25.0600					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	14.1959		(33)
Main dwelling								
Party Wall			47.6000	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							216.6009	(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		
E2 Other lintels (including other steel lintels)				5.4300	0.0500	0.2715		
E4 Jamb				18.1800	0.0500	0.9090		
E7 Party floor between dwellings (in blocks of flats)				14.3300	0.0700	1.0031		
E18 Party wall between dwellings				10.0000	0.0600	0.6000		
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				38.0800	0.0000	0.0000		
E23 Balcony within or between dwellings, balcony support penetrates wall insulation				7.2400	0.0200	0.1448		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							2.9284	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss						(33) + (36) + (36a) =	17.1243	(37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	25.2656	25.1066	24.9507	24.2184	24.0814	23.4436	23.4436	23.3254	23.6892	24.0814	24.3585	24.6483	(38)
Average = Sum(39)m / 12 =	42.3899	42.2308	42.0749	41.3426	41.2056	40.5678	40.5678	40.4497	40.8135	41.2056	41.4828	41.7726	(39)
												41.3420	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.8260	0.8229	0.8199	0.8056	0.8029	0.7905	0.7905	0.7882	0.7953	0.8029	0.8083	0.8140	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

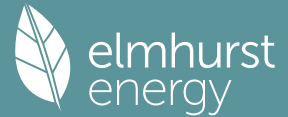
4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.7290 (42)
Hot water usage for mixer showers													
Hot water usage for baths	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 other uses	23.0050	22.6633	22.1822	21.2951	20.6308	19.8943	19.4964	19.9742	20.4944	21.2825	22.1879	22.9272	(42b)
Average daily hot water use (litres/day)	32.3368	31.1609	29.9850	28.8091	27.6333	26.4574	26.4574	27.6333	28.8091	29.9850	31.1609	32.3368	(42c)
												50.7263	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	55.3418	53.8242	52.1672	50.1042	48.2641	46.3517	45.9538	47.6074	49.3035	51.2675	53.3488	55.2640	(44)
Energy content (annual)	87.6478	76.6450	80.1791	68.5902	64.9727	56.9948	55.5771	58.9480	60.7962	69.5696	76.0051	86.5300	(45)
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 (or HIU 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	74.5006	65.1482	68.1522	58.3017	55.2268	48.4455	47.2406	50.1058	51.6767	59.1341	64.6044	73.5505	(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	74.5006	65.1482	68.1522	58.3017	55.2268	48.4455	47.2406	50.1058	51.6767	59.1341	64.6044	73.5505	(64)
12Total per year (kWh/year)													
Electric shower(s)	42.6118	37.9675	41.4590	39.5638	40.3062	38.4482	39.7298	40.3062	39.5638	41.4590	40.6794	42.6118	(64a)
Heat gains from water heating, kWh/month	29.2781	25.7789	27.4028	24.4664	23.8833	21.7234	21.7426	22.6030	22.8101	25.1483	26.3209	29.0406	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	78.8767	87.3277	78.8767	81.5059	78.8767	81.5059	78.8767	78.8767	81.5059	78.8767	81.5059	78.8767	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	150.6615	152.2249	148.2852	139.8980	129.3107	119.3602	112.7126	111.1492	115.0889	123.4761	134.0634	144.0139	(68)
	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	(69)

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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)	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604 (71)
Water heating gains (Table 5)	39.3523	38.3615	36.8317	33.9811	32.1012	30.1714	29.2239	30.3804	31.6807	33.8015	36.5569	39.0330 (72)
Total internal gains	317.8256	326.8493	312.9287	304.3201	289.2237	279.9727	269.7483	269.3414	277.2107	285.0893	301.0613	310.8588 (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				8.4300	46.7521	0.6300	0.7000			0.7700		120.4482 (78)
Solar gains	120.4482	197.2631	251.2781	283.9989	295.9444	284.8062	278.2730	270.2416	262.4897	212.7667	142.7722	104.0783 (83)
Total gains	438.2738	524.1123	564.2069	588.3190	585.1681	564.7788	548.0213	539.5830	539.7004	497.8560	443.8334	414.9371 (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	72.8420	73.1164	73.3873	74.6872	74.9355	76.1137	76.1137	76.3359	75.6555	74.9355	74.4349	73.9185
alpha	5.8561	5.8744	5.8925	5.9791	5.9957	6.0742	6.0742	6.0891	6.0437	5.9957	5.9623	5.9279
util living area	0.9761	0.9404	0.8861	0.7791	0.6360	0.4575	0.3255	0.3445	0.5168	0.7857	0.9423	0.9814 (86)
MIT	20.2996	20.5319	20.7242	20.8947	20.9723	20.9968	20.9997	20.9995	20.9933	20.9061	20.6024	20.2615 (87)
Th 2	20.2309	20.2335	20.2362	20.2485	20.2508	20.2616	20.2616	20.2636	20.2574	20.2508	20.2461	20.2412 (88)
util rest of house	0.9706	0.9282	0.8650	0.7449	0.5903	0.4056	0.2710	0.2895	0.4632	0.7460	0.9284	0.9769 (89)
MIT 2	19.6059	19.8305	20.0110	20.1708	20.2335	20.2601	20.2615	20.2634	20.2541	20.1848	19.9116	19.5776 (90)
Living area fraction	19.8465	20.0738	20.2584	20.4219	20.4897	20.5157	20.5175	20.5187	20.5105	20.4350	20.1512	19.8148 (92)
MIT Temperature adjustment	19.8465	20.0738	20.2584	20.4219	20.4897	20.5157	20.5175	20.5187	20.5105	20.4350	20.1512	19.8148 (93)
adjusted MIT	19.8465	20.0738	20.2584	20.4219	20.4897	20.5157	20.5175	20.5187	20.5105	20.4350	20.1512	19.8148 (93)

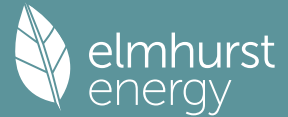
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	423.9301	484.9850	488.4108	443.0635	354.1303	239.2210	158.8640	166.5122	259.9282	376.4920	411.1890	404.1291 (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	659.0159	640.8023	578.8843	476.3454	362.1867	239.9851	158.9253	166.6021	261.6337	405.2566	541.4009	652.2709 (97)
Space heating kWh	174.9038	104.7093	67.3123	23.9630	5.9940	0.0000	0.0000	0.0000	0.0000	21.4008	93.7526	184.6175 (98a)
Space heating requirement - total per year (kWh/year)												676.6533
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	174.9038	104.7093	67.3123	23.9630	5.9940	0.0000	0.0000	0.0000	0.0000	21.4008	93.7526	184.6175 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												676.6533
Space heating per m2										(98c) / (4) =		13.1850 (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	381.3376	300.2019	307.4178	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9807	0.9932	0.9919	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	373.9838	298.1652	304.9159	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	629.7960	611.8463	603.5179	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	184.1848	233.3787	222.1599	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	46.0462	58.3447	55.5400	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												159.9309 (107)
Energy for space heating												13.1850 (99)
Energy for space cooling												3.1163 (108)
Total												16.3013 (109)
Fabric Energy Efficiency (TFEE)												16.3 (109)

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Plot Reference	B2 1B2P Mid				Issued on Date	19/12/2025	
Assessment Reference	1B2P			Plot Type Ref	1B2P		
Plot Address					SAP Version	10.2	
SAP Rating	81 B	DER	3.37	TER	11.39		
Environmental	98 A	% DER < TER				70.41	
CO ₂ Emissions (t/year)	0.16	DFEE	15.35	TFEE	16.30		
Compliance Check	See BREL	% DFEE < TFEE				5.85	
% DPER < TPER	41.26	DPER	35.81	TPER	60.97		
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	51.3200 (1b)	2.5000 (2b)	128.3000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.3200		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	128.3000 (5)

2. Ventilation rate

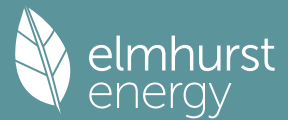
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000 (23c)
Effective ac	0.3026	0.2994	0.2962	0.2802	0.2771	0.2611	0.2611	0.2579	0.2675	0.2771	0.2834	0.2898 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			8.4300	0.9615	8.1058		(27)
External Wall	25.0600	10.3200	14.7400	0.1600	2.3584	14.0000	206.3600 (29a)
Total net area of external elements Aum(A, m ²)			25.0600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	12.3542		(33)
Main dwelling							
Party Wall			47.6000	0.0000	0.0000	20.0000	952.0000 (32)
Party Floor			51.3200			80.0000	4105.6000 (32d)
Party Ceiling			51.3200			100.0000	5132.0000 (32b)
Stud			80.0000			9.0000	720.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11115.9600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							216.6009 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

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E2 Other lintels (including other steel lintels)	5.4300	0.0500	0.2715
E4 Jamb	18.1800	0.0500	0.9090
E7 Party floor between dwellings (in blocks of flats)	14.3300	0.0700	1.0031
E18 Party wall between dwellings	10.0000	0.0600	0.6000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	38.0800	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.2400	0.0200	0.1448
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			2.9284 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	15.2826 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	12.8102	12.6752	12.5403	11.8655	11.7305	11.0558	11.0558	10.9208	11.3257	11.7305	12.0005	12.2704 (38)
Average = Sum(39)m / 12 =	28.0928	27.9578	27.8229	27.1481	27.0131	26.3383	26.3383	26.2034	26.6083	27.0131	27.2830	27.5529 (39)
												27.1143
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.5474	0.5448	0.5421	0.5290	0.5264	0.5132	0.5132	0.5106	0.5185	0.5264	0.5316	0.5369 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7290 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths												23.0050
Hot water usage for other uses												22.6633
Average daily hot water use (litres/day)												22.1822
												21.2951
												20.6308
												19.8943
												19.4964
												19.9742
												20.4944
												21.2825
												22.1879
												22.9272 (42b)
												32.3368
												31.1609
												29.9850
												28.8091
												27.6333
												26.4574
												26.4574
												27.6333
												28.8091
												29.9850
												31.1609
												32.3368 (42c)
												50.7263 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	55.3418	53.8242	52.1672	50.1042	48.2641	46.3517	45.9538	47.6074	49.3035	51.2675	53.3488	55.2640 (44)
Energy content (annual)	87.6478	76.6450	80.1791	68.5902	64.9727	56.9948	55.5771	58.9480	60.7962	69.5696	76.0051	86.5300 (45)
Distribution loss	13.1472	11.4967	12.0269	10.2885	9.7459	8.5492	8.3366	8.8422	9.1194	10.4354	11.4008	12.9795 (46)
Water storage loss (or HIU loss):												110.0000 (47)
Store volume												0.0152 (51)
b) If manufacturer declared loss factor is not known :												1.0294 (52)
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.6000 (53)
Volume factor from Table 2a												1.0327 (55)
Temperature factor from Table 2b												
Enter (49) or (54) in (55)												
Total storage loss												
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage												
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	142.9246	126.5724	135.4559	122.0839	120.2495	110.4884	110.8539	114.2248	114.2898	124.8464	129.4988	141.8069 (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	142.9246	126.5724	135.4559	122.0839	120.2495	110.4884	110.8539	114.2248	114.2898	124.8464	129.4988	141.8069 (64)
12Total per year (kWh/year)												1493.2953 (64)
Electric shower(s)	42.6118	37.9675	41.4590	39.5638	40.3062	38.4482	39.7298	40.3062	39.5638	41.4590	40.6794	42.6118 (64a)
												484.7066 (64a)
Heat gains from water heating, kWh/month	84.0173	74.9183	81.2457	75.4921	75.9014	71.3578	72.6333	73.8982	72.9006	77.7181	78.2365	83.6456 (65)

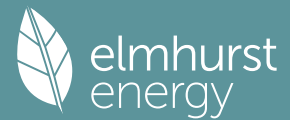
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	78.8767	87.3277	78.8767	81.5059	78.8767	81.5059	78.8767	78.8767	81.5059	78.8767	81.5059	78.8767 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	150.6615	152.2249	148.2852	139.8980	129.3107	119.3602	112.7126	111.1492	115.0889	123.4761	134.0634	144.0139 (68)
Pumps, fans	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604 (71)
Total internal gains	112.9265	111.4855	109.2013	104.8502	102.0181	99.1080	97.6254	99.3255	101.2509	104.4598	108.6618	112.4269 (72)
	391.3998	399.9733	385.2982	375.1892	359.1406	348.9092	338.1498	338.2865	346.7808	355.7476	373.1662	384.2526 (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				8.4300	46.7521		0.4000		0.7000		0.7700		76.4750 (78)
Solar gains	76.4750	125.2464	159.5417	180.3167	187.9012	180.8293	176.6813	171.5820	166.6601	135.0900	90.6490		66.0815 (83)
Total gains	467.8748	525.2197	544.8399	555.5060	547.0418	529.7385	514.8311	509.8685	513.4409	490.8376	463.8152		450.3341 (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	109.9132	110.4438	110.9795	113.7380	114.3062	117.2347	117.2347	117.8385	116.0455	114.3062	113.1754	112.0667	
alpha	8.3275	8.3629	8.3986	8.5825	8.6204	8.8156	8.8156	8.8559	8.7364	8.6204	8.5450	8.4711	
util living area	0.8940	0.8129	0.7241	0.5887	0.4589	0.3182	0.2251	0.2364	0.3576	0.5704	0.7864	0.9063 (86)	
MIT	20.8646	20.9383	20.9762	20.9960	20.9996	21.0000	21.0000	21.0000	21.0000	20.9974	20.9613	20.8539 (87)	
Th 2	20.4776	20.4800	20.4823	20.4943	20.4967	20.5087	20.5087	20.5111	20.5039	20.4967	20.4919	20.4871 (88)	
util rest of house	0.8794	0.7935	0.7014	0.5647	0.4342	0.2938	0.2000	0.2113	0.3319	0.5433	0.7635	0.8928 (89)	
MIT 2	20.3630	20.4299	20.4641	20.4915	20.4965	20.5087	20.5087	20.5111	20.5039	20.4950	20.4619	20.3626 (90)	
Living area fraction									fLA = Living area / (4) =				0.3468 (91)
MIT	20.5370	20.6062	20.6417	20.6665	20.6709	20.6791	20.6791	20.6807	20.6760	20.6692	20.6351	20.5330 (92)	
Temperature adjustment												0.0000	
adjusted MIT	20.5370	20.6062	20.6417	20.6665	20.6709	20.6791	20.6791	20.6807	20.6760	20.6692	20.6351	20.5330 (93)	

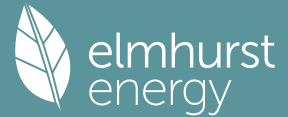
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8811	0.7983	0.7085	0.5729	0.4428	0.3022	0.2087	0.2200	0.3408	0.5526	0.7701	0.8941 (94)
Useful gains	412.2476	419.3030	386.0101	318.2564	242.2125	160.1109	107.4373	112.1686	174.9652	271.2511	357.1701	402.6459 (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	456.1411	439.1110	393.4624	319.4380	242.3333	160.1138	107.4374	112.1687	174.9747	272.0014	369.2778	450.0213 (97)
Space heating kWh	32.6568	13.3110	5.5445	0.8508	0.0899	0.0000	0.0000	0.0000	0.0000	0.5582	8.7176	35.2473 (98a)
Space heating requirement - total per year (kWh/year)												96.9760
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	32.6568	13.3110	5.5445	0.8508	0.0899	0.0000	0.0000	0.0000	0.0000	0.5582	8.7176	35.2473 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												96.9760
Space heating per m2										(98c) / (4) =		1.8896 (99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump-Space and Water	1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating	1.0500 (305)
Factor for charging method (Table 4c(3)) for water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.5000 (306)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)
Space heating:	
Space heating requirement	
32.6568 13.3110 5.5445 0.8508 0.0899 0.0000 0.0000 0.0000 0.0000 0.5582 8.7176 35.2473 (98)	
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50	
307a 51.4344 20.9648 8.7325 1.3400 0.1416 0.0000 0.0000 0.0000 0.0000 0.8792 13.7301 55.5145	
Space heating requirement	
51.4344 20.9648 8.7325 1.3400 0.1416 0.0000 0.0000 0.0000 0.0000 0.8792 13.7301 55.5145 (307)	
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (309)	
Water heating	
Annual water heating requirement	
142.9246 126.5724 135.4559 122.0839 120.2495 110.4884 110.8539 114.2248 114.2898 124.8464 129.4988 141.8069 (64)	
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50	
310a 214.3869 189.8586 203.1838 183.1258 180.3743 165.7327 166.2809 171.3371 171.4348 187.2696 194.2482 212.7103	
Water heating fuel	
214.3869 189.8586 203.1838 183.1258 180.3743 165.7327 166.2809 171.3371 171.4348 187.2696 194.2482 212.7103 (310)	
Cooling System Energy Efficiency Ratio	0.0000 (314)
Space coolin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (315)	
Pumps and Fa 10.2364 9.2458 10.2364 9.9062 10.2364 9.9062 10.2364 10.2364 9.9062 10.2364 9.9062 10.2364 (331)	
Lighting 16.3536 13.1195 11.8127 8.6545 6.6850 5.4617 6.0982 7.9267 10.2960 13.5089 15.2583 16.8082 (332)	
Electricity generated by PVs (Appendix M) (negative quantity)	
(333a)m -12.5132 -20.9352 -36.0754 -47.1729 -55.8169 -54.0576 -53.2594 -47.5641 -37.8940 -26.4066 -14.6994 -10.3398 (333a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	
(334a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (334a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	
(335a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (335a)	
Electricity generated by PVs (Appendix M) (negative quantity)	
(333b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (333b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	
(334b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (334b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	
(335b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (335b)	
Annual totals kWh/year	
Space heating fuel - community heating	152.7373 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	2239.9430 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	1.5274 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7700)	
mechanical ventilation fans (SFP = 0.7700)	120.5250 (330a)
Total electricity for the above, kWh/year	120.5250 (331)
Electricity for lighting (calculated in Appendix L)	131.9833 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-416.7344 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)

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Energy used
Total delivered energy for all uses

0.0000 (337)
2713.1607 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			280.0000 (367)
Space and Water heating from Heat pump	854.5287	0.1606	8.7594 (367)
Electrical energy for heat distribution (space & water)	1.5274	0.0000	3.3885 (372)
Overall CO2 factor for heat network			0.0520 (386)
Total CO2 associated with community systems			124.4078 (373)
Energy for instantaneous electric shower(s)	484.7066	0.1391	67.4334 (264a)
Space and water heating			124.4078 (376)
Pumps, fans and electric keep-hot	120.5250	0.1387	16.7183 (378)
Energy for lighting	131.9833	0.1443	19.0493 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-416.7344	0.1317	-54.8676
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-54.8676 (380)
Total CO2, kg/year			172.7412 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.3700 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	854.5287	1.5943	86.9670 (467)
Electrical energy for heat distribution (space & water)	1.5274	0.0000	36.4566 (472)
Overall CO2 factor for heat network			0.5594 (486)
Total CO2 associated with community systems			1338.4766 (473)
Energy for instantaneous electric shower(s)	484.7066	1.5143	734.0077 (278a)
Space and water heating			1338.4766 (476)
Pumps, fans and electric keep-hot	120.5250	1.5128	182.3302 (478)
Energy for lighting	131.9833	1.5338	202.4403 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-416.7344	1.4864	-619.4477
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-619.4477 (480)
Total Primary energy kWh/year			1837.8072 (483)
Dwelling Primary energy Rate (DPER)			35.8100 (484)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	51.3200 (1b)	x 2.5000 (2b)	= 128.3000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.3200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 128.3000 (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	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	(6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 20.0000 / (5) = 0.1559 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4059 (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) = 0.3450 (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	0.4399	0.4313	0.4226	0.3795	0.3709	0.3278	0.3278	0.3191	0.3450	0.3709	0.3881	0.4054 (22b)
Effective ac	0.5967	0.5930	0.5893	0.5720	0.5688	0.5537	0.5537	0.5509	0.5595	0.5688	0.5753	0.5822 (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	
Main dwelling								
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type			8.4300	1.1450	9.6527			(27)
External Wall	25.0600	10.3200	14.7400	0.1800	2.6532			(29a)
Total net area of external elements Aum(A, m2)			25.0600					(31)
Fabric heat loss, W/K = Sum (A x U)								(33)
Main dwelling								
Party Wall			47.6000	0.0000	0.0000			(32)

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

216.6009 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element	5.4300	0.0500	0.2715	
E2 Other lintels (including other steel lintels)	18.1800	0.0500	0.9090	
E4 Jamb	14.3300	0.0700	1.0031	
E7 Party floor between dwellings (in blocks of flats)	10.0000	0.0600	0.6000	
E18 Party wall between dwellings	38.0800	0.0000	0.0000	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.2400	0.0200	0.1448	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				2.9284 (36)
Point Thermal bridges				(36a) = 0.0000
Total fabric heat loss				(33) + (36) + (36a) = 17.1243 (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	25.2656	25.1066	24.9507	24.2184	24.0814	23.4436	23.4436	23.3254	23.6892	24.0814	24.3585	24.6483	(38)
Heat transfer coeff	42.3899	42.2308	42.0749	41.3426	41.2056	40.5678	40.5678	40.4497	40.8135	41.2056	41.4828	41.7726	(39)
Average = Sum(39)m / 12 =												41.3420	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8260	0.8229	0.8199	0.8056	0.8029	0.7905	0.7905	0.7882	0.7953	0.8029	0.8083	0.8140	(40)
HLP (average)												0.8056	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

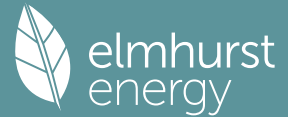
Assumed occupancy													1.7290 (42)
Hot water usage for mixer showers	53.2093	52.4097	51.2444	49.0150	47.3697	45.5349	44.4921	45.6485	46.9161	48.8861	51.1634	53.0054	(42a)
Hot water usage for baths	23.0050	22.6633	22.1822	21.2951	20.6308	19.8943	19.4964	19.9742	20.4944	21.2825	22.1879	22.9272	(42b)
Hot water usage for other uses	32.3368	31.1609	29.9850	28.8091	27.6333	26.4574	26.4574	27.6333	28.8091	29.9850	31.1609	32.3368	(42c)
Average daily hot water use (litres/day)												99.7835	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	108.5511	106.2339	103.4117	99.1192	95.6338	91.8866	90.4459	93.2559	96.2196	100.1536	104.5122	108.2694	(44)
Energy conte	171.9183	151.2756	158.9399	135.6893	128.7415	112.9853	109.3864	115.4703	118.6484	135.9075	148.8968	169.5238	(45)
Energy content (annual)												1657.3831	(45)
Distribution loss (46)m = 0.15 x (45)m	25.7878	22.6913	23.8410	20.3534	19.3112	16.9478	16.4080	17.3205	17.7973	20.3861	22.3345	25.4286	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(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	218.5133	193.3614	205.5348	180.7811	175.3364	158.0771	155.9813	162.0652	163.7402	182.5024	193.9887	216.1187	(62)
WWHRS	-24.3251	-21.5133	-22.5275	-18.6536	-17.3845	-14.8761	-13.9439	-14.8280	-15.3913	-18.1447	-20.5557	-23.8746	(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	194.1882	171.8481	183.0073	162.1275	157.9519	143.2011	142.0374	147.2372	148.3489	164.3577	173.4329	192.2440	(64)
Total per year (kWh/year)												1979.9822	(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	94.4388	83.9677	90.1234	81.1902	80.0825	73.6411	73.6469	75.6698	75.5241	82.4652	85.5817	93.6426	(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	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	78.8767	87.3277	78.8767	81.5059	78.8767	81.5059	78.8767	78.8767	81.5059	78.8767	81.5059	78.8767	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	150.6615	152.2249	148.2852	139.8980	129.3107	119.3602	112.7126	111.1492	115.0889	123.4761	134.0634	144.0139	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	(71)
Water heating gains (Table 5)	126.9338	124.9520	121.1336	112.7641	107.6377	102.2793	98.9878	101.7067	104.8945	110.8403	118.8634	125.8637	(72)
Total internal gains	408.4071	416.4397	400.2306	386.1032	367.7603	352.0805	339.5122	340.6677	350.4245	365.1282	386.3678	400.6894	(73)

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6. Solar gains

[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
South	8.4300				46.7521	0.6300		0.7000		0.7700	120.4482 (78)
Solar gains	120.4482	197.2631	251.2781	283.9989	295.9444	284.8062	278.2730	270.2416	262.4897	212.7667	104.0783 (83)
Total gains	528.8553	613.7028	651.5088	670.1020	663.7047	636.8867	617.7852	610.9093	612.9142	577.8949	504.7677 (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	72.8420	73.1164	73.3873	74.6872	74.9355	76.1137	76.1137	76.3359	75.6555	74.9355	74.4349	73.9185
alpha	5.8561	5.8744	5.8925	5.9791	5.9957	6.0742	6.0742	6.0891	6.0437	5.9957	5.9623	5.9279
util living area	0.9470	0.8945	0.8254	0.7086	0.5681	0.4066	0.2888	0.3044	0.4572	0.7051	0.8904	0.9557 (86)
MIT	20.4821	20.6723	20.8189	20.9363	20.9846	20.9983	20.9998	20.9998	20.9965	20.9471	20.7353	20.4500 (87)
Th 2	20.2309	20.2335	20.2362	20.2485	20.2508	20.2616	20.2616	20.2636	20.2574	20.2508	20.2461	20.2412 (88)
util rest of house	0.9363	0.8764	0.7991	0.6730	0.5252	0.3602	0.2404	0.2558	0.4089	0.6635	0.8690	0.9465 (89)
MIT 2	19.6528	19.8814	20.0520	20.1898	20.2387	20.2606	20.2615	20.2635	20.2552	20.2049	19.9706	19.6225 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.9405	20.1557	20.3180	20.4487	20.4974	20.5165	20.5176	20.5189	20.5123	20.4623	20.2358	19.9095 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.9405	20.1557	20.3180	20.4487	20.4974	20.5165	20.5176	20.5189	20.5123	20.4623	20.2358	19.9095 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9316	0.8745	0.8021	0.6827	0.5395	0.3762	0.2572	0.2726	0.4256	0.6756	0.8686	0.9418 (94)
Useful gains	492.7068	536.6553	522.5697	457.4929	358.0590	239.6201	158.8975	166.5624	260.8321	390.4173	459.6296	475.4103 (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	662.9973	644.2621	581.3923	477.4541	362.5022	240.0191	158.9285	166.6068	261.7100	406.3843	544.9116	656.2270 (97)
Space heating kWh	126.6961	72.3118	43.7640	14.3721	3.3058	0.0000	0.0000	0.0000	0.0000	11.8794	61.4030	134.5276 (98a)
Space heating requirement - total per year (kWh/year)	468.2597											
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	126.6961	72.3118	43.7640	14.3721	3.3058	0.0000	0.0000	0.0000	0.0000	11.8794	61.4030	134.5276 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	468.2597											
Space heating per m2	(98c) / (4) = 9.1243 (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	126.6961	72.3118	43.7640	14.3721	3.3058	0.0000	0.0000	0.0000	0.0000	11.8794	61.4030	134.5276 (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)	137.2656	78.3443	47.4150	15.5710	3.5815	0.0000	0.0000	0.0000	0.0000	12.8705	66.5255	145.7504 (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	194.1882	171.8481	183.0073	162.1275	157.9519	143.2011	142.0374	147.2372	148.3489	164.3577	173.4329	192.2440 (64)
Efficiency of water heater (217)m	83.1265	82.2695	81.3920	80.4641	79.9661	79.8000	79.8000	79.8000	79.8000	80.3489	81.9723	79.8000 (216)
Fuel for water heating, kWh/month	233.6057	208.8844	224.8468	201.4905	197.5234	179.4500	177.9917	184.5078	185.9009	204.5550	211.5750	230.8555 (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	16.3890	13.1479	11.8382	8.6732	6.6994	5.4735	6.1114	7.9439	10.3183	13.5382	15.2913	16.8445 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-11.4838	-17.2825	-26.5020	-31.8632	-36.2126	-34.5024	-34.1006	-31.2732	-26.6125	-20.6626	-13.0126	-9.8063 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-3.5448	-7.6698	-15.6460	-24.0965	-32.4468	-32.8021	-32.3987	-27.1472	-19.5404	-11.1422	-4.7888	-2.7864 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												

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(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												507.3237	(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												2441.1867	(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)												132.2687	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-507.3239	(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												2659.4552	(238)

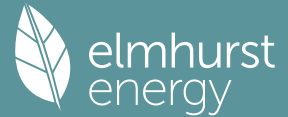
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	507.3237	0.2100	106.5380	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2441.1867	0.2100	512.6492	(264)
Space and water heating			619.1872	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	132.2687	0.1443	19.0905	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-293.3143	0.1332	-39.0766	
PV Unit electricity exported	-214.0096	0.1252	-26.7902	
Total			-65.8667	(269)
Total CO2, kg/year			584.3402	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.3900	(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	507.3237	1.1300	573.2757	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2441.1867	1.1300	2758.5410	(278)
Space and water heating			3331.8167	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	132.2687	1.5338	202.8782	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-293.3143	1.4923	-437.7119	
PV Unit electricity exported	-214.0096	0.4595	-98.3312	
Total			-536.0431	(283)
Total Primary energy kWh/year			3128.7526	(286)
Target Primary Energy Rate (TPER)			60.9700	(287)

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Plot Reference	B2 1B2P Top				Issued on Date	19/12/2025	
Assessment Reference	1B2P			Plot Type Ref	1B2P		
Plot Address					SAP Version	10.2	
SAP Rating	78 C		DER	4.53		TER	14.38
Environmental	97 A		% DER < TER				68.50
CO ₂ Emissions (t/year)	0.21		DFEE	30.79		TFEE	30.32
Compliance Check	See BREL		% DFEE < TFEE				-1.54
% DPER < TPER	38.28		DPER	47.56		TPER	77.06
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	51.3200 (1b)	2.5000 (2b)	128.3000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.3200		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	128.3000 (5)

2. Ventilation rate

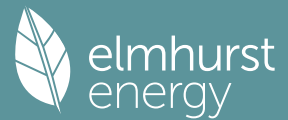
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000 (23c)
Effective ac	0.3026	0.2994	0.2962	0.2802	0.2771	0.2611	0.2611	0.2579	0.2675	0.2771	0.2834	0.2898 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			8.4300	0.9615	8.1058		(27)
External Wall	25.0600	10.3200	14.7400	0.1600	2.3584	14.0000	206.3600 (29a)
Roof	51.3200		51.3200	0.1300	6.6716	9.0000	461.8800 (30)
Total net area of external elements Aum(A, m ²)			76.3800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	19.0258	(33)
Main dwelling							
Party Wall			47.6000	0.0000	0.0000	20.0000	952.0000 (32)
Party Floor			51.3200			80.0000	4105.6000 (32d)
Stud			80.0000			9.0000	720.0000 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 6445.8400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							125.6009 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value		Total

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E2 Other lintels (including other steel lintels)						5.4300		0.0500		0.2715		
E4 Jamb						18.1800		0.0500		0.9090		
E7 Party floor between dwellings (in blocks of flats)						3.5200		0.0700		0.2464		
E18 Party wall between dwellings						10.0000		0.0600		0.6000		
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)						19.0400		0.0000		0.0000		
E23 Balcony within or between dwellings, balcony support penetrates wall insulation						7.2400		0.0200		0.1448		
E15 Flat roof with parapet						10.7800		0.5600		6.0368		
P4 Party wall - Roof (insulation at ceiling level)						19.0400		0.1200		2.2848		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											10.4933	(36)
Point Thermal bridges											0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	29.5191 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	12.8102	12.6752	12.5403	11.8655	11.7305	11.0558	11.0558	10.9208	11.3257	11.7305	12.0005	12.2704 (38)
Average = Sum(39)m / 12 =	42.3293	42.1943	42.0594	41.3846	41.2496	40.5748	40.5748	40.4399	40.8448	41.2496	41.5195	41.7894 (39)
												41.3508
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8248	0.8222	0.8196	0.8064	0.8038	0.7906	0.7906	0.7880	0.7959	0.8038	0.8090	0.8143 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31
												0.8057

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												1.7290 (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												
	23.0050	22.6633	22.1822	21.2951	20.6308	19.8943	19.4964	19.9742	20.4944	21.2825	22.1879	22.9272 (42b)
Hot water usage for other uses												
	32.3368	31.1609	29.9850	28.8091	27.6333	26.4574	26.4574	27.6333	28.8091	29.9850	31.1609	32.3368 (42c)
Average daily hot water use (litres/day)												50.7263 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	55.3418	53.8242	52.1672	50.1042	48.2641	46.3517	45.9538	47.6074	49.3035	51.2675	53.3488	55.2640 (44)
Energy content (annual)	87.6478	76.6450	80.1791	68.5902	64.9727	56.9948	55.5771	58.9480	60.7962	69.5696	76.0051	86.5300 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		842.4556
	13.1472	11.4967	12.0269	10.2885	9.7459	8.5492	8.3366	8.8422	9.1194	10.4354	11.4008	12.9795 (46)
Water storage loss (or HIU loss):												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage												
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	142.9246	126.5724	135.4559	122.0839	120.2495	110.4884	110.8539	114.2248	114.2898	124.8464	129.4988	141.8069 (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)
FV 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												
	142.9246	126.5724	135.4559	122.0839	120.2495	110.4884	110.8539	114.2248	114.2898	124.8464	129.4988	141.8069 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1493.2953 (64)
Electric shower(s)												1493 (64)
	42.6118	37.9675	41.4590	39.5638	40.3062	38.4482	39.7298	40.3062	39.5638	41.4590	40.6794	42.6118 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												484.7066 (64a)
Heat gains from water heating, kWh/month												
	84.0173	74.9183	81.2457	75.4921	75.9014	71.3578	72.6333	73.8982	72.9006	77.7181	78.2365	83.6456 (65)

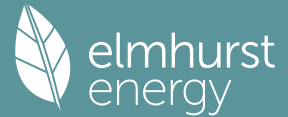
5. Internal gains (see Table 5 and 5a)												

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	78.8767	87.3277	78.8767	81.5059	78.8767	81.5059	78.8767	78.8767	81.5059	78.8767	81.5059	78.8767 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	150.6615	152.2249	148.2852	139.8980	129.3107	119.3602	112.7126	111.1492	115.0889	123.4761	134.0634	144.0139 (68)
Pumps, fans	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604 (71)
Total internal gains	112.9265	111.4855	109.2013	104.8502	102.0181	99.1080	97.6254	99.3255	101.2509	104.4598	108.6618	112.4269 (72)
	391.3998	399.9733	385.2982	375.1892	359.1406	348.9092	338.1498	338.2865	346.7808	355.7476	373.1662	384.2526 (73)

6. Solar gains												

[Jan]												
	Area											
	m2											
	Solar flux											
	Table 6a											
	W/m2											
	Specific data											
	or Table 6b											
	Specific data											
	or Table 6c											
South	8.4300							0.7000				
										0.7700		
												76.4750 (78)
Solar gains	76.4750	125.2464	159.5417	180.3167	187.9012	180.8293	176.6813	171.5820	166.6601	135.0900	90.6490	66.0815 (83)
Total gains	467.8748	525.2197	544.8399	555.5060	547.0418	529.7385	514.8311	509.8685	513.4409	490.8376	463.8152	450.3341 (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	42.2996	42.4349	42.5711	43.2652	43.4067	44.1286	44.1286	44.2759	43.8370	43.4067	43.1246	42.8460	
alpha	3.8200	3.8290	3.8381	3.8843	3.8938	3.9419	3.9419	3.9517	3.9225	3.8938	3.8750	3.8564	
util living area	0.9190	0.8809	0.8355	0.7521	0.6374	0.4747	0.3433	0.3605	0.5241	0.7390	0.8716	0.9268 (86)	
MIT	19.9434	20.1726	20.4088	20.6815	20.8658	20.9683	20.9930	20.9915	20.9509	20.7453	20.3369	19.9099 (87)	
Th 2	20.2319	20.2342	20.2364	20.2478	20.2501	20.2615	20.2615	20.2637	20.2569	20.2501	20.2455	20.2410 (88)	
util rest of house	0.9085	0.8665	0.8159	0.7238	0.5978	0.4244	0.2870	0.3045	0.4741	0.7053	0.8540	0.9172 (89)	
MIT 2	19.2806	19.5013	19.7272	19.9884	20.1514	20.2425	20.2584	20.2598	20.2259	20.0507	19.6714	19.2558 (90)	
Living area fraction									fLA = Living area / (4) =				0.3468 (91)
MIT	19.5104	19.7341	19.9636	20.2288	20.3992	20.4943	20.5132	20.5136	20.4774	20.2916	19.9022	19.4826 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.5104	19.7341	19.9636	20.2288	20.3992	20.4943	20.5132	20.5136	20.4774	20.2916	19.9022	19.4826 (93)	
8. Space heating requirement													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8972	0.8561	0.8083	0.7230	0.6059	0.4405	0.3063	0.3236	0.4892	0.7072	0.8452	0.9062 (94)	
Useful gains	419.7834	449.6584	440.4066	401.6462	331.4558	233.3366	157.7113	165.0072	251.1918	347.1336	392.0247	408.0708 (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	643.8470	625.9156	566.2711	468.8375	358.8372	239.1586	158.7782	166.3530	260.4813	399.7739	531.5407	638.6532 (97)	
Space heating kWh	166.7033	118.4449	93.6432	48.3777	20.3718	0.0000	0.0000	0.0000	0.0000	39.1644	100.4515	171.5533 (98a)	
Space heating requirement - total per year (kWh/year)												758.7102	
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	166.7033	118.4449	93.6432	48.3777	20.3718	0.0000	0.0000	0.0000	0.0000	39.1644	100.4515	171.5533 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												758.7102	
Space heating per m2										(98c) / (4) =		14.7839 (99)	
9b. Energy requirements													
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)	
Fraction of space heat from community system												1.0000 (302)	
Fraction of heat from community Heat pump-Space and Water												1.0000 (303a)	
Factor for control and charging method (Table 4c(3)) for space heating												1.0500 (305)	
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)	
Distribution loss factor (Table 12c) for community heating system												1.5000 (306)	
Efficiency of secondary/supplementary heating system, %												0.0000 (208)	
Space heating:													
Space heating requirement													
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a													
Space heating requirement													
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)	
Space heating fuel for secondary/supplementary system													
Water heating													
Annual water heating requirement													
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a													
Water heating fuel													
Cooling System Energy Efficiency Ratio													
Space coolin													
Pumps and Fa													
Lighting													
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m													
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m													
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m													
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m													
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m													
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m													
Annual totals kWh/year													
Space heating fuel - community heating												1194.9685 (307)	
Space heating fuel - secondary												0.0000 (309)	
Water heating fuel - community heating												2239.9430 (310)	
Efficiency of water heater												0.0000 (311)	
Electricity used for heat distribution												11.9497 (313)	
Space cooling fuel												0.0000 (321)	
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7700)													
mechanical ventilation fans (SFP = 0.7700)												120.5250 (330a)	
Total electricity for the above, kWh/year												120.5250 (331)	
Electricity for lighting (calculated in Appendix L)												131.9833 (332)	
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-416.7344 (333)	
Wind generation												0.0000 (334)	
Hydro-electric generation (Appendix N)												0.0000 (335a)	
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)	

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Appendix Q - special features
 Energy saved or generated
 Energy used
 Total delivered energy for all uses

-0.0000 (336)
 0.0000 (337)
 3755.3920 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			280.0000 (367)
Space and Water heating from Heat pump	1226.7541	0.1562	66.6653 (367)
Electrical energy for heat distribution (space & water)	11.9497	0.0000	5.0099 (372)
Overall CO2 factor for heat network			0.0535 (386)
Total CO2 associated with community systems			183.9351 (373)
Energy for instantaneous electric shower(s)	484.7066	0.1391	67.4334 (264a)
Space and water heating			183.9351 (376)
Pumps, fans and electric keep-hot	120.5250	0.1387	16.7183 (378)
Energy for lighting	131.9833	0.1443	19.0493 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-416.7344	0.1317	-54.8676
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-54.8676 (380)
Total CO2, kg/year			232.2685 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.5300 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	1226.7541	1.5783	673.5729 (467)
Electrical energy for heat distribution (space & water)	11.9497	0.0000	52.8815 (472)
Overall CO2 factor for heat network			0.5652 (486)
Total CO2 associated with community systems			1941.5075 (473)
Energy for instantaneous electric shower(s)	484.7066	1.5143	734.0077 (278a)
Space and water heating			1941.5075 (476)
Pumps, fans and electric keep-hot	120.5250	1.5128	182.3302 (478)
Energy for lighting	131.9833	1.5338	202.4403 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-416.7344	1.4864	-619.4477
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-619.4477 (480)
Total Primary energy kWh/year			2440.8381 (483)
Dwelling Primary energy Rate (DPER)			47.5600 (484)

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

1. Overall dwelling characteristics

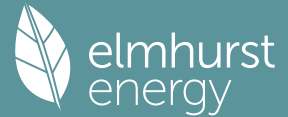
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	51.3200 (1b)	x 2.5000 (2b)	= 128.3000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.3200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 128.3000 (5)

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	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 20.0000 / (5) = 0.1559 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4059 (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) = 0.3450 (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	0.4399	0.4313	0.4226	0.3795	0.3709	0.3278	0.3278	0.3191	0.3450	0.3709	0.3881	0.4054 (22b)
Effective ac	0.5967	0.5930	0.5893	0.5720	0.5688	0.5537	0.5537	0.5509	0.5595	0.5688	0.5753	0.5822 (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	
Main dwelling								
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type			8.4300	1.1450	9.6527			(27)
External Wall	25.0600	10.3200	14.7400	0.1800	2.6532			(29a)
Roof	51.3200		51.3200	0.1100	5.6452			(30)
Total net area of external elements Aum(A, m2)			76.3800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	19.8411			(33)
Main dwelling								
Party Wall			47.6000	0.0000	0.0000			(32)

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

125.6009 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	5.4300	0.0500	0.2715	
E4 Jamb	18.1800	0.0500	0.9090	
E7 Party floor between dwellings (in blocks of flats)	3.5200	0.0700	0.2464	
E18 Party wall between dwellings	10.0000	0.0600	0.6000	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	19.0400	0.0000	0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.2400	0.0200	0.1448	
E15 Flat roof with parapet	10.7800	0.5600	6.0368	
P4 Party wall - Roof (insulation at ceiling level)	19.0400	0.1200	2.2848	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				10.4933 (36)
Point Thermal bridges				(36a) = 0.0000
Total fabric heat loss				(33) + (36) + (36a) = 30.3344 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	25.2656	25.1066	24.9507	24.2184	24.0814	23.4436	23.4436	23.3254	23.6892	24.0814	24.3585	24.6483	(38)
Average = Sum(39)m / 12 =	55.6000	55.4409	55.2850	54.5527	54.4157	53.7779	53.7779	53.6598	54.0236	54.4157	54.6929	54.9827	(39)
												54.5521	
HLP	1.0834	1.0803	1.0773	1.0630	1.0603	1.0479	1.0479	1.0456	1.0527	1.0603	1.0657	1.0714	(40)
HLP (average)												1.0630	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

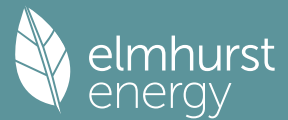
4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.7290 (42)
Hot water usage for mixer showers													
53.2093	52.4097	51.2444	49.0150	47.3697	45.5349	44.4921	45.6485	46.9161	48.8861	51.1634	53.0054	53.0054	(42a)
Hot water usage for baths													
23.0050	22.6633	22.1822	21.2951	20.6308	19.8943	19.4964	19.9742	20.4944	21.2825	22.1879	22.9272	22.9272	(42b)
Hot water usage for other uses													
32.3368	31.1609	29.9850	28.8091	27.6333	26.4574	26.4574	27.6333	28.8091	29.9850	31.1609	32.3368	32.3368	(42c)
Average daily hot water use (litres/day)												99.7835	(43)
Daily hot water use													
108.5511	106.2339	103.4117	99.1192	95.6338	91.8866	90.4459	93.2559	96.2196	100.1536	104.5122	108.2694	108.2694	(44)
Energy conte	171.9183	151.2756	158.9399	135.6893	128.7415	112.9853	109.3864	115.4703	118.6484	135.9075	148.8968	169.5238	(45)
Energy content (annual)												1657.3831	
Distribution loss (46)m = 0.15 x (45)m													
25.7878	22.6913	23.8410	20.3534	19.3112	16.9478	16.4080	17.3205	17.7973	20.3861	22.3345	25.4286	25.4286	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	(56)
If cylinder contains dedicated solar storage													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	(58)
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	(59)
Total heat required for water heating calculated for each month													
218.5133	193.3614	205.5348	180.7811	175.3364	158.0771	155.9813	162.0652	163.7402	182.5024	193.9887	216.1187	216.1187	(62)
WWHRS	-24.3251	-21.5133	-22.5275	-18.6536	-17.3845	-14.8761	-13.9439	-14.8280	-15.3913	-18.1447	-20.5557	-23.8746	(63a)
FV 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	194.1882	171.8481	183.0073	162.1275	157.9519	143.2011	142.0374	147.2372	148.3489	164.3577	173.4329	192.2440	(64)
12Total per year (kWh/year)												1979.9822	(64)
Electric shower(s)												1980	(64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower (s) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
94.4388	83.9677	90.1234	81.1902	80.0825	73.6411	73.6469	75.6698	75.5241	82.4652	85.5817	93.6426	93.6426	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
78.8767	87.3277	78.8767	81.5059	78.8767	81.5059	78.8767	78.8767	81.5059	78.8767	81.5059	78.8767	78.8767	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
150.6615	152.2249	148.2852	139.8980	129.3107	119.3602	112.7126	111.1492	115.0889	123.4761	134.0634	144.0139	144.0139	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	(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)													
-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	(71)
Water heating gains (Table 5)													

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Total internal gains	126.9338	124.9520	121.1336	112.7641	107.6377	102.2793	98.9878	101.7067	104.8945	110.8403	118.8634	125.8637 (72)
	408.4071	416.4397	400.2306	386.1032	367.7603	352.0805	339.5122	340.6677	350.4245	365.1282	386.3678	400.6894 (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					8.4300	46.7521		0.6300	0.7000	0.7700		120.4482 (78)	

Solar gains	120.4482	197.2631	251.2781	283.9989	295.9444	284.8062	278.2730	270.2416	262.4897	212.7667	142.7722	104.0783	(83)
Total gains	528.8553	613.7028	651.5088	670.1020	663.7047	636.8867	617.7852	610.9093	612.9142	577.8949	529.1400	504.7677	(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	32.2034	32.2958	32.3869	32.8217	32.9043	33.2945	33.2945	33.3678	33.1431	32.9043	32.7375	32.5650
alpha	3.1469	3.1531	3.1591	3.1881	3.1936	3.2196	3.2196	3.2245	3.2095	3.1936	3.1825	3.1710
util living area	0.9189	0.8785	0.8317	0.7555	0.6503	0.5034	0.3721	0.3908	0.5531	0.7535	0.8771	0.9274 (86)
MIT	19.4451	19.7568	20.0855	20.4560	20.7366	20.9163	20.9760	20.9712	20.8802	20.5383	19.9538	19.3934 (87)
Th 2	20.0144	20.0170	20.0194	20.0312	20.0334	20.0436	20.0436	20.0455	20.0397	20.0334	20.0289	20.0243 (88)
util rest of house	0.9071	0.8619	0.8089	0.7225	0.6028	0.4385	0.2954	0.3146	0.4901	0.7147	0.8576	0.9167 (89)
MIT 2	18.2381	18.6219	19.0238	19.4727	19.7911	19.9823	20.0313	20.0300	19.9464	19.5778	18.8806	18.1810 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.6567	19.0155	19.3921	19.8138	20.1190	20.3062	20.3590	20.3564	20.2703	19.9110	19.2529	18.6015 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.6567	19.0155	19.3921	19.8138	20.1190	20.3062	20.3590	20.3564	20.2703	19.9110	19.2529	18.6015 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8872	0.8422	0.7925	0.7145	0.6073	0.4569	0.3211	0.3399	0.5058	0.7093	0.8395	0.8974 (94)
Useful gains	469.1742	516.8891	516.3257	478.7639	403.0561	290.9888	198.3875	207.6628	310.0148	409.8962	444.1945	452.9549 (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	798.2347	782.5787	712.7389	595.3761	458.1287	306.8693	202.1494	212.3017	333.3398	506.6624	664.6752	791.8338 (97)
Space heating kWh	244.8210	178.5434	146.1314	83.9608	40.9740	0.0000	0.0000	0.0000	0.0000	71.9940	158.7461	252.1259 (98a)
Space heating requirement - total per year (kWh/year)	1177.2967											
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	244.8210	178.5434	146.1314	83.9608	40.9740	0.0000	0.0000	0.0000	0.0000	71.9940	158.7461	252.1259 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1177.2967											
Space heating per m2	(98c) / (4) = 22.9403 (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	244.8210	178.5434	146.1314	83.9608	40.9740	0.0000	0.0000	0.0000	0.0000	71.9940	158.7461	252.1259 (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)	265.2449	193.4382	158.3222	90.9651	44.3922	0.0000	0.0000	0.0000	0.0000	78.0000	171.9892	273.1591 (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	194.1882	171.8481	183.0073	162.1275	157.9519	143.2011	142.0374	147.2372	148.3489	164.3577	173.4329	192.2440 (64)
Efficiency of water heater	84.5805	84.1456	83.5600	82.6583	81.5014	79.8000	79.8000	79.8000	79.8000	82.3421	83.8619	79.8000 (216)
Fuel for water heating, kWh/month	229.5897	204.2270	219.0129	196.1419	193.8026	179.4500	177.9917	184.5078	185.9009	199.6036	206.8079	227.0541 (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	16.3890	13.1479	11.8382	8.6732	6.6994	5.4735	6.1114	7.9439	10.3183	13.5382	15.2913	16.8445 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-11.4838	-17.2825	-26.5020	-31.8632	-36.2126	-34.5024	-34.1006	-31.2732	-26.6125	-20.6626	-13.0126	-9.8063 (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	-3.5448	-7.6698	-15.6460	-24.0965	-32.4468	-32.8021	-32.3987	-27.1472	-19.5404	-11.1422	-4.7888	-2.7864 (233b)

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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	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	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	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													1275.5110	(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													2404.0900	(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)													132.2687	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-507.3239	(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													3390.5458	(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	1275.5110	0.2100	267.8573 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2404.0900	0.2100	504.8589 (264)
Space and water heating			772.7162 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	132.2687	0.1443	19.0905 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-293.3143	0.1332	-39.0766
PV Unit electricity exported	-214.0096	0.1252	-26.7902
Total			-65.8667 (269)
Total CO2, kg/year			737.8692 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.3800 (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	1275.5110	1.1300	1441.3274 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2404.0900	1.1300	2716.6217 (278)
Space and water heating			4157.9491 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	132.2687	1.5338	202.8782 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-293.3143	1.4923	-437.7119
PV Unit electricity exported	-214.0096	0.4595	-98.3312
Total			-536.0431 (283)
Total Primary energy kWh/year			3954.8850 (286)
Target Primary Energy Rate (TPER)			77.0600 (287)

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Plot Reference	B2 1B2P Top				Issued on Date	19/12/2025	
Assessment Reference	1B2P		Plot Type Ref		1B2P		
Plot Address					SAP Version	10.2	
SAP Rating	78 C	DER	4.53	TER	14.38		
Environmental	97 A	% DER < TER				68.50	
CO ₂ Emissions (t/year)	0.21	DFEE	30.79	TFEE	30.32		
Compliance Check	See BREL	% DFEE < TFEE				-1.54	
% DPER < TPER	38.28	DPER	47.56	TPER	77.06		
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	51.3200 (1b)	2.5000 (2b)	128.3000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.3200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	128.3000 (5)

2. Ventilation rate

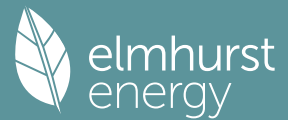
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1559 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.3059 (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) = 0.2600 (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)
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	0.3315	0.3250	0.3185	0.2860	0.2795	0.2470	0.2470	0.2405	0.2600	0.2795	0.2925	0.3055 (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	0.5549	0.5528	0.5507	0.5409	0.5391	0.5305	0.5305	0.5289	0.5338	0.5391	0.5428	0.5467 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			8.4300	0.9615	8.1058		(27)
External Wall	25.0600	10.3200	14.7400	0.1600	2.3584	14.0000	206.3600 (29a)
Roof	51.3200		51.3200	0.1300	6.6716	9.0000	461.8800 (30)
Total net area of external elements Aum(A, m ²)			76.3800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.0258		(33)
Main dwelling							
Party Wall			47.6000	0.0000	0.0000	20.0000	952.0000 (32)
Party Floor			51.3200			80.0000	4105.6000 (32d)
Stud			80.0000			9.0000	720.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	6445.8400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							125.6009 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				5.4300	0.0500	0.2715	
E4 Jamb				18.1800	0.0500	0.9090	
E7 Party floor between dwellings (in blocks of flats)				3.5200	0.0700	0.2464	

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E18 Party wall between dwellings	10.0000	0.0600	0.6000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	19.0400	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.2400	0.0200	0.1448
E15 Flat roof with parapet	10.7800	0.5600	6.0368
P4 Party wall - Roof (insulation at ceiling level)	19.0400	0.1200	2.2848
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			10.4933 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	29.5191 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	23.4959	23.4056	23.3170	22.9011	22.8233	22.4610	22.4610	22.3940	22.6006	22.8233	22.9807	23.1453 (38)
Average = Sum(39)m / 12 =	53.0150	52.9246	52.8361	52.4202	52.3424	51.9801	51.9801	51.9130	52.1196	52.3424	52.4998	52.6644 (39)
												52.4198
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0330	1.0313	1.0295	1.0214	1.0199	1.0129	1.0129	1.0116	1.0156	1.0199	1.0230	1.0262 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												1.7290 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths												22.9272 (42b)
Hot water usage for other uses												32.3368 (42c)
Average daily hot water use (litres/day)												50.7263 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	55.3418	53.8242	52.1672	50.1042	48.2641	46.3517	45.9538	47.6074	49.3035	51.2675	53.3488	55.2640 (44)
Energy content (annual)	87.6478	76.6450	80.1791	68.5902	64.9727	56.9948	55.5771	58.9480	60.7962	69.5696	76.0051	86.5300 (45)
Distribution loss (46)m = 0.15 x (45)m												842.4556
Water storage loss (or HIU loss):												0.0000 (46)
Total storage loss												0.0000 (56)
If cylinder contains dedicated solar storage												0.0000 (57)
Primary loss												0.0000 (59)
Combi loss												0.0000 (61)
Total heat required for water heating calculated for each month												
WWHRS	74.5006	65.1482	68.1522	58.3017	55.2268	48.4455	47.2406	50.1058	51.6767	59.1341	64.6044	73.5505 (62)
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 (63a)
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 (63b)
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 (63c)
Output from w/h	74.5006	65.1482	68.1522	58.3017	55.2268	48.4455	47.2406	50.1058	51.6767	59.1341	64.6044	73.5505 (64)
12Total per year (kWh/year)												716.0872 (64)
Electric shower(s)	42.6118	37.9675	41.4590	39.5638	40.3062	38.4482	39.7298	40.3062	39.5638	41.4590	40.6794	42.6118 (64a)
Heat gains from water heating, kWh/month	29.2781	25.7789	27.4028	24.4664	23.8833	21.7234	21.7426	22.6030	22.8101	25.1483	26.3209	29.0406 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	78.8767	87.3277	78.8767	81.5059	78.8767	81.5059	78.8767	78.8767	81.5059	78.8767	81.5059	78.8767 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	150.6615	152.2249	148.2852	139.8980	129.3107	119.3602	112.7126	111.1492	115.0889	123.4761	134.0634	144.0139 (68)
Pumps, fans	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604 (71)
Total internal gains	39.3523	38.3615	36.8317	33.9811	32.1012	30.1714	29.2239	30.3804	31.6807	33.8015	36.5569	39.0330 (72)
	317.8256	326.8493	312.9287	304.3201	289.2237	279.9727	269.7483	269.3414	277.2107	285.0893	301.0613	310.8588 (73)

6. Solar gains												
[Jan]												
Area												
Solar flux												
Specific data												
Specific data												
Access factor												
Gains W												
South	8.4300											76.4750 (78)
Solar gains	76.4750	125.2464	159.5417	180.3167	187.9012	180.8293	176.6813	171.5820	166.6601	135.0900	90.6490	66.0815 (83)
Total gains	394.3006	452.0956	472.4704	484.6369	477.1249	460.8020	446.4296	440.9234	443.8708	420.1793	391.7102	376.9402 (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	

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tau	33.7737	33.8313	33.8880	34.1569	34.2077	34.4461	34.4461	34.4906	34.3539	34.2077	34.1051	33.9985
alpha	3.2516	3.2554	3.2592	3.2771	3.2805	3.2964	3.2964	3.2994	3.2903	3.2805	3.2737	3.2666
util living area	0.9587	0.9361	0.9091	0.8571	0.7740	0.6309	0.4831	0.5062	0.6808	0.8544	0.9350	0.9637 (86)
MIT	19.1895	19.4686	19.7975	20.2160	20.5790	20.8494	20.9532	20.9440	20.7939	20.3358	19.6988	19.1350 (87)
Th 2	20.0559	20.0574	20.0588	20.0655	20.0668	20.0726	20.0726	20.0737	20.0704	20.0668	20.0642	20.0616 (88)
util rest of house	0.9521	0.9261	0.8944	0.8327	0.7325	0.5622	0.3919	0.4166	0.6178	0.8252	0.9232	0.9578 (89)
MIT 2	18.4147	18.6880	19.0091	19.4146	19.7499	19.9814	20.0527	20.0485	19.9377	19.5337	18.9223	18.3653 (90)
Living area fraction	FLA = Living area / (4) =											0.3468 (91)
MIT	18.6834	18.9587	19.2825	19.6926	20.0375	20.2825	20.3650	20.3591	20.2347	19.8119	19.1916	18.6323 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6834	18.9587	19.2825	19.6926	20.0375	20.2825	20.3650	20.3591	20.2347	19.8119	19.1916	18.6323 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9398	0.9119	0.8801	0.8217	0.7311	0.5787	0.4217	0.4453	0.6297	0.8161	0.9097	0.9463 (94)
Useful gains	370.5615	412.2772	415.8000	398.2048	348.8346	266.6446	188.2388	196.3420	279.5017	342.9132	356.3358	356.7012 (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	762.5373	744.0529	675.3795	565.7493	436.4040	295.3752	195.7066	205.5303	319.7385	482.1705	634.8069	760.0672 (97)
Space heating kWh	291.6299	222.9533	193.1271	120.6320	65.1516	0.0000	0.0000	0.0000	0.0000	103.6074	200.4993	300.1043 (98a)
Space heating requirement - total per year (kWh/year)												1497.7049
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	291.6299	222.9533	193.1271	120.6320	65.1516	0.0000	0.0000	0.0000	0.0000	103.6074	200.4993	300.1043 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1497.7049
Space heating per m2										(98c) / (4) =		29.1837 (99)

8c. Space cooling requirement

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

Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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	488.6131	384.6529	394.5391	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7821	0.8522	0.8416	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	382.1636	327.7838	332.0473	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	508.2646	493.1027	488.2015	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	90.7927	122.9973	116.1787	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	22.6982	30.7493	29.0447	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												82.4922 (107)
Energy for space heating												29.1837 (99)
Energy for space cooling												1.6074 (108)
Total												30.7911 (109)
Fabric Energy Efficiency (DFEE)												30.8 (109)

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

1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	51.3200 (1b)	x 2.5000 (2b)	= 128.3000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.3200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	128.3000 (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	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1559 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4059 (18)
Number of sides sheltered	2 (19)

elmhurst
energy

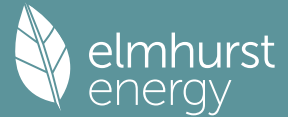
$$\begin{aligned}(20) &= 1 - [0.075 \times (19)] = 0.8500 \quad (20) \\(21) &= (18) \times (20) = 0.3450 \quad (21)\end{aligned}$$
[illegible]

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0834	1.0803	1.0773	1.0630	1.0603	1.0479	1.0479	1.0456	1.0527	1.0603	1.0657	1.0714 (40)
HLP (average)												1.0630
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

Assumed occupancy												1.7290 (42)
Hot water usage for mixer showers	0.0000	0.0000										0.0000 (42a)
Hot water usage for baths	23.0050	22.6633	22.1822	21.2951	20.6308	19.8943	19.4964	19.9742	20.4944	21.2825	22.1879	22.9272 (42b)
Hot water usage for other uses	32.3368	31.1609	29.9850	28.8091	27.6333	26.4574	26.4574	27.6333	28.8091	29.9850	31.1609	32.3368 (42c)
Average daily hot water use (litres/day)												50.7263 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	55.3418	53.8242	52.1672	50.1042	48.2641	46.3517	45.9538	47.6074	49.3035	51.2675	53.3488	55.2640 (44)
Energy content (annual)	87.6478	76.6450	80.1791	68.5902	64.9727	56.9948	55.5771	58.9480	60.7962	69.5696	76.0051	86.5300 (45)
Distribution loss (46)m = 0.15 x (45)m										Total =	Sum(45)m =	842.4556
Water storage loss (or HIU 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 (46)
Total storage loss												
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 (56)
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 (57)
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 (59)
Total heat required for water heating calculated for each month	74.5006	65.1482	68.1522	58.3017	55.2268	48.4455	47.2406	50.1058	51.6767	59.1341	64.6044	73.5505 (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	74.5006	65.1482	68.1522	58.3017	55.2268	48.4455	47.2406	50.1058	51.6767	59.1341	64.6044	73.5505 (64)
12Total per year (kWh/year)									Total per year (kWh/year) =	Sum(64)m =		716.0872 (64)
Electric shower(s)	42.6118	37.9675	41.4590	39.5638	40.3062	38.4482	39.7298	40.3062	39.5638	41.4590	40.6794	42.6118 (64a)
												484.7066 (64a)
Heat gains from water heating, kWh/month	29.2781	25.7789	27.4028	24.4664	23.8833	21.7234	21.7426	22.6030	22.8101	25.1483	26.3209	29.0406 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												

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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	78.8767	87.3277	78.8767	81.5059	78.8767	81.5059	78.8767	78.8767	81.5059	78.8767	81.5059	78.8767 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	150.6615	152.2249	148.2852	139.8980	129.3107	119.3602	112.7126	111.1492	115.0889	123.4761	134.0634	144.0139 (68)
Pumps, fans	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604 (71)
Total internal gains	39.3523	38.3615	36.8317	33.9811	32.1012	30.1714	29.2239	30.3804	31.6807	33.8015	36.5569	39.0330 (72)
	317.8256	326.8493	312.9287	304.3201	289.2237	279.9727	269.7483	269.3414	277.2107	285.0893	301.0613	310.8588 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF			Access factor Table 6d	Gains W
South					8.4300	46.7521	0.6300	0.7000				0.7700	120.4482 (78)
Solar gains	120.4482	197.2631	251.2781	283.9989	295.9444	284.8062	278.2730	270.2416	262.4897	212.7667	142.7722	104.0783	(83)
Total gains	438.2738	524.1123	564.2069	588.3190	585.1681	564.7788	548.0213	539.5830	539.7004	497.8560	443.8334	414.9371	(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)												
tau	32.2034	32.2958	32.3869	32.8217	32.9043	33.2945	33.2945	33.3678	33.1431	32.9043	32.7375	32.5650
alpha	3.1469	3.1531	3.1591	3.1881	3.1936	3.2196	3.2196	3.2245	3.2095	3.1936	3.1825	3.1710
util living area	0.9480	0.9135	0.8728	0.8031	0.7036	0.5543	0.4149	0.4368	0.6082	0.8079	0.9161	0.9549 (86)
MIT	19.1974	19.5446	19.9117	20.3366	20.6663	20.8894	20.9671	20.9603	20.8420	20.4206	19.7507	19.1397 (87)
Th 2	20.0144	20.0170	20.0194	20.0312	20.0334	20.0436	20.0436	20.0455	20.0397	20.0334	20.0289	20.0243 (88)
util rest of house	0.9397	0.9006	0.8538	0.7731	0.6573	0.4862	0.3311	0.3536	0.5434	0.7731	0.9014	0.9476 (89)
MIT 2	18.3916	18.7294	19.0841	19.4924	19.7898	19.9792	20.0302	20.0285	19.9417	19.5788	18.9442	18.3426 (90)
Living area fraction	18.6711	19.0122	19.3711	19.7852	20.0938	20.2949	20.3552	20.3517	20.2540	19.8708	19.2239	18.6191 (91)
MIT	18.6711	19.0122	19.3711	19.7852	20.0938	20.2949	20.3552	20.3517	20.2540	19.8708	19.2239	18.6191 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6711	19.0122	19.3711	19.7852	20.0938	20.2949	20.3552	20.3517	20.2540	19.8708	19.2239	18.6191 (93)

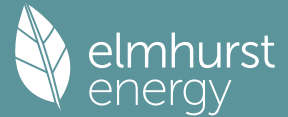
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9256	0.8849	0.8393	0.7648	0.6604	0.5048	0.3590	0.3810	0.5586	0.7665	0.8867	0.9344 (94)
Ext temp.	405.6752	463.7663	473.5326	449.9212	386.4422	285.1201	196.7433	205.5868	301.4677	381.6311	393.5548	387.7273 (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	799.0322	782.3928	711.5803	593.8171	456.7540	306.2597	201.9453	212.0456	332.4605	504.4780	663.0925	792.8007 (97)
Space heating kWh	292.6576	214.1170	177.1075	103.6050	52.3120	0.0000	0.0000	0.0000	0.0000	91.3980	194.0671	301.3746 (98a)
Space heating requirement - total per year (kWh/year)												1426.6389
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	292.6576	214.1170	177.1075	103.6050	52.3120	0.0000	0.0000	0.0000	0.0000	91.3980	194.0671	301.3746 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1426.6389
Space heating per m2										(98c) / (4) =		27.7989 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	505.5125	397.9567	407.8146	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8391	0.8955	0.8868	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	424.1947	356.3539	361.6316	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	629.7960	611.8463	603.5179	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	148.0329	190.0864	179.9634	0.0000	0.0000	0.0000	0.0000 (104)
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 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	37.0082	47.5216	44.9909	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												129.5207 (107)
Energy for space heating												27.7989 (99)
Energy for space cooling												2.5238 (108)
Total												30.3227 (109)
Fabric Energy Efficiency (TFEE)												30.3 (109)

Full SAP Calculation Printout



Plot Reference	B2 1B2P Top				Issued on Date	19/12/2025
Assessment Reference	1B2P	Plot Type Ref	1B2P			
Plot Address					SAP Version	10.2
SAP Rating	78 C	DER	4.53	TER	14.38	
Environmental	97 A	% DER < TER				68.50
CO ₂ Emissions (t/year)	0.21	DFEE	30.79	TFEE	30.32	
Compliance Check	See BREL	% DFEE < TFEE				-1.54
% DPER < TPER	38.28	DPER	47.56	TPER	77.06	
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001
Client	ROK, Wilf Foster					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	51.3200 (1b)	2.5000 (2b)	128.3000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.3200		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	128.3000 (5)

2. Ventilation rate

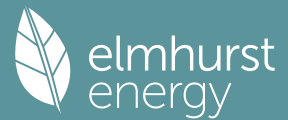
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000 (23c)
Effective ac	0.3026	0.2994	0.2962	0.2802	0.2771	0.2611	0.2611	0.2579	0.2675	0.2771	0.2834	0.2898 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			8.4300	0.9615	8.1058		(27)
External Wall	25.0600	10.3200	14.7400	0.1600	2.3584	14.0000	206.3600 (29a)
Roof	51.3200		51.3200	0.1300	6.6716	9.0000	461.8800 (30)
Total net area of external elements Aum(A, m ²)			76.3800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	19.0258	(33)
Main dwelling							
Party Wall			47.6000	0.0000	0.0000	20.0000	952.0000 (32)
Party Floor			51.3200			80.0000	4105.6000 (32d)
Stud			80.0000			9.0000	720.0000 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 6445.8400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							125.6009 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value		Total

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E2 Other lintels (including other steel lintels)						5.4300		0.0500		0.2715		
E4 Jamb						18.1800		0.0500		0.9090		
E7 Party floor between dwellings (in blocks of flats)						3.5200		0.0700		0.2464		
E18 Party wall between dwellings						10.0000		0.0600		0.6000		
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)						19.0400		0.0000		0.0000		
E23 Balcony within or between dwellings, balcony support penetrates wall insulation						7.2400		0.0200		0.1448		
E15 Flat roof with parapet						10.7800		0.5600		6.0368		
P4 Party wall - Roof (insulation at ceiling level)						19.0400		0.1200		2.2848		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											10.4933	(36)
Point Thermal bridges											0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	29.5191 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	12.8102	12.6752	12.5403	11.8655	11.7305	11.0558	11.0558	10.9208	11.3257	11.7305	12.0005	12.2704 (38)
Average = Sum(39)m / 12 =	42.3293	42.1943	42.0594	41.3846	41.2496	40.5748	40.5748	40.4399	40.8448	41.2496	41.5195	41.7894 (39)
												41.3508
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8248	0.8222	0.8196	0.8064	0.8038	0.7906	0.7906	0.7880	0.7959	0.8038	0.8090	0.8143 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31
												0.8057

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												1.7290 (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												
	23.0050	22.6633	22.1822	21.2951	20.6308	19.8943	19.4964	19.9742	20.4944	21.2825	22.1879	22.9272 (42b)
Hot water usage for other uses												
	32.3368	31.1609	29.9850	28.8091	27.6333	26.4574	26.4574	27.6333	28.8091	29.9850	31.1609	32.3368 (42c)
Average daily hot water use (litres/day)												50.7263 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	55.3418	53.8242	52.1672	50.1042	48.2641	46.3517	45.9538	47.6074	49.3035	51.2675	53.3488	55.2640 (44)
Energy content (annual)	87.6478	76.6450	80.1791	68.5902	64.9727	56.9948	55.5771	58.9480	60.7962	69.5696	76.0051	86.5300 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		842.4556
	13.1472	11.4967	12.0269	10.2885	9.7459	8.5492	8.3366	8.8422	9.1194	10.4354	11.4008	12.9795 (46)
Water storage loss (or HIU loss):												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage												
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	142.9246	126.5724	135.4559	122.0839	120.2495	110.4884	110.8539	114.2248	114.2898	124.8464	129.4988	141.8069 (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)
FV 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												
	142.9246	126.5724	135.4559	122.0839	120.2495	110.4884	110.8539	114.2248	114.2898	124.8464	129.4988	141.8069 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1493.2953 (64)
Electric shower(s)												1493 (64)
	42.6118	37.9675	41.4590	39.5638	40.3062	38.4482	39.7298	40.3062	39.5638	41.4590	40.6794	42.6118 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												484.7066 (64a)
Heat gains from water heating, kWh/month												
	84.0173	74.9183	81.2457	75.4921	75.9014	71.3578	72.6333	73.8982	72.9006	77.7181	78.2365	83.6456 (65)

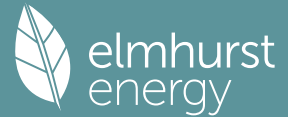
5. Internal gains (see Table 5 and 5a)												

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	78.8767	87.3277	78.8767	81.5059	78.8767	81.5059	78.8767	78.8767	81.5059	78.8767	81.5059	78.8767 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	150.6615	152.2249	148.2852	139.8980	129.3107	119.3602	112.7126	111.1492	115.0889	123.4761	134.0634	144.0139 (68)
Pumps, fans	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604 (71)
Total internal gains	112.9265	111.4855	109.2013	104.8502	102.0181	99.1080	97.6254	99.3255	101.2509	104.4598	108.6618	112.4269 (72)
	391.3998	399.9733	385.2982	375.1892	359.1406	348.9092	338.1498	338.2865	346.7808	355.7476	373.1662	384.2526 (73)

6. Solar gains												

[Jan]												
	Area											
	m2											
	Solar flux											
	Table 6a											
	W/m2											
	Specific data											
	or Table 6b											
	Specific data											
	or Table 6c											
South	8.4300							0.7000				
										0.7700		
												76.4750 (78)
Solar gains	76.4750	125.2464	159.5417	180.3167	187.9012	180.8293	176.6813	171.5820	166.6601	135.0900	90.6490	66.0815 (83)
Total gains	467.8748	525.2197	544.8399	555.5060	547.0418	529.7385	514.8311	509.8685	513.4409	490.8376	463.8152	450.3341 (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	42.2996	42.4349	42.5711	43.2652	43.4067	44.1286	44.1286	44.2759	43.8370	43.4067	43.1246	42.8460	
alpha	3.8200	3.8290	3.8381	3.8843	3.8938	3.9419	3.9419	3.9517	3.9225	3.8938	3.8750	3.8564	
util living area	0.9190	0.8809	0.8355	0.7521	0.6374	0.4747	0.3433	0.3605	0.5241	0.7390	0.8716	0.9268 (86)	
MIT	19.9434	20.1726	20.4088	20.6815	20.8658	20.9683	20.9930	20.9915	20.9509	20.7453	20.3369	19.9099 (87)	
Th 2	20.2319	20.2342	20.2364	20.2478	20.2501	20.2615	20.2615	20.2637	20.2569	20.2501	20.2455	20.2410 (88)	
util rest of house	0.9085	0.8665	0.8159	0.7238	0.5978	0.4244	0.2870	0.3045	0.4741	0.7053	0.8540	0.9172 (89)	
MIT 2	19.2806	19.5013	19.7272	19.9884	20.1514	20.2425	20.2584	20.2598	20.2259	20.0507	19.6714	19.2558 (90)	
Living area fraction									fLA = Living area / (4) =				0.3468 (91)
MIT	19.5104	19.7341	19.9636	20.2288	20.3992	20.4943	20.5132	20.5136	20.4774	20.2916	19.9022	19.4826 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.5104	19.7341	19.9636	20.2288	20.3992	20.4943	20.5132	20.5136	20.4774	20.2916	19.9022	19.4826 (93)	
8. Space heating requirement													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8972	0.8561	0.8083	0.7230	0.6059	0.4405	0.3063	0.3236	0.4892	0.7072	0.8452	0.9062 (94)	
Useful gains	419.7834	449.6584	440.4066	401.6462	331.4558	233.3366	157.7113	165.0072	251.1918	347.1336	392.0247	408.0708 (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	643.8470	625.9156	566.2711	468.8375	358.8372	239.1586	158.7782	166.3530	260.4813	399.7739	531.5407	638.6532 (97)	
Space heating kWh	166.7033	118.4449	93.6432	48.3777	20.3718	0.0000	0.0000	0.0000	0.0000	39.1644	100.4515	171.5533 (98a)	
Space heating requirement - total per year (kWh/year)												758.7102	
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	166.7033	118.4449	93.6432	48.3777	20.3718	0.0000	0.0000	0.0000	0.0000	39.1644	100.4515	171.5533 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												758.7102	
Space heating per m2										(98c) / (4) =		14.7839 (99)	
9b. Energy requirements													
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)	
Fraction of space heat from community system												1.0000 (302)	
Fraction of heat from community Heat pump-Space and Water												1.0000 (303a)	
Factor for control and charging method (Table 4c(3)) for space heating												1.0500 (305)	
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)	
Distribution loss factor (Table 12c) for community heating system												1.5000 (306)	
Efficiency of secondary/supplementary heating system, %												0.0000 (208)	
Space heating:													
Space heating requirement	166.7033	118.4449	93.6432	48.3777	20.3718	0.0000	0.0000	0.0000	0.0000	39.1644	100.4515	171.5533 (98)	
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	262.5577	186.5507	147.4880	76.1949	32.0856	0.0000	0.0000	0.0000	0.0000	61.6839	158.2112	270.1965	
Space heating requirement	262.5577	186.5507	147.4880	76.1949	32.0856	0.0000	0.0000	0.0000	0.0000	61.6839	158.2112	270.1965 (307)	
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)	
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)	
Water heating													
Annual water heating requirement	142.9246	126.5724	135.4559	122.0839	120.2495	110.4884	110.8539	114.2248	114.2898	124.8464	129.4988	141.8069 (64)	
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	214.3869	189.8586	203.1838	183.1258	180.3743	165.7327	166.2809	171.3371	171.4348	187.2696	194.2482	212.7103	
Water heating fuel	214.3869	189.8586	203.1838	183.1258	180.3743	165.7327	166.2809	171.3371	171.4348	187.2696	194.2482	212.7103 (310)	
Cooling System Energy Efficiency Ratio												0.0000 (314)	
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)	
Pumps and Fa	10.2364	9.2458	10.2364	9.9062	10.2364	9.9062	10.2364	10.2364	9.9062	10.2364	9.9062	10.2364 (331)	
Lighting	16.3536	13.1195	11.8127	8.6545	6.6850	5.4617	6.0982	7.9267	10.2960	13.5089	15.2583	16.8082 (332)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-12.5132	-20.9352	-36.0754	-47.1729	-55.8169	-54.0576	-53.2594	-47.5641	-37.8940	-26.4066	-14.6994	-10.3398 (333a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)	
Annual totals kWh/year													
Space heating fuel - community heating												1194.9685 (307)	
Space heating fuel - secondary												0.0000 (309)	
Water heating fuel - community heating												2239.9430 (310)	
Efficiency of water heater												0.0000 (311)	
Electricity used for heat distribution												11.9497 (313)	
Space cooling fuel												0.0000 (321)	
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7700)													
mechanical ventilation fans (SFP = 0.7700)												120.5250 (330a)	
Total electricity for the above, kWh/year												120.5250 (331)	
Electricity for lighting (calculated in Appendix L)												131.9833 (332)	
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-416.7344 (333)	
Wind generation												0.0000 (334)	
Hydro-electric generation (Appendix N)												0.0000 (335a)	
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)	

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Appendix Q - special features
Energy saved or generated
Energy used
Total delivered energy for all uses

-0.0000 (336)
0.0000 (337)
3755.3920 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			280.0000 (367)
Space and Water heating from Heat pump	1226.7541	0.1562	66.6653 (367)
Electrical energy for heat distribution (space & water)	11.9497	0.0000	5.0099 (372)
Overall CO2 factor for heat network			0.0535 (386)
Total CO2 associated with community systems			183.9351 (373)
Energy for instantaneous electric shower(s)	484.7066	0.1391	67.4334 (264a)
Space and water heating			183.9351 (376)
Pumps, fans and electric keep-hot	120.5250	0.1387	16.7183 (378)
Energy for lighting	131.9833	0.1443	19.0493 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-416.7344	0.1317	-54.8676
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-54.8676 (380)
Total CO2, kg/year			232.2685 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.5300 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	1226.7541	1.5783	673.5729 (467)
Electrical energy for heat distribution (space & water)	11.9497	0.0000	52.8815 (472)
Overall CO2 factor for heat network			0.5652 (486)
Total CO2 associated with community systems			1941.5075 (473)
Energy for instantaneous electric shower(s)	484.7066	1.5143	734.0077 (278a)
Space and water heating			1941.5075 (476)
Pumps, fans and electric keep-hot	120.5250	1.5128	182.3302 (478)
Energy for lighting	131.9833	1.5338	202.4403 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-416.7344	1.4864	-619.4477
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-619.4477 (480)
Total Primary energy kWh/year			2440.8381 (483)
Dwelling Primary energy Rate (DPER)			47.5600 (484)

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

1. Overall dwelling characteristics

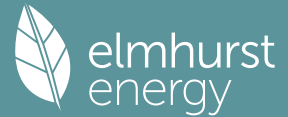
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	51.3200 (1b)	x 2.5000 (2b)	= 128.3000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.3200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 128.3000 (5)

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	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 20.0000 / (5) = 0.1559 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4059 (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) = 0.3450 (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	0.4399	0.4313	0.4226	0.3795	0.3709	0.3278	0.3278	0.3191	0.3450	0.3709	0.3881	0.4054 (22b)
Effective ac	0.5967	0.5930	0.5893	0.5720	0.5688	0.5537	0.5537	0.5509	0.5595	0.5688	0.5753	0.5822 (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	
Main dwelling								
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type			8.4300	1.1450	9.6527			(27)
External Wall	25.0600	10.3200	14.7400	0.1800	2.6532			(29a)
Roof	51.3200		51.3200	0.1100	5.6452			(30)
Total net area of external elements Aum(A, m2)			76.3800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	19.8411			(33)
Main dwelling								
Party Wall			47.6000	0.0000	0.0000			(32)

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

125.6009 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	5.4300	0.0500	0.2715	
E4 Jamb	18.1800	0.0500	0.9090	
E7 Party floor between dwellings (in blocks of flats)	3.5200	0.0700	0.2464	
E18 Party wall between dwellings	10.0000	0.0600	0.6000	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	19.0400	0.0000	0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.2400	0.0200	0.1448	
E15 Flat roof with parapet	10.7800	0.5600	6.0368	
P4 Party wall - Roof (insulation at ceiling level)	19.0400	0.1200	2.2848	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				10.4933 (36)
Point Thermal bridges				(36a) = 0.0000
Total fabric heat loss				(33) + (36) + (36a) = 30.3344 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	25.2656	25.1066	24.9507	24.2184	24.0814	23.4436	23.4436	23.3254	23.6892	24.0814	24.3585	24.6483	(38)
Average = Sum(39)m / 12 =	55.6000	55.4409	55.2850	54.5527	54.4157	53.7779	53.7779	53.6598	54.0236	54.4157	54.6929	54.9827	(39)
												54.5521	
HLP	1.0834	1.0803	1.0773	1.0630	1.0603	1.0479	1.0479	1.0456	1.0527	1.0603	1.0657	1.0714	(40)
HLP (average)												1.0630	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

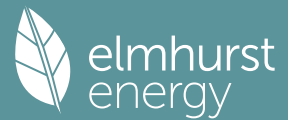
4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.7290 (42)
Hot water usage for mixer showers													
53.2093	52.4097	51.2444	49.0150	47.3697	45.5349	44.4921	45.6485	46.9161	48.8861	51.1634	53.0054	53.0054	(42a)
Hot water usage for baths													
23.0050	22.6633	22.1822	21.2951	20.6308	19.8943	19.4964	19.9742	20.4944	21.2825	22.1879	22.9272	22.9272	(42b)
Hot water usage for other uses													
32.3368	31.1609	29.9850	28.8091	27.6333	26.4574	26.4574	27.6333	28.8091	29.9850	31.1609	32.3368	32.3368	(42c)
Average daily hot water use (litres/day)												99.7835	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	108.5511	106.2339	103.4117	99.1192	95.6338	91.8866	90.4459	93.2559	96.2196	100.1536	104.5122	108.2694	(44)
Energy conte	171.9183	151.2756	158.9399	135.6893	128.7415	112.9853	109.3864	115.4703	118.6484	135.9075	148.8968	169.5238	(45)
Energy content (annual)										Total = Sum(45)m =		1657.3831	
Distribution loss (46)m = 0.15 x (45)m	25.7878	22.6913	23.8410	20.3534	19.3112	16.9478	16.4080	17.3205	17.7973	20.3861	22.3345	25.4286	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(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	(58)
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	(59)
Total heat required for water heating calculated for each month													
218.5133	193.3614	205.5348	180.7811	175.3364	158.0771	155.9813	162.0652	163.7402	182.5024	193.9887	216.1187	216.1187	(62)
WWHRS	-24.3251	-21.5133	-22.5275	-18.6536	-17.3845	-14.8761	-13.9439	-14.8280	-15.3913	-18.1447	-20.5557	-23.8746	(63a)
FV 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	194.1882	171.8481	183.0073	162.1275	157.9519	143.2011	142.0374	147.2372	148.3489	164.3577	173.4329	192.2440	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1979.9822	(64)
Electric shower(s)												1980	(64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
94.4388	83.9677	90.1234	81.1902	80.0825	73.6411	73.6469	75.6698	75.5241	82.4652	85.5817	93.6426	93.6426	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	86.4505	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
78.8767	87.3277	78.8767	81.5059	78.8767	81.5059	78.8767	78.8767	81.5059	78.8767	81.5059	78.8767	78.8767	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
150.6615	152.2249	148.2852	139.8980	129.3107	119.3602	112.7126	111.1492	115.0889	123.4761	134.0634	144.0139	144.0139	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	31.6450	(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)													
-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	-69.1604	(71)
Water heating gains (Table 5)													

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Total internal gains	126.9338	124.9520	121.1336	112.7641	107.6377	102.2793	98.9878	101.7067	104.8945	110.8403	118.8634	125.8637 (72)
	408.4071	416.4397	400.2306	386.1032	367.7603	352.0805	339.5122	340.6677	350.4245	365.1282	386.3678	400.6894 (73)

6. Solar gains

[Jan]	Area m2				Solar flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d	Gains W
South	8.4300				46.7521		0.6300		0.7000		0.7700	120.4482 (78)
Solar gains	120.4482	197.2631	251.2781	283.9989	295.9444	284.8062	278.2730	270.2416	262.4897	212.7667	142.7722	104.0783 (83)
Total gains	528.8553	613.7028	651.5088	670.1020	663.7047	636.8867	617.7852	610.9093	612.9142	577.8949	529.1400	504.7677 (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	32.2034	32.2958	32.3869	32.8217	32.9043	33.2945	33.2945	33.3678	33.1431	32.9043	32.7375	32.5650
alpha	3.1469	3.1531	3.1591	3.1881	3.1936	3.2196	3.2196	3.2245	3.2095	3.1936	3.1825	3.1710
util living area	0.9189	0.8785	0.8317	0.7555	0.6503	0.5034	0.3721	0.3908	0.5531	0.7535	0.8771	0.9274 (86)
MIT	19.4451	19.7568	20.0855	20.4560	20.7366	20.9163	20.9760	20.9712	20.8802	20.5383	19.9538	19.3934 (87)
Th 2	20.0144	20.0170	20.0194	20.0312	20.0334	20.0436	20.0436	20.0455	20.0397	20.0334	20.0289	20.0243 (88)
util rest of house	0.9071	0.8619	0.8089	0.7225	0.6028	0.4385	0.2954	0.3146	0.4901	0.7147	0.8576	0.9167 (89)
MIT 2	18.2381	18.6219	19.0238	19.4727	19.7911	19.9823	20.0313	20.0300	19.9464	19.5778	18.8806	18.1810 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.6567	19.0155	19.3921	19.8138	20.1190	20.3062	20.3590	20.3564	20.2703	19.9110	19.2529	18.6015 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.6567	19.0155	19.3921	19.8138	20.1190	20.3062	20.3590	20.3564	20.2703	19.9110	19.2529	18.6015 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8872	0.8422	0.7925	0.7145	0.6073	0.4569	0.3211	0.3399	0.5058	0.7093	0.8395	0.8974 (94)
Useful gains	469.1742	516.8891	516.3257	478.7639	403.0561	290.9888	198.3875	207.6628	310.0148	409.8962	444.1945	452.9549 (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	798.2347	782.5787	712.7389	595.3761	458.1287	306.8693	202.1494	212.3017	333.3398	506.6624	664.6752	791.8338 (97)
Space heating kWh	244.8210	178.5434	146.1314	83.9608	40.9740	0.0000	0.0000	0.0000	0.0000	71.9940	158.7461	252.1259 (98a)
Space heating requirement - total per year (kWh/year)	1177.2967											
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	244.8210	178.5434	146.1314	83.9608	40.9740	0.0000	0.0000	0.0000	0.0000	71.9940	158.7461	252.1259 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1177.2967											
Space heating per m2	(98c) / (4) = 22.9403 (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	244.8210	178.5434	146.1314	83.9608	40.9740	0.0000	0.0000	0.0000	0.0000	71.9940	158.7461	252.1259 (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)	265.2449	193.4382	158.3222	90.9651	44.3922	0.0000	0.0000	0.0000	0.0000	78.0000	171.9892	273.1591 (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	194.1882	171.8481	183.0073	162.1275	157.9519	143.2011	142.0374	147.2372	148.3489	164.3577	173.4329	192.2440 (64)
Efficiency of water heater	84.5805	84.1456	83.5600	82.6583	81.5014	79.8000	79.8000	79.8000	79.8000	82.3421	83.8619	79.8000 (216)
Fuel for water heating, kWh/month	229.5897	204.2270	219.0129	196.1419	193.8026	179.4500	177.9917	184.5078	185.9009	199.6036	206.8079	227.0541 (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	16.3890	13.1479	11.8382	8.6732	6.6994	5.4735	6.1114	7.9439	10.3183	13.5382	15.2913	16.8445 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-11.4838	-17.2825	-26.5020	-31.8632	-36.2126	-34.5024	-34.1006	-31.2732	-26.6125	-20.6626	-13.0126	-9.8063 (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	-3.5448	-7.6698	-15.6460	-24.0965	-32.4468	-32.8021	-32.3987	-27.1472	-19.5404	-11.1422	-4.7888	-2.7864 (233b)

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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	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	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	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													1275.5110	(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													2404.0900	(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)													132.2687	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-507.3239	(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													3390.5458	(238)

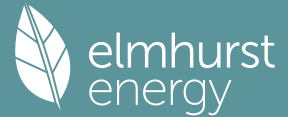
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1275.5110	0.2100	267.8573	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2404.0900	0.2100	504.8589	(264)
Space and water heating			772.7162	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	132.2687	0.1443	19.0905	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-293.3143	0.1332	-39.0766	
PV Unit electricity exported	-214.0096	0.1252	-26.7902	
Total			-65.8667	(269)
Total CO2, kg/year			737.8692	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.3800	(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	1275.5110	1.1300	1441.3274	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2404.0900	1.1300	2716.6217	(278)
Space and water heating			4157.9491	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	132.2687	1.5338	202.8782	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-293.3143	1.4923	-437.7119	
PV Unit electricity exported	-214.0096	0.4595	-98.3312	
Total			-536.0431	(283)
Total Primary energy kWh/year			3954.8850	(286)
Target Primary Energy Rate (TPER)			77.0600	(287)

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Plot Reference	B2 2B3P Mid				Issued on Date	19/12/2025	
Assessment Reference	2B3P			Plot Type Ref	2B3P		
Plot Address					SAP Version	10.2	
SAP Rating	80 C	DER	3.92	TER	12.67		
Environmental	97 A	% DER < TER				69.06	
CO ₂ Emissions (t/year)	0.21	DFEE	27.96	TFEE	28.86		
Compliance Check	See BREL	% DFEE < TFEE				3.11	
% DPER < TPER	39.14	DPER	41.15	TPER	67.62		
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	61.9200 (1b)	2.5000 (2b)	154.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.9200		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	154.8000 (5)

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	2	(19)

Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000 (23c)
Effective ac	0.3026	0.2994	0.2962	0.2802	0.2771	0.2611	0.2611	0.2579	0.2675	0.2771	0.2834	0.2898 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			17.0900	0.9615	16.4327		(27)
External Wall	55.6500	17.0900	38.5600	0.1600	6.1696	14.0000	539.8400 (29a)
Communal Wall	4.4500	1.8900	2.5600	0.2100	0.5376	14.0000	35.8400 (29a)
Total net area of external elements Aum(A, m ²)			60.1000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	25.0299	(33)
Main dwelling							
Party Wall			23.8000	0.0000	0.0000	20.0000	476.0000 (32)
Party Floor			61.9200			80.0000	4953.6000 (32d)
Party Ceiling			61.9200			100.0000	6192.0000 (32b)
Stud			100.0000			9.0000	900.0000 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13097.2800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		211.5194 (35)
List of Thermal Bridges		

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K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.1500	0.0500	0.4075
E4 Jamb	21.2000	0.0500	1.0600
E7 Party floor between dwellings (in blocks of flats)	40.8200	0.0700	2.8574
E16 Corner (normal)	7.5000	0.0900	0.6750
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.2600	0.0200	0.1452
E18 Party wall between dwellings	2.5000	0.0600	0.1500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	19.0400	0.0000	0.0000
E3 Sill	1.8100	0.0500	0.0905
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.3106 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	30.3405 (37)

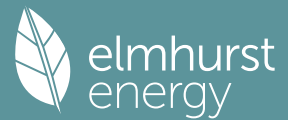
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	15.4561	15.2933	15.1304	14.3163	14.1535	13.3393	13.3393	13.1765	13.6650	14.1535	14.4791	14.8048 (38)
Heat transfer coeff	45.7966	45.6338	45.4709	44.6568	44.4940	43.6798	43.6798	43.5170	44.0055	44.4940	44.8196	45.1453 (39)
Average = Sum(39)m / 12 =												44.6161
HLP	0.7396	0.7370	0.7343	0.7212	0.7186	0.7054	0.7054	0.7028	0.7107	0.7186	0.7238	0.7291 (40)
HLP (average)												0.7205
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.0354 (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	25.2139	24.8395	24.3121	23.3398	22.6118	21.8045	21.3685	21.8921	22.4623	23.3261	24.3184	25.1287 (42b)
Hot water usage for other uses	35.4742	34.1842	32.8943	31.6043	30.3143	29.0243	29.0243	30.3143	31.6043	32.8943	34.1842	35.4742 (42c)
Average daily hot water use (litres/day)												55.6265 (43)
Daily hot water use	60.6881	59.0237	57.2064	54.9441	52.9261	50.8289	50.3928	52.2064	54.0665	56.2203	58.5026	60.6029 (44)
Energy conte	96.1151	84.0489	87.9241	75.2158	71.2487	62.5000	60.9458	64.6425	66.6695	76.2905	83.3477	94.8895 (45)
Energy content (annual)										Total = Sum(45)m =		923.8380
Distribution loss (46)m = 0.15 x (45)m	14.4173	12.6073	13.1886	11.2824	10.6873	9.3750	9.1419	9.6964	10.0004	11.4436	12.5022	14.2334 (46)
Water storage loss (or HIU loss):												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	151.3919	133.9764	143.2009	128.7095	126.5255	115.9937	116.2226	119.9193	120.1631	131.5673	136.8414	150.1663 (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	151.3919	133.9764	143.2009	128.7095	126.5255	115.9937	116.2226	119.9193	120.1631	131.5673	136.8414	150.1663 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1574.6778 (64)
Electric shower(s)	46.7254	41.6327	45.4614	43.3832	44.1973	42.1599	43.5652	44.1973	43.3832	45.4614	44.6065	46.7254 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												531.4990 (64a)
Heat gains from water heating, kWh/month	87.8611	78.2964	84.8215	78.6500	78.9610	74.1162	75.3772	76.7644	75.8083	80.9534	81.6597	87.4535 (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	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	89.6605	99.2670	89.6605	92.6492	89.6605	92.6492	89.6605	89.6605	92.6492	89.6605	92.6492	89.6605 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.7619	179.6066	174.9582	165.0624	152.5707	140.8302	132.9869	131.1423	135.7907	145.6865	158.1782	169.9186 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768 (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)	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147 (71)
Water heating gains (Table 5)	118.0929	116.5125	114.0074	109.2361	106.1303	102.9391	101.3135	103.1779	105.2894	108.8083	113.4162	117.5451 (72)
Total internal gains	439.0458	448.9165	432.1566	420.4781	401.8920	389.9491	377.4914	377.5112	387.2597	397.6858	417.7741	430.6547 (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	2.3200	10.6334	0.4000	0.7000	0.7700	4.7869 (74)	
East	6.3400	19.6403	0.4000	0.7000	0.7700	24.1617 (76)	

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West	8.4300		19.6403		0.4000		0.7000		0.7700		32.1267 (80)	
Solar gains	61.0753	119.2600	196.8835	289.4406	357.7554	367.8022	349.4996	298.0093	229.5943	141.5467	76.0903	50.2794 (83)
Total gains	500.1211	568.1766	629.0402	709.9188	759.6474	757.7512	726.9910	675.5205	616.8540	539.2325	493.8643	480.9341 (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	79.4411	79.7246	80.0101	81.4688	81.7669	83.2910	83.2910	83.6026	82.6746	81.7669	81.1728	80.5872
alpha	6.2961	6.3150	6.3340	6.4313	6.4511	6.5527	6.5527	6.5735	6.5116	6.4511	6.4115	6.3725
util living area	0.9750	0.9472	0.8831	0.7250	0.5397	0.3686	0.2643	0.2963	0.4897	0.7914	0.9431	0.9792 (86)
MIT	20.4028	20.5764	20.7760	20.9444	20.9918	20.9994	20.9999	20.9999	20.9967	20.9221	20.6600	20.3791 (87)
Th 2	20.3060	20.3083	20.3106	20.3221	20.3245	20.3360	20.3360	20.3384	20.3314	20.3245	20.3198	20.3152 (88)
util rest of house	0.9695	0.9367	0.8629	0.6921	0.5021	0.3305	0.2245	0.2537	0.4433	0.7549	0.9301	0.9746 (89)
MIT 2	19.7714	19.9398	20.1269	20.2816	20.3194	20.3358	20.3360	20.3383	20.3297	20.2690	20.0319	19.7562 (90)
Living area fraction	20.0518	20.2225	20.4152	20.5760	20.6180	20.6305	20.6309	20.6321	20.6259	20.5591	20.3108	20.0329 (92)
Temperature adjustment	20.0518	20.2225	20.4152	20.5760	20.6180	20.6305	20.6309	20.6321	20.6259	20.5591	20.3108	0.0000
adjusted MIT	20.0518	20.2225	20.4152	20.5760	20.6180	20.6305	20.6309	20.6321	20.6259	20.5591	20.3108	20.0329 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9672	0.9353	0.8662	0.7047	0.5185	0.3474	0.2422	0.2726	0.4638	0.7680	0.9299	0.9723 (94)
Useful gains	483.7054	531.4044	544.8530	500.2506	393.9037	263.2432	176.0562	184.1441	286.1163	414.1480	459.2327	467.6213 (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	721.3795	699.2256	632.7364	521.4117	396.7987	263.4124	176.0685	184.1702	287.1765	443.1177	592.1050	714.7794 (97)
Space heating kWh	176.8296	112.7759	65.3853	15.2360	2.1539	0.0000	0.0000	0.0000	0.0000	21.5534	95.6681	183.8857 (98a)
Space heating requirement - total per year (kWh/year)												673.4877
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	176.8296	112.7759	65.3853	15.2360	2.1539	0.0000	0.0000	0.0000	0.0000	21.5534	95.6681	183.8857 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												673.4877
Space heating per m2										(98c) / (4) =		10.8767 (99)
9b. Energy requirements												
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space and Water												1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500 (305)
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system												1.5000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement												
	176.8296	112.7759	65.3853	15.2360	2.1539	0.0000	0.0000	0.0000	0.0000	21.5534	95.6681	183.8857 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	278.5066	177.6220	102.9819	23.9966	3.3924	0.0000	0.0000	0.0000	0.0000	33.9466	150.6772	289.6199
Space heating requirement												
	278.5066	177.6220	102.9819	23.9966	3.3924	0.0000	0.0000	0.0000	0.0000	33.9466	150.6772	289.6199 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement												
	151.3919	133.9764	143.2009	128.7095	126.5255	115.9937	116.2226	119.9193	120.1631	131.5673	136.8414	150.1663 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	227.0879	200.9646	214.8013	193.0642	189.7883	173.9906	174.3338	179.8789	180.2447	197.3509	205.2621	225.2494
Water heating fuel												
	227.0879	200.9646	214.8013	193.0642	189.7883	173.9906	174.3338	179.8789	180.2447	197.3509	205.2621	225.2494 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	12.3507	11.1554	12.3507	11.9523	12.3507	11.9523	12.3507	12.3507	11.9523	12.3507	11.9523	12.3507 (331)
Lighting	19.0311	15.2675	13.7467	10.0714	7.7794	6.3559	7.0967	9.2245	11.9817	15.7207	17.7565	19.5601 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-12.7420	-21.4952	-37.3947	-49.4010	-58.8998	-57.1836	-56.2866	-50.0082	-39.5215	-27.2354	-15.0133	-10.5109 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												1060.7431 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2362.0166 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												10.6074 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7700)												
mechanical ventilation fans (SFP = 0.7700)												145.4191 (330a)
Total electricity for the above, kWh/year												145.4191 (331)
Electricity for lighting (calculated in Appendix L)												153.5922 (332)

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Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-435.6920 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	3817.5780 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			280.0000 (367)
Space and Water heating from Heat pump	1222.4142	0.1584	60.0102 (367)
Electrical energy for heat distribution (space & water)	10.6074	0.0000	4.9964 (372)
Overall CO2 factor for heat network			0.0536 (386)
Total CO2 associated with community systems			183.4390 (373)
Energy for instantaneous electric shower(s)	531.4990	0.1391	73.9433 (264a)
Space and water heating			183.4390 (376)
Pumps, fans and electric keep-hot	145.4191	0.1387	20.1714 (378)
Energy for lighting	153.5922	0.1443	22.1681 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-435.6920	0.1315	-57.2933
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-57.2933 (380)
Total CO2, kg/year			242.4285 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.9200 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	1222.4142	1.5864	600.9697 (467)
Electrical energy for heat distribution (space & water)	10.6074	0.0000	52.7085 (472)
Overall CO2 factor for heat network			0.5654 (486)
Total CO2 associated with community systems			1935.1539 (473)
Energy for instantaneous electric shower(s)	531.4990	1.5143	804.8670 (278a)
Space and water heating			1935.1539 (476)
Pumps, fans and electric keep-hot	145.4191	1.5128	219.9900 (478)
Energy for lighting	153.5922	1.5338	235.5849 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-435.6920	1.4858	-647.3628
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-647.3628 (480)
Total Primary energy kWh/year			2548.2330 (483)
Dwelling Primary energy Rate (DPER)			41.1500 (484)

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

1. Overall dwelling characteristics

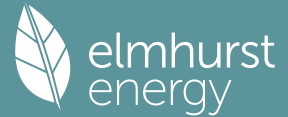
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	61.9200 (1b)	2.5000 (2b)	154.8000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	154.8000 (5)

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	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	20.0000 / (5) = 0.1292 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3792 (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) = 0.3223 (21)

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

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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												
	0.4110	0.4029	0.3948	0.3546	0.3465	0.3062	0.3062	0.2981	0.3223	0.3465	0.3626	0.3787 (22b)
Effective ac	0.5844	0.5812	0.5779	0.5629	0.5600	0.5469	0.5469	0.5444	0.5519	0.5600	0.5657	0.5717 (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
Main dwelling							
TER Opaque door			1.8900	1.8900	1.8900		(26)
TER Opening Type			13.5800	1.1450	15.5496		(27)
External Wall	55.6500	13.5800	42.0700	0.1800	7.5726		(29a)
Communal Wall	4.4500	1.8900	2.5600	0.1800	0.4608		(29a)
Total net area of external elements Aum(A, m2)			60.1000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	25.4730		(33)
Main dwelling							
Party Wall			23.8000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							211.5194 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.1500	0.0500	0.4075
E4 Jamb	21.2000	0.0500	1.0600
E7 Party floor between dwellings (in blocks of flats)	40.8200	0.0700	2.8574
E16 Corner (normal)	7.5000	0.0900	0.6750
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.2600	0.0200	0.1452
E18 Party wall between dwellings	2.5000	0.0600	0.1500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	19.0400	0.0000	0.0000
E3 Sill	1.8100	0.0500	0.0905
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.3106 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	30.7836 (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	29.8557	29.6882	29.5240	28.7528	28.6085	27.9368	27.9368	27.8124	28.1955	28.6085	28.9004	29.2056 (38)
Heat transfer coeff	60.6393	60.4718	60.3076	59.5364	59.3921	58.7204	58.7204	58.5961	58.9792	59.3921	59.6840	59.9892 (39)
Average = Sum(39)m / 12 =												59.5357
HLP	0.9793	0.9766	0.9740	0.9615	0.9592	0.9483	0.9483	0.9463	0.9525	0.9592	0.9639	Dec 0.9688 (40)
HLP (average)												0.9615
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

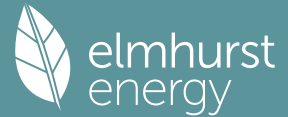
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0354 (42)
Hot water usage for mixer showers												
58.3460	57.4692	56.1915	53.7468	51.9427	49.9308	48.7872	50.0552	51.4453	53.6054	56.1026	58.1225 (42a)	
Hot water usage for baths												
25.2139	24.8395	24.3121	23.3398	22.6118	21.8045	21.3685	21.8921	22.4623	23.3261	24.3184	25.1287 (42b)	
Hot water usage for other uses												
35.4742	34.1842	32.8943	31.6043	30.3143	29.0243	29.0243	30.3143	31.6043	32.8943	34.1842	35.4742 (42c)	
Average daily hot water use (litres/day)												109.4196 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
119.0341	116.4929	113.3979	108.6909	104.8688	100.7597	99.1800	102.2617	105.5118	109.8258	114.6052	118.7253 (44)	
Energy content (annual)	188.5209	165.8843	174.2883	148.7925	141.1736	123.8958	119.9497	126.6213	130.1066	149.0325	163.2761	185.8952 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1817.4367
28.2781	24.8826	26.1432	22.3189	21.1760	18.5844	17.9924	18.9932	19.5160	22.3549	24.4914	27.8843 (46)	
Water storage loss (or HIU loss):												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)	
If cylinder contains dedicated solar storage												
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	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 (61)	
Total heat required for water heating calculated for each month												
235.1158	207.9700	220.8832	193.8843	187.7685	168.9876	166.5446	173.2162	175.1984	195.6274	208.3680	232.4901 (62)	
WWHRS	-26.6734	-23.5901	-24.7022	-20.4544	-19.0628	-16.3122	-15.2901	-16.2594	-16.8772	-19.8963	-22.5401	-26.1794 (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												
208.4425	184.3799	196.1810	173.4299	168.7057	152.6754	151.2545	156.9568	158.3212	175.7311	185.8278	206.3107 (64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2118.2165 (64)
Electric shower(s)												2118 (64)
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												
99.9591	88.8251	95.2268	85.5470	84.2161	77.2688	77.1592	79.3775	79.3339	86.8292	90.3628	99.0861 (65)	

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

Metabolic gains (Table 5), Watts												
(66)m	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
89.7006	99.3114	89.7006	92.6907	89.7006	92.6907	89.7006	89.7006	89.7006	92.6907	89.7006	92.6907	89.7006 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												

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Cooking gains	177.7619	179.6066	174.9582	165.0624	152.5707	140.8302	132.9869	131.1423	135.7907	145.6865	158.1782	169.9186 (68)
Pumps, fans	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147 (71)
Total internal gains	134.3537	132.1802	127.9930	118.8152	113.1937	107.3178	103.7086	106.6902	110.1860	116.7060	125.5039	133.1802 (72)
	458.3468	467.6287	449.1823	433.0988	411.9956	394.3692	379.9267	381.0637	392.1978	408.6236	432.9032	449.3300 (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				1.8400	10.6334	0.6300	0.7000		0.7700		5.9795 (74)	
East				5.0400	19.6403	0.6300	0.7000		0.7700		30.2517 (76)	
West				6.7000	19.6403	0.6300	0.7000		0.7700		40.2155 (80)	
Solar gains	76.4467	149.2759	246.4348	362.2806	447.7797	460.3506	437.4444	373.0030	287.3766	177.1717	95.2408	62.9336 (83)
Total gains	534.7935	616.9046	695.6171	795.3794	859.7753	854.7199	817.3711	754.0667	679.5745	585.7953	528.1440	512.2636 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)											
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	59.9963	60.1625	60.3263	61.1077	61.2562	61.9568	61.9568	62.0884	61.6851	61.2562	60.9566	60.6465
alpha	4.9998	5.0108	5.0218	5.0738	5.0837	5.1305	5.1305	5.1392	5.1123	5.0837	5.0638	5.0431
util living area	0.9802	0.9602	0.9133	0.7914	0.6164	0.4360	0.3155	0.3563	0.5806	0.8569	0.9605	0.9835 (86)
MIT	20.0018	20.2205	20.5108	20.8135	20.9542	20.9936	20.9990	20.9982	20.9745	20.7626	20.3392	19.9678 (87)
Th 2	20.1006	20.1029	20.1051	20.1155	20.1175	20.1266	20.1266	20.1283	20.1231	20.1175	20.1135	20.1094 (88)
util rest of house	0.9753	0.9510	0.8946	0.7548	0.5654	0.3780	0.2532	0.2894	0.5135	0.8204	0.9498	0.9794 (89)
MIT 2	18.9560	19.2301	19.5848	19.9381	20.0811	20.1229	20.1263	20.1276	20.1066	19.8944	19.3898	18.9198 (90)
Living area fraction	19.4205	19.6699	19.9960	20.3269	20.4689	20.5096	20.5139	20.5143	20.4920	20.2800	19.8115	19.3852 (91)
MIT	19.4205	19.6699	19.9960	20.3269	20.4689	20.5096	20.5139	20.5143	20.4920	20.2800	19.8115	19.3852 (92)
Temperature adjustment	19.4205	19.6699	19.9960	20.3269	20.4689	20.5096	20.5139	20.5143	20.4920	20.2800	19.8115	0.0000
adjusted MIT	19.4205	19.6699	19.9960	20.3269	20.4689	20.5096	20.5139	20.5143	20.4920	20.2800	19.8115	19.3852 (93)

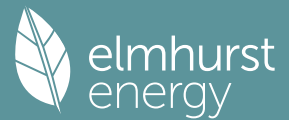
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9707	0.9457	0.8920	0.7640	0.5861	0.4036	0.2809	0.3191	0.5423	0.8277	0.9454	0.9752 (94)
Useful gains	519.1301	583.4082	620.4953	607.6479	503.9466	344.9839	229.5779	240.6111	368.5106	484.8607	499.2980	499.5737 (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	916.8941	893.1649	813.9131	680.3160	520.8018	347.0135	229.8241	241.0789	376.9966	574.9162	758.6717	910.9504 (97)
Space heating kWh	295.9364	208.1565	143.9028	52.3210	12.5403	0.0000	0.0000	0.0000	0.0000	67.0013	186.7490	306.0643 (98a)
Space heating requirement - total per year (kWh/year)												1272.6716
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	295.9364	208.1565	143.9028	52.3210	12.5403	0.0000	0.0000	0.0000	0.0000	67.0013	186.7490	306.0643 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1272.6716
Space heating per m ²										(98c) / (4) =		20.5535 (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	295.9364	208.1565	143.9028	52.3210	12.5403	0.0000	0.0000	0.0000	0.0000	67.0013	186.7490	306.0643 (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)	320.6245	225.5216	155.9077	56.6858	13.5864	0.0000	0.0000	0.0000	0.0000	72.5908	202.3283	331.5973 (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	208.4425	184.3799	196.1810	173.4299	168.7057	152.6754	151.2545	156.9568	158.3212	175.7311	185.8278	206.3107 (64)
Water heating requirement	84.8454	84.3325	83.3756	81.7196	80.3635	79.8000	79.8000	79.8000	79.8000	82.0967	84.0709	79.8000 (216)
Efficiency of water heater (217)m	245.6732	218.6345	235.2977	212.2257	209.9282	191.3226	189.5420	196.6877	198.3975	214.0537	221.0371	84.9426 (217)
Fuel for water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (219)
Space cooling fuel requirement (221)m	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (221)
Pumps and Fa	18.6380	14.9521	13.4627	9.8634	7.6187	6.2246	6.9501	9.0340	11.7342	15.3960	17.3897	19.1560 (232)
Lighting												
Electricity generated by PVs (Appendix M) (negative quantity)												

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(233a)m	-13.7800	-20.6981	-31.6771	-38.0026	-43.1088	-41.0319	-40.5403	-37.2092	-31.7193	-24.6976	-15.5964	-11.7707	(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	-4.3526	-9.4080	-19.1765	-29.5153	-39.7321	-40.1741	-39.6942	-33.2778	-23.9664	-13.6764	-5.8819	-3.4230	(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												1378.8425	(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												2575.6824	(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)												150.4195	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-612.1102	(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												3578.8342	(238)

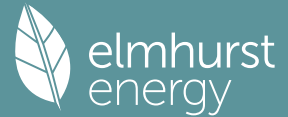
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1378.8425	0.2100	289.5569	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2575.6824	0.2100	540.8933	(264)
Space and water heating			830.4502	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	150.4195	0.1443	21.7102	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-349.8321	0.1333	-46.6227	
PV Unit electricity exported	-262.2781	0.1252	-32.8349	
Total			-79.4577	(269)
Total CO2, kg/year			784.6320	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.6700	(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	1378.8425	1.1300	1558.0920	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2575.6824	1.1300	2910.5211	(278)
Space and water heating			4468.6131	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	150.4195	1.5338	230.7185	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-349.8321	1.4925	-522.1155	
PV Unit electricity exported	-262.2781	0.4595	-120.5180	
Total			-642.6335	(283)
Total Primary energy kWh/year			4186.7989	(286)
Target Primary Energy Rate (TPER)			67.6200	(287)

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Plot Reference	B2 2B3P Mid				Issued on Date	19/12/2025	
Assessment Reference	2B3P			Plot Type Ref	2B3P		
Plot Address					SAP Version	10.2	
SAP Rating	80 C	DER	3.92	TER	12.67		
Environmental	97 A	% DER < TER				69.06	
CO ₂ Emissions (t/year)	0.21	DFEE	27.96	TFEE	28.86		
Compliance Check	See BREL	% DFEE < TFEE				3.11	
% DPER < TPER	39.14	DPER	41.15	TPER	67.62		
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	61.9200 (1b)	x 2.5000 (2b)	= 154.8000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.9200		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 154.8000 (4)
Dwelling volume			(5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1292 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2792 (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) = 0.2373 (21)

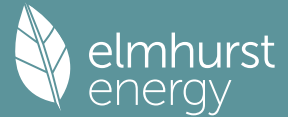
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3026	0.2966	0.2907	0.2611	0.2551	0.2255	0.2255	0.2195	0.2373	0.2551	0.2670	0.2788 (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	0.5458	0.5440	0.5423	0.5341	0.5325	0.5254	0.5254	0.5241	0.5282	0.5325	0.5356	0.5389 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			17.0900	0.9615	16.4327		(27)
External Wall	55.6500	17.0900	38.5600	0.1600	6.1696	14.0000	539.8400 (29a)
Communal Wall	4.4500	1.8900	2.5600	0.2100	0.5376	14.0000	35.8400 (29a)
Total net area of external elements Aum(A, m ²)			60.1000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	25.0299		(33)
Main dwelling							
Party Wall			23.8000	0.0000	0.0000	20.0000	476.0000 (32)
Party Floor			61.9200			80.0000	4953.6000 (32a)
Party Ceiling			61.9200			100.0000	6192.0000 (32b)
Stud			100.0000			9.0000	900.0000 (32c)
Heat capacity Cm = Sum (A x k)						(28)...(30) + (32) + (32a)...(32e) =	13097.2800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							211.5194 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				8.1500	0.0500	0.4075	
E4 Jamb				21.2000	0.0500	1.0600	

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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	62.4883	62.5859	62.6819	63.1367	63.2225	63.6251	63.6251	63.7002	63.4694	63.2225	63.0491	62.8689	
alpha	5.1659	5.1724	5.1788	5.2091	5.2148	5.2417	5.2417	5.2467	5.2313	5.2148	5.2033	5.1913	
util living area	0.9921	0.9824	0.9572	0.8738	0.7183	0.5227	0.3810	0.4307	0.6814	0.9231	0.9832	0.9937 (86)	
MIT	19.8657	20.0706	20.3609	20.7113	20.9164	20.9868	20.9979	20.9961	20.9519	20.6552	20.1977	19.8269 (87)	
Th 2	20.1334	20.1346	20.1359	20.1416	20.1426	20.1476	20.1476	20.1485	20.1457	20.1426	20.1405	20.1382 (88)	
util rest of house	0.9900	0.9778	0.9463	0.8453	0.6674	0.4568	0.3080	0.3525	0.6116	0.8984	0.9780	0.9920 (89)	
MIT 2	19.1012	19.3043	19.5877	19.9175	20.0885	20.1414	20.1470	20.1473	20.1200	19.8759	19.4361	19.0666 (90)	
Living area fraction	19.4407	19.6447	19.9311	20.2700	20.4562	20.5169	20.5249	20.5243	fLA = Living area / (4) =				0.4441 (91)
MIT	19.4407	19.6447	19.9311	20.2700	20.4562	20.5169	20.5249	20.5243	20.4895	20.2220	19.7744	19.4043 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.4407	19.6447	19.9311	20.2700	20.4562	20.5169	20.5249	20.5243	20.4895	20.2220	19.7744	19.4043 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9879	0.9747	0.9433	0.8499	0.6867	0.4857	0.3404	0.3872	0.6407	0.9010	0.9753	0.9902 (94)
Useful gains	420.0324	481.2434	523.9515	542.1984	472.9336	334.1128	223.9009	234.5343	350.0013	421.2115	410.1610	402.2032 (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	881.5083	857.1097	779.5573	655.1759	503.8762	338.3315	224.4290	235.5517	366.2499	553.6964	731.3511	879.8509 (97)
Space heating kWh	343.3380	252.5821	190.1707	81.3438	23.0213	0.0000	0.0000	0.0000	0.0000	98.5688	231.2569	355.3699 (98a)
Space heating requirement - total per year (kWh/year)												1575.6516
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	343.3380	252.5821	190.1707	81.3438	23.0213	0.0000	0.0000	0.0000	0.0000	98.5688	231.2569	355.3699 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1575.6516
Space heating per m2										(98c) / (4) =		25.4466 (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												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	537.4992	423.1377	434.0614	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.9489	0.9761	0.9631	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	510.0398	413.0157	418.0575	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	770.9779	737.4718	678.3449	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	187.8754	241.3953	193.6539	0.0000	0.0000	0.0000	0.0000 (104)
Intermittency factor (Table 10b)	fc = cooled area / (4) =											1.0000 (105)
Space cooling kWh	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 requirement	0.0000	0.0000	0.0000	0.0000	0.0000	46.9689	60.3488	48.4135	0.0000	0.0000	0.0000	0.0000 (107)
Energy for space heating												155.7312 (107)
Energy for space cooling												25.4466 (99)
Total												2.5150 (108)
Fabric Energy Efficiency (DFEE)												27.9616 (109)
												28.0 (109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

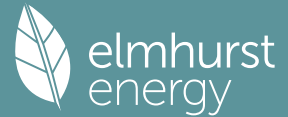
1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	61.9200 (1b)	x 2.5000 (2b)	= 154.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	154.8000 (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	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) =	0.1292 (8)

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Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3792 (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) =	0.3223 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	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)
Adj infilt rate	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)
	0.4110	0.4029	0.3948	0.3546	0.3465	0.3062	0.3062	0.2981	0.3223	0.3465	0.3626	0.3787 (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	0.5844	0.5812	0.5779	0.5629	0.5600	0.5469	0.5469	0.5444	0.5519	0.5600	0.5657	0.5717 (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
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			13.5800	1.1450	15.5496		(27)
External Wall	55.6500	13.5800	42.0700	0.1800	7.5726		(29a)
Communal Wall	4.4500	1.8900	2.5600	0.1800	0.4608		(29a)
Total net area of external elements Aum(A, m2)			60.1000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	25.4730	(33)
Main dwelling							
Party Wall			23.8000	0.0000	0.0000		(32)

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

211.5194 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	8.1500	0.0500	0.4075
E2 Other lintels (including other steel lintels)			
E4 Jamb	21.2000	0.0500	1.0600
E7 Party floor between dwellings (in blocks of flats)	40.8200	0.0700	2.8574
E16 Corner (normal)	7.5000	0.0900	0.6750
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.2600	0.0200	0.1452
E18 Party wall between dwellings	2.5000	0.0600	0.1500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	19.0400	0.0000	0.0000
E3 Sill	1.8100	0.0500	0.0905
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.3106 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	30.7836 (37)

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

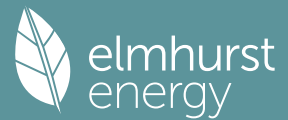
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	29.8557	29.6882	29.5240	28.7528	28.6085	27.9368	27.9368	27.8124	28.1955	28.6085	28.9004	29.2056 (38)
Average = Sum(39)m / 12 =	60.6393	60.4718	60.3076	59.5364	59.3921	58.7204	58.7204	58.5961	58.9792	59.3921	59.6840	59.9892 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9793	0.9766	0.9740	0.9615	0.9592	0.9483	0.9483	0.9463	0.9525	0.9592	0.9639	0.9688 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0354 (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	0.0000 (42a)
Hot water usage for baths	25.2139	24.8395	24.3121	23.3398	22.6118	21.8045	21.3685	21.8921	22.4623	23.3261	24.3184	25.1287	(42b)
Hot water usage for other uses	35.4742	34.1842	32.8943	31.6043	30.3143	29.0243	29.0243	30.3143	31.6043	32.8943	34.1842	35.4742	(42c)
Average daily hot water use (litres/day)													55.6265 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	60.6881	59.0237	57.2064	54.9441	52.9261	50.8289	50.3928	52.2064	54.0665	56.2203	58.5026	60.6029	(44)
Energy content (annual)	96.1151	84.0489	87.9241	75.2158	71.2487	62.5000	60.9458	64.6425	66.6695	76.2905	83.3477	94.8895	(45)
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	923.8380 (46)
Water storage loss (or HIU 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	0.0000 (56)
If cylinder contains dedicated solar storage													
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	0.0000 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Total heat required for water heating calculated for each month													0.0000 (61)
WWHRS	81.6979	71.4416	74.7355	63.9334	60.5614	53.1250	51.8039	54.9461	56.6690	64.8469	70.8455	80.6560	(62)
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	0.0000 (63a)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
Output from w/h	81.6979	71.4416	74.7355	63.9334	60.5614	53.1250	51.8039	54.9461	56.6690	64.8469	70.8455	80.6560	0.0000 (63d)
12Total per year (kWh/year)													80.6560 (64)
Electric shower(s)	46.7254	41.6327	45.4614	43.3832	44.1973	42.1599	43.5652	44.1973	43.3832	45.4614	44.6065	46.7254	785.2623 (64)
													785 (64)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													531.4490 (64a)
Heat gains from water heating, kWh/month	32.1058	28.2686	30.0492	26.8292	26.1897	23.8212	23.8423	24.7858	25.0131	27.5771	28.8630	31.8454	(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	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	89.7006	99.3114	89.7006	92.6907	89.7006	92.6907	89.7006	89.7006	92.6907	89.7006	92.6907	89.7006 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.7619	179.6066	174.9582	165.0624	152.5707	140.8302	132.9869	131.1423	135.7907	145.6865	158.1782	169.9186 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768 (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)	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147 (71)
Water heating gains (Table 5)	43.1530	42.0663	40.3887	37.2627	35.2012	33.0851	32.0461	33.3143	34.7404	37.0659	40.0875	42.8029 (72)
Total internal gains	364.1461	374.5148	358.5781	348.5463	331.0030	320.1365	308.2642	307.6878	316.7522	325.9836	344.4869	355.9527 (73)

6. Solar gains

[Jan]	Area m ²		Solar flux Table 6a W/m ²		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North	1.8400		10.6334		0.6300		0.7000		0.7700		5.9795 (74)	
East	5.0400		19.6403		0.6300		0.7000		0.7700		30.2517 (76)	
West	6.7000		19.6403		0.6300		0.7000		0.7700		40.2155 (80)	
Solar gains	76.4467	149.2759	246.4348	362.2806	447.7797	460.3506	437.4444	373.0030	287.3766	177.1717	95.2408	62.9336 (83)
Total gains	440.5928	523.7907	605.0128	710.8269	778.7827	780.4871	745.7086	680.6908	604.1288	503.1553	439.7277	418.8863 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	59.9963	60.1625	60.3263	61.1077	61.2562	61.9568	61.9568	62.0884	61.6851	61.2562	60.9566	60.6465
alpha	4.9998	5.0108	5.0218	5.0738	5.0837	5.1305	5.1305	5.1392	5.1123	5.0837	5.0638	5.0431
util living area	0.9911	0.9788	0.9456	0.8409	0.6682	0.4756	0.3455	0.3939	0.6416	0.9083	0.9807	0.9930 (86)
MIT	19.8230	20.0576	20.3815	20.7484	20.9344	20.9905	20.9985	20.9971	20.9602	20.6703	20.1833	19.7878 (87)
Th 2	20.1006	20.1029	20.1051	20.1155	20.1175	20.1266	20.1266	20.1283	20.1231	20.1175	20.1135	20.1094 (88)
util rest of house	0.9888	0.9734	0.9323	0.8082	0.6161	0.4131	0.2774	0.3203	0.5713	0.8802	0.9749	0.9911 (89)
MIT 2	19.0330	19.2657	19.5805	19.9242	20.0761	20.1223	20.1262	20.1274	20.1024	19.8663	19.4000	19.0051 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.3838	19.6174	19.9362	20.2903	20.4573	20.5079	20.5136	20.5137	20.4834	20.2234	19.7479	19.3527 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.3838	19.6174	19.9362	20.2903	20.4573	20.5079	20.5136	20.5137	20.4834	20.2234	19.7479	19.3527 (93)

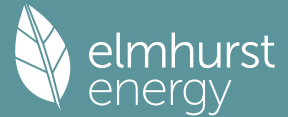
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9864	0.9699	0.9294	0.8151	0.6367	0.4406	0.3077	0.3530	0.6010	0.8840	0.9719	0.9891 (94)
Useful gains	434.5946	508.0077	562.3196	579.3846	495.8426	343.8830	229.4287	240.2935	363.0975	444.7708	427.3651	414.3045 (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	914.6739	889.9875	810.3072	678.1352	520.1149	346.9118	229.8080	241.0451	376.4854	571.5517	754.8764	908.9986 (97)
Space heating kWh	357.1790	256.6904	184.5028	71.1005	18.0586	0.0000	0.0000	0.0000	0.0000	94.3250	235.8081	368.0524 (98a)
Space heating requirement - total per year (kWh/year)	1585.7168											
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	357.1790	256.6904	184.5028	71.1005	18.0586	0.0000	0.0000	0.0000	0.0000	94.3250	235.8081	368.0524 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1585.7168											
Space heating per m ²	(98c) / (4) = 25.6091 (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	551.9722	434.5313	445.3301	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9637	0.9833	0.9733	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	531.9591	427.2838	433.4229	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	879.1550	840.2681	766.0049	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	249.9810	307.2604	247.4410	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											
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 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	62.4953	76.8151	61.8602	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	201.1706 (107)											
Energy for space heating	25.6091 (99)											
Energy for space cooling	3.2489 (108)											
Total	28.8580 (109)											
Fabric Energy Efficiency (TFEE)	28.9 (109)											

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Plot Reference	B2 2B3P Mid				Issued on Date	19/12/2025	
Assessment Reference	2B3P			Plot Type Ref	2B3P		
Plot Address					SAP Version	10.2	
SAP Rating	80 C	DER	3.92	TER	12.67		
Environmental	97 A	% DER < TER				69.06	
CO ₂ Emissions (t/year)	0.21	DFEE	27.96	TFEE	28.86		
Compliance Check	See BREL	% DFEE < TFEE				3.11	
% DPER < TPER	39.14	DPER	41.15	TPER	67.62		
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	61.9200 (1b)	2.5000 (2b)	154.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.9200		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	154.8000 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000 (23c)
Effective ac	0.3026	0.2994	0.2962	0.2802	0.2771	0.2611	0.2611	0.2579	0.2675	0.2771	0.2834	0.2898 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			17.0900	0.9615	16.4327		(27)
External Wall	55.6500	17.0900	38.5600	0.1600	6.1696	14.0000	539.8400 (29a)
Communal Wall	4.4500	1.8900	2.5600	0.2100	0.5376	14.0000	35.8400 (29a)
Total net area of external elements Aum(A, m ²)			60.1000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 25.0299		(33)
Main dwelling							
Party Wall			23.8000	0.0000	0.0000	20.0000	476.0000 (32)
Party Floor			61.9200			80.0000	4953.6000 (32d)
Party Ceiling			61.9200			100.0000	6192.0000 (32b)
Stud			100.0000			9.0000	900.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13097.2800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							211.5194 (35)
List of Thermal Bridges							

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K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.1500	0.0500	0.4075
E4 Jamb	21.2000	0.0500	1.0600
E7 Party floor between dwellings (in blocks of flats)	40.8200	0.0700	2.8574
E16 Corner (normal)	7.5000	0.0900	0.6750
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.2600	0.0200	0.1452
E18 Party wall between dwellings	2.5000	0.0600	0.1500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	19.0400	0.0000	0.0000
E3 Sill	1.8100	0.0500	0.0905
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.3106 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	30.3405 (37)

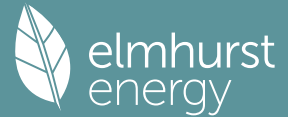
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	15.4561	15.2933	15.1304	14.3163	14.1535	13.3393	13.3393	13.1765	13.6650	14.1535	14.4791	14.8048 (38)
Heat transfer coeff	45.7966	45.6338	45.4709	44.6568	44.4940	43.6798	43.6798	43.5170	44.0055	44.4940	44.8196	45.1453 (39)
Average = Sum(39)m / 12 =												44.6161
HLP	0.7396	0.7370	0.7343	0.7212	0.7186	0.7054	0.7054	0.7028	0.7107	0.7186	0.7238	0.7291 (40)
HLP (average)												0.7205
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.0354 (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	25.2139	24.8395	24.3121	23.3398	22.6118	21.8045	21.3685	21.8921	22.4623	23.3261	24.3184	25.1287 (42b)
Hot water usage for other uses	35.4742	34.1842	32.8943	31.6043	30.3143	29.0243	29.0243	30.3143	31.6043	32.8943	34.1842	35.4742 (42c)
Average daily hot water use (litres/day)												55.6265 (43)
Daily hot water use	60.6881	59.0237	57.2064	54.9441	52.9261	50.8289	50.3928	52.2064	54.0665	56.2203	58.5026	60.6029 (44)
Energy conte	96.1151	84.0489	87.9241	75.2158	71.2487	62.5000	60.9458	64.6425	66.6695	76.2905	83.3477	94.8895 (45)
Energy content (annual)										Total = Sum(45)m =		923.8380
Distribution loss (46)m = 0.15 x (45)m	14.4173	12.6073	13.1886	11.2824	10.6873	9.3750	9.1419	9.6964	10.0004	11.4436	12.5022	14.2334 (46)
Water storage loss (or HIU loss):												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	151.3919	133.9764	143.2009	128.7095	126.5255	115.9937	116.2226	119.9193	120.1631	131.5673	136.8414	150.1663 (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	151.3919	133.9764	143.2009	128.7095	126.5255	115.9937	116.2226	119.9193	120.1631	131.5673	136.8414	150.1663 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1574.6778 (64)
Electric shower(s)	46.7254	41.6327	45.4614	43.3832	44.1973	42.1599	43.5652	44.1973	43.3832	45.4614	44.6065	46.7254 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												531.4990 (64a)
Heat gains from water heating, kWh/month	87.8611	78.2964	84.8215	78.6500	78.9610	74.1162	75.3772	76.7644	75.8083	80.9534	81.6597	87.4535 (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	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	89.6605	99.2670	89.6605	92.6492	89.6605	92.6492	89.6605	89.6605	92.6492	89.6605	92.6492	89.6605 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.7619	179.6066	174.9582	165.0624	152.5707	140.8302	132.9869	131.1423	135.7907	145.6865	158.1782	169.9186 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768 (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)	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147 (71)
Water heating gains (Table 5)	118.0929	116.5125	114.0074	109.2361	106.1303	102.9391	101.3135	103.1779	105.2894	108.8083	113.4162	117.5451 (72)
Total internal gains	439.0458	448.9165	432.1566	420.4781	401.8920	389.9491	377.4914	377.5112	387.2597	397.6858	417.7741	430.6547 (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	2.3200	10.6334	0.4000	0.7000	0.7700	4.7869 (74)	
East	6.3400	19.6403	0.4000	0.7000	0.7700	24.1617 (76)	

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West	8.4300		19.6403		0.4000		0.7000		0.7700		32.1267 (80)	
Solar gains	61.0753	119.2600	196.8835	289.4406	357.7554	367.8022	349.4996	298.0093	229.5943	141.5467	76.0903	50.2794 (83)
Total gains	500.1211	568.1766	629.0402	709.9188	759.6474	757.7512	726.9910	675.5205	616.8540	539.2325	493.8643	480.9341 (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	79.4411	79.7246	80.0101	81.4688	81.7669	83.2910	83.2910	83.6026	82.6746	81.7669	81.1728	80.5872
alpha	6.2961	6.3150	6.3340	6.4313	6.4511	6.5527	6.5527	6.5735	6.5116	6.4511	6.4115	6.3725
util living area	0.9750	0.9472	0.8831	0.7250	0.5397	0.3686	0.2643	0.2963	0.4897	0.7914	0.9431	0.9792 (86)
MIT	20.4028	20.5764	20.7760	20.9444	20.9918	20.9994	20.9999	20.9999	20.9967	20.9221	20.6600	20.3791 (87)
Th 2	20.3060	20.3083	20.3106	20.3221	20.3245	20.3360	20.3360	20.3384	20.3314	20.3245	20.3198	20.3152 (88)
util rest of house	0.9695	0.9367	0.8629	0.6921	0.5021	0.3305	0.2245	0.2537	0.4433	0.7549	0.9301	0.9746 (89)
MIT 2	19.7714	19.9398	20.1269	20.2816	20.3194	20.3358	20.3360	20.3383	20.3297	20.2690	20.0319	19.7562 (90)
Living area fraction	20.0518	20.2225	20.4152	20.5760	20.6180	20.6305	20.6309	20.6321	20.6259	20.5591	20.3108	20.0329 (92)
MIT	20.0518	20.2225	20.4152	20.5760	20.6180	20.6305	20.6309	20.6321	20.6259	20.5591	20.3108	20.0329 (93)
Temperature adjustment												0.0000
adjusted MIT												20.0329 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9672	0.9353	0.8662	0.7047	0.5185	0.3474	0.2422	0.2726	0.4638	0.7680	0.9299	0.9723 (94)
Useful gains	483.7054	531.4044	544.8530	500.2506	393.9037	263.2432	176.0562	184.1441	286.1163	414.1480	459.2327	467.6213 (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	721.3795	699.2256	632.7364	521.4117	396.7987	263.4124	176.0685	184.1702	287.1765	443.1177	592.1050	714.7794 (97)
Space heating kWh	176.8296	112.7759	65.3853	15.2360	2.1539	0.0000	0.0000	0.0000	0.0000	21.5534	95.6681	183.8857 (98a)
Space heating requirement - total per year (kWh/year)												673.4877
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	176.8296	112.7759	65.3853	15.2360	2.1539	0.0000	0.0000	0.0000	0.0000	21.5534	95.6681	183.8857 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												673.4877
Space heating per m2										(98c) / (4) =		10.8767 (99)
9b. Energy requirements												
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space and Water												1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500 (305)
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system												1.5000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement												
	176.8296	112.7759	65.3853	15.2360	2.1539	0.0000	0.0000	0.0000	0.0000	21.5534	95.6681	183.8857 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	278.5066	177.6220	102.9819	23.9966	3.3924	0.0000	0.0000	0.0000	0.0000	33.9466	150.6772	289.6199
Space heating requirement												
	278.5066	177.6220	102.9819	23.9966	3.3924	0.0000	0.0000	0.0000	0.0000	33.9466	150.6772	289.6199 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement												
	151.3919	133.9764	143.2009	128.7095	126.5255	115.9937	116.2226	119.9193	120.1631	131.5673	136.8414	150.1663 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	227.0879	200.9646	214.8013	193.0642	189.7883	173.9906	174.3338	179.8789	180.2447	197.3509	205.2621	225.2494
Water heating fuel												
	227.0879	200.9646	214.8013	193.0642	189.7883	173.9906	174.3338	179.8789	180.2447	197.3509	205.2621	225.2494 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	12.3507	11.1554	12.3507	11.9523	12.3507	11.9523	12.3507	12.3507	11.9523	12.3507	11.9523	12.3507 (331)
Lighting	19.0311	15.2675	13.7467	10.0714	7.7794	6.3559	7.0967	9.2245	11.9817	15.7207	17.7565	19.5601 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-12.7420	-21.4952	-37.3947	-49.4010	-58.8998	-57.1836	-56.2866	-50.0082	-39.5215	-27.2354	-15.0133	-10.5109 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												1060.7431 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2362.0166 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												10.6074 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7700)												
mechanical ventilation fans (SFP = 0.7700)												145.4191 (330a)
Total electricity for the above, kWh/year												145.4191 (331)
Electricity for lighting (calculated in Appendix L)												153.5922 (332)

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Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-435.6920 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	3817.5780 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			280.0000 (367)
Space and Water heating from Heat pump	1222.4142	0.1584	60.0102 (367)
Electrical energy for heat distribution (space & water)	10.6074	0.0000	4.9964 (372)
Overall CO2 factor for heat network			0.0536 (386)
Total CO2 associated with community systems			183.4390 (373)
Energy for instantaneous electric shower(s)	531.4990	0.1391	73.9433 (264a)
Space and water heating			183.4390 (376)
Pumps, fans and electric keep-hot	145.4191	0.1387	20.1714 (378)
Energy for lighting	153.5922	0.1443	22.1681 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-435.6920	0.1315	-57.2933
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-57.2933 (380)
Total CO2, kg/year			242.4285 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.9200 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	1222.4142	1.5864	600.9697 (467)
Electrical energy for heat distribution (space & water)	10.6074	0.0000	52.7085 (472)
Overall CO2 factor for heat network			0.5654 (486)
Total CO2 associated with community systems			1935.1539 (473)
Energy for instantaneous electric shower(s)	531.4990	1.5143	804.8670 (278a)
Space and water heating			1935.1539 (476)
Pumps, fans and electric keep-hot	145.4191	1.5128	219.9900 (478)
Energy for lighting	153.5922	1.5338	235.5849 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-435.6920	1.4858	-647.3628
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-647.3628 (480)
Total Primary energy kWh/year			2548.2330 (483)
Dwelling Primary energy Rate (DPER)			41.1500 (484)

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

1. Overall dwelling characteristics

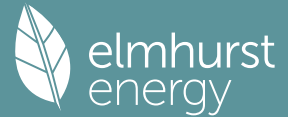
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	61.9200 (1b)	2.5000 (2b)	154.8000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	154.8000 (5)

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	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	20.0000 / (5) = 0.1292 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3792 (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) = 0.3223 (21)

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

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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												
	0.4110	0.4029	0.3948	0.3546	0.3465	0.3062	0.3062	0.2981	0.3223	0.3465	0.3626	0.3787 (22b)
Effective ac	0.5844	0.5812	0.5779	0.5629	0.5600	0.5469	0.5469	0.5444	0.5519	0.5600	0.5657	0.5717 (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
Main dwelling							
TER Opaque door			1.8900	1.8900	1.8900		(26)
TER Opening Type			13.5800	1.1450	15.5496		(27)
External Wall	55.6500	13.5800	42.0700	0.1800	7.5726		(29a)
Communal Wall	4.4500	1.8900	2.5600	0.1800	0.4608		(29a)
Total net area of external elements Aum(A, m2)			60.1000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	25.4730		(33)
Main dwelling							
Party Wall			23.8000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							211.5194 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.1500	0.0500	0.4075
E4 Jamb	21.2000	0.0500	1.0600
E7 Party floor between dwellings (in blocks of flats)	40.8200	0.0700	2.8574
E16 Corner (normal)	7.5000	0.0900	0.6750
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.2600	0.0200	0.1452
E18 Party wall between dwellings	2.5000	0.0600	0.1500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	19.0400	0.0000	0.0000
E3 Sill	1.8100	0.0500	0.0905
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.3106 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	30.7836 (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	29.8557	29.6882	29.5240	28.7528	28.6085	27.9368	27.9368	27.8124	28.1955	28.6085	28.9004	29.2056 (38)
Heat transfer coeff	60.6393	60.4718	60.3076	59.5364	59.3921	58.7204	58.7204	58.5961	58.9792	59.3921	59.6840	59.9892 (39)
Average = Sum(39)m / 12 =												59.5357
HLP	0.9793	0.9766	0.9740	0.9615	0.9592	0.9483	0.9483	0.9463	0.9525	0.9592	0.9639	Dec 0.9688 (40)
HLP (average)												0.9615
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

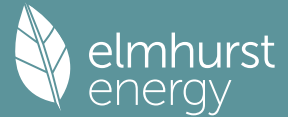
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0354 (42)
Hot water usage for mixer showers												
58.3460	57.4692	56.1915	53.7468	51.9427	49.9308	48.7872	50.0552	51.4453	53.6054	56.1026	58.1225 (42a)	
Hot water usage for baths												
25.2139	24.8395	24.3121	23.3398	22.6118	21.8045	21.3685	21.8921	22.4623	23.3261	24.3184	25.1287 (42b)	
Hot water usage for other uses												
35.4742	34.1842	32.8943	31.6043	30.3143	29.0243	29.0243	30.3143	31.6043	32.8943	34.1842	35.4742 (42c)	
Average daily hot water use (litres/day)												109.4196 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
119.0341	116.4929	113.3979	108.6909	104.8688	100.7597	99.1800	102.2617	105.5118	109.8258	114.6052	118.7253 (44)	
Energy content (annual)	188.5209	165.8843	174.2883	148.7925	141.1736	123.8958	119.9497	126.6213	130.1066	149.0325	163.2761	185.8952 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1817.4367
28.2781	24.8826	26.1432	22.3189	21.1760	18.5844	17.9924	18.9932	19.5160	22.3549	24.4914	27.8843 (46)	
Water storage loss (or HIU loss):												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)	
If cylinder contains dedicated solar storage												
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (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 (61)	
Total heat required for water heating calculated for each month												
235.1158	207.9700	220.8832	193.8843	187.7685	168.9876	166.5446	173.2162	175.1984	195.6274	208.3680	232.4901 (62)	
WWHRS	-26.6734	-23.5901	-24.7022	-20.4544	-19.0628	-16.3122	-15.2901	-16.2594	-16.8772	-19.8963	-22.5401	-26.1794 (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												
208.4425	184.3799	196.1810	173.4299	168.7057	152.6754	151.2545	156.9568	158.3212	175.7311	185.8278	206.3107 (64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2118.2165 (64)
Electric shower(s)												2118 (64)
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												
99.9591	88.8251	95.2268	85.5470	84.2161	77.2688	77.1592	79.3775	79.3339	86.8292	90.3628	99.0861 (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	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	89.7006	99.3114	89.7006	92.6907	89.7006	92.6907	89.7006	89.7006	92.6907	89.7006	92.6907	89.7006 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												

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Cooking gains	177.7619	179.6066	174.9582	165.0624	152.5707	140.8302	132.9869	131.1423	135.7907	145.6865	158.1782	169.9186 (68)
Pumps, fans	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768 (69)
Losses e.g. evaporation	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)
Water heating gains	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147 (71)
Total internal gains	134.3537	132.1802	127.9930	118.8152	113.1937	107.3178	103.7086	106.6902	110.1860	116.7060	125.5039	133.1802 (72)
	458.3468	467.6287	449.1823	433.0988	411.9956	394.3692	379.9267	381.0637	392.1978	408.6236	432.9032	449.3300 (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				1.8400	10.6334	0.6300	0.7000		0.7700		5.9795 (74)	
East				5.0400	19.6403	0.6300	0.7000		0.7700		30.2517 (76)	
West				6.7000	19.6403	0.6300	0.7000		0.7700		40.2155 (80)	
Solar gains	76.4467	149.2759	246.4348	362.2806	447.7797	460.3506	437.4444	373.0030	287.3766	177.1717	95.2408	62.9336 (83)
Total gains	534.7935	616.9046	695.6171	795.3794	859.7753	854.7199	817.3711	754.0667	679.5745	585.7953	528.1440	512.2636 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)											
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	59.9963	60.1625	60.3263	61.1077	61.2562	61.9568	61.9568	62.0884	61.6851	61.2562	60.9566	60.6465
alpha	4.9998	5.0108	5.0218	5.0738	5.0837	5.1305	5.1305	5.1392	5.1123	5.0837	5.0638	5.0431
util living area	0.9802	0.9602	0.9133	0.7914	0.6164	0.4360	0.3155	0.3563	0.5806	0.8569	0.9605	0.9835 (86)
MIT	20.0018	20.2205	20.5108	20.8135	20.9542	20.9936	20.9990	20.9982	20.9745	20.7626	20.3392	19.9678 (87)
Th 2	20.1006	20.1029	20.1051	20.1155	20.1175	20.1266	20.1266	20.1283	20.1231	20.1175	20.1135	20.1094 (88)
util rest of house	0.9753	0.9510	0.8946	0.7548	0.5654	0.3780	0.2532	0.2894	0.5135	0.8204	0.9498	0.9794 (89)
MIT 2	18.9560	19.2301	19.5848	19.9381	20.0811	20.1229	20.1263	20.1276	20.1066	19.8944	19.3898	18.9198 (90)
Living area fraction	19.4205	19.6699	19.9960	20.3269	20.4689	20.5096	20.5139	20.5143	20.4920	20.2800	19.8115	19.3852 (91)
MIT	19.4205	19.6699	19.9960	20.3269	20.4689	20.5096	20.5139	20.5143	20.4920	20.2800	19.8115	19.3852 (92)
Temperature adjustment	19.4205	19.6699	19.9960	20.3269	20.4689	20.5096	20.5139	20.5143	20.4920	20.2800	19.8115	0.0000
adjusted MIT	19.4205	19.6699	19.9960	20.3269	20.4689	20.5096	20.5139	20.5143	20.4920	20.2800	19.8115	19.3852 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9707	0.9457	0.8920	0.7640	0.5861	0.4036	0.2809	0.3191	0.5423	0.8277	0.9454	0.9752 (94)
Ext temp.	519.1301	583.4082	620.4953	607.6479	503.9466	344.9839	229.5779	240.6111	368.5106	484.8607	499.2980	499.5737 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Space heating kWh	916.8941	893.1649	813.9131	680.3160	520.8018	347.0135	229.8241	241.0789	376.9966	574.9162	758.6717	910.9504 (97)
Space heating requirement - total per year (kWh/year)	295.9364	208.1565	143.9028	52.3210	12.5403	0.0000	0.0000	0.0000	0.0000	67.0013	186.7490	306.0643 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	295.9364	208.1565	143.9028	52.3210	12.5403	0.0000	0.0000	0.0000	0.0000	67.0013	186.7490	306.0643 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (99)
Space heating per m2	(98c) / (4) = 20.5535 (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)											
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating efficiency (main heating system 1)	295.9364	208.1565	143.9028	52.3210	12.5403	0.0000	0.0000	0.0000	0.0000	67.0013	186.7490	306.0643 (98)
Space heating fuel (main heating system)	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 efficiency (main heating system 2)	320.6245	225.5216	155.9077	56.6858	13.5864	0.0000	0.0000	0.0000	0.0000	72.5908	202.3283	331.5973 (211)
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 (212)
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 (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	208.4425	184.3799	196.1810	173.4299	168.7057	152.6754	151.2545	156.9568	158.3212	175.7311	185.8278	206.3107 (64)
Water heating requirement	84.8454	84.3325	83.3756	81.7196	80.3635	79.8000	79.8000	79.8000	79.8000	82.0967	84.0709	79.8000 (216)
Efficiency of water heater (217)m	245.6732	218.6345	235.2977	212.2257	209.9282	191.3226	189.5420	196.6877	198.3975	214.0537	221.0371	84.9426 (217)
Fuel for water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (219)
Space cooling fuel requirement (221)m	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (221)
Pumps and Fa	18.6380	14.9521	13.4627	9.8634	7.6187	6.2246	6.9501	9.0340	11.7342	15.3960	17.3897	19.1560 (232)
Lighting	Electricity generated by PVs (Appendix M) (negative quantity)											

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(233a)m	-13.7800	-20.6981	-31.6771	-38.0026	-43.1088	-41.0319	-40.5403	-37.2092	-31.7193	-24.6976	-15.5964	-11.7707	(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	-4.3526	-9.4080	-19.1765	-29.5153	-39.7321	-40.1741	-39.6942	-33.2778	-23.9664	-13.6764	-5.8819	-3.4230	(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												1378.8425	(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												2575.6824	(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)												150.4195	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-612.1102	(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												3578.8342	(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			
Total CO2 associated with community systems			
Water heating (other fuel)			
Space and water heating			
Pumps, fans and electric keep-hot			
Energy for lighting			
Energy saving/generation technologies			
PV Unit electricity used in dwelling			
PV Unit electricity exported			
Total			
Total CO2, kg/year			
EPC Target Carbon Dioxide Emission Rate (TER)			

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			
Total CO2 associated with community systems			
Water heating (other fuel)			
Space and water heating			
Pumps, fans and electric keep-hot			
Energy for lighting			
Energy saving/generation technologies			
PV Unit electricity used in dwelling			
PV Unit electricity exported			
Total			
Total Primary energy kWh/year			
Target Primary Energy Rate (TPER)			

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Plot Reference	B2 2B3P Top				Issued on Date	19/12/2025	
Assessment Reference	2B3P			Plot Type Ref	2B3P		
Plot Address					SAP Version	10.2	
SAP Rating	75 C		DER	5.56		TER	16.26
Environmental	96 A		% DER < TER				65.81
CO ₂ Emissions (t/year)	0.3		DFEE	45.18		TFEE	44.96
Compliance Check	See BREL		% DFEE < TFEE				-0.50
% DPER < TPER	33.36		DPER	57.94		TPER	86.94
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	61.9200 (1b)	2.5000 (2b)	154.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	154.8000 (5)

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	2	(19)

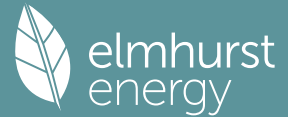
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000 (23c)
Effective ac	0.3026	0.2994	0.2962	0.2802	0.2771	0.2611	0.2611	0.2579	0.2675	0.2771	0.2834	0.2898 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			17.0900	0.9615	16.4327		(27)
External Wall	60.1000	18.9800	41.1200	0.1600	6.5792	14.0000	575.6800 (29a)
Roof	61.9200		61.9200	0.1300	8.0496	9.0000	557.2800 (30)
Total net area of external elements Aum(A, m ²)			122.0200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	32.9515	(33)
Main dwelling							
Party Wall			23.8000	0.0000	0.0000	20.0000	476.0000 (32)
Party Floor			61.9200			80.0000	4953.6000 (32d)
Stud			100.0000			9.0000	900.0000 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) =
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							7462.5600 (34)
List of Thermal Bridges							120.5194 (35)
K1 Element				Length	Psi-value		Total

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E2 Other lintels (including other steel lintels)	8.1500	0.0500	0.4075
E4 Jamb	21.2000	0.0500	1.0600
E7 Party floor between dwellings (in blocks of flats)	16.7800	0.0700	1.1746
E16 Corner (normal)	7.5000	0.0900	0.6750
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.2600	0.0200	0.1452
E18 Party wall between dwellings	2.5000	0.0600	0.1500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.5200	0.0000	0.0000
E3 Sill	1.8100	0.0500	0.0905
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
E15 Flat roof with parapet	24.0400	0.5600	13.4624
P4 Party wall - Roof (insulation at ceiling level)	9.5200	0.1200	1.1424
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			18.2326 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	51.1841 (37)

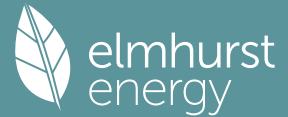
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	15.4561	15.2933	15.1304	14.3163	14.1535	13.3393	13.3393	13.1765	13.6650	14.1535	14.4791	14.8048 (38)
Average = Sum(39)m / 12 =	66.6402	66.4774	66.3145	65.5004	65.3376	64.5234	64.5234	64.3606	64.8491	65.3376	65.6632	65.9889 (39)
	66.6402	66.4774	66.3145	65.5004	65.3376	64.5234	64.5234	64.3606	64.8491	65.3376	65.6632	65.4597
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0762	1.0736	1.0710	1.0578	1.0552	1.0420	1.0420	1.0394	1.0473	1.0552	1.0605	1.0657 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.0354 (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	25.2139	24.8395	24.3121	23.3398	22.6118	21.8045	21.3685	21.8921	22.4623	23.3261	24.3184	25.1287 (42b)
Hot water usage for other uses	35.4742	34.1842	32.8943	31.6043	30.3143	29.0243	29.0243	30.3143	31.6043	32.8943	34.1842	35.4742 (42c)
Average daily hot water use (litres/day)												55.6265 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	60.6881	59.0237	57.2064	54.9441	52.9261	50.8289	50.3928	52.2064	54.0665	56.2203	58.5026	60.6029 (44)
Energy content (annual)	96.1151	84.0489	87.9241	75.2158	71.2487	62.5000	60.9458	64.6425	66.6695	76.2905	83.3477	94.8895 (45)
Distribution loss (46)m = 0.15 x (45)m	14.4173	12.6073	13.1886	11.2824	10.6873	9.3750	9.1419	9.6964	10.0004	11.4436	12.5022	14.2334 (46)
Water storage loss (or HIU loss):												110.0000 (47)
Store volume												
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	151.3919	133.9764	143.2009	128.7095	126.5255	115.9937	116.2226	119.9193	120.1631	131.5673	136.8414	150.1663 (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	151.3919	133.9764	143.2009	128.7095	126.5255	115.9937	116.2226	119.9193	120.1631	131.5673	136.8414	150.1663 (64)
12Total per year (kWh/year)												1574.6778 (64)
Electric shower(s)	46.7254	41.6327	45.4614	43.3832	44.1973	42.1599	43.5652	44.1973	43.3832	45.4614	44.6065	46.7254 (64a)
Heat gains from water heating, kWh/month	87.8611	78.2964	84.8215	78.6500	78.9610	74.1162	75.3772	76.7644	75.8083	80.9534	81.6597	87.4535 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	89.6605	99.2670	89.6605	92.6492	89.6605	92.6492	89.6605	89.6605	92.6492	89.6605	92.6492	89.6605 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	177.7619	179.6066	174.9582	165.0624	152.5707	140.8302	132.9869	131.1423	135.7907	145.6865	158.1782	169.9186 (68)
Pumps, fans	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147 (71)
Total internal gains	118.0929	116.5125	114.0074	109.2361	106.1303	102.9391	101.3135	103.1779	105.2894	108.8083	113.4162	117.5451 (72)
	439.0458	448.9165	432.1566	420.4781	401.8920	389.9491	377.4914	377.5112	387.2597	397.6858	417.7741	430.6547 (73)

6. Solar gains												
[Jan]			Area	Solar flux	g	FF	Access	Gains				
			m2	Table 6a	Specific data	Specific data	factor	W				
				W/m2	or Table 6b	or Table 6c	Table 6d					
North			2.3200	10.6334	0.4000	0.7000	0.7700	4.7869 (74)				

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East	6.3400		19.6403		0.4000		0.7000		0.7700		24.1617 (76)	
West	8.4300		19.6403		0.4000		0.7000		0.7700		32.1267 (80)	
Solar gains	61.0753	119.2600	196.8835	289.4406	357.7554	367.8022	349.4996	298.0093	229.5943	141.5467	76.0903	50.2794 (83)
Total gains	500.1211	568.1766	629.0402	709.9188	759.6474	757.7512	726.9910	675.5205	616.8540	539.2325	493.8643	480.9341 (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	31.1064	31.1825	31.2591	31.6477	31.7265	32.1268	32.1268	32.2081	31.9655	31.7265	31.5692	31.4134
alpha	3.0738	3.0788	3.0839	3.1098	3.1151	3.1418	3.1418	3.1472	3.1310	3.1151	3.1046	3.0942
util living area	0.9510	0.9278	0.8865	0.7966	0.6670	0.5049	0.3779	0.4193	0.6261	0.8364	0.9259	0.9558 (86)
MIT	19.0884	19.3694	19.7864	20.3150	20.6953	20.9079	20.9721	20.9611	20.8147	20.3099	19.6269	19.0469 (87)
Th 2	20.0203	20.0225	20.0246	20.0354	20.0376	20.0484	20.0484	20.0506	20.0441	20.0376	20.0333	20.0289 (88)
util rest of house	0.9434	0.9168	0.8693	0.7668	0.6205	0.4407	0.3009	0.3395	0.5621	0.8051	0.9128	0.9489 (89)
MIT 2	18.2930	18.5683	18.9728	19.4772	19.8160	19.9950	20.0370	20.0337	19.9269	19.4866	18.8321	18.2587 (90)
Living area fraction									fLA = Living area / (4) =			0.4441 (91)
MIT	18.6463	18.9240	19.3341	19.8493	20.2065	20.4005	20.4523	20.4456	20.3212	19.8522	19.1851	18.6088 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6463	18.9240	19.3341	19.8493	20.2065	20.4005	20.4523	20.4456	20.3212	19.8522	19.1851	18.6088 (93)
8. Space heating requirement												
Utilisation	0.9299	0.9020	0.8552	0.7605	0.6291	0.4651	0.3341	0.3734	0.5816	0.7984	0.8989	0.9361 (94)
Useful gains	465.0702	512.4791	537.9326	539.9073	477.9141	352.4408	242.8814	252.2551	358.7712	430.5073	443.9583	450.2041 (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	956.0375	932.2815	851.0883	717.1834	555.7945	374.2665	248.5632	260.3740	403.4358	604.5183	793.5451	950.8186 (97)
Space heating kWh	365.2797	282.1072	232.9878	127.6389	57.9430	0.0000	0.0000	0.0000	0.0000	129.4642	251.7025	372.4573 (98a)
Space heating requirement - total per year (kWh/year)												1819.5804
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	365.2797	282.1072	232.9878	127.6389	57.9430	0.0000	0.0000	0.0000	0.0000	129.4642	251.7025	372.4573 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1819.5804
Space heating per m2										(98c) / (4) =		29.3860 (99)
9b. Energy requirements												
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space and Water												1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500 (305)
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system												1.5000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	365.2797	282.1072	232.9878	127.6389	57.9430	0.0000	0.0000	0.0000	0.0000	129.4642	251.7025	372.4573 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	575.3155	444.3188	366.9558	201.0312	91.2602	0.0000	0.0000	0.0000	0.0000	203.9061	396.4314	586.6202
Space heating requirement	575.3155	444.3188	366.9558	201.0312	91.2602	0.0000	0.0000	0.0000	0.0000	203.9061	396.4314	586.6202 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement	151.3919	133.9764	143.2009	128.7095	126.5255	115.9937	116.2226	119.9193	120.1631	131.5673	136.8414	150.1663 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	227.0879	200.9646	214.8013	193.0642	189.7883	173.9906	174.3338	179.8789	180.2447	197.3509	205.2621	225.2494
Water heating fuel	227.0879	200.9646	214.8013	193.0642	189.7883	173.9906	174.3338	179.8789	180.2447	197.3509	205.2621	225.2494 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	12.3507	11.1554	12.3507	11.9523	12.3507	11.9523	12.3507	12.3507	11.9523	12.3507	11.9523	12.3507 (331)
Lighting	19.0311	15.2675	13.7467	10.0714	7.7794	6.3559	7.0967	9.2245	11.9817	15.7207	17.7565	19.5601 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-12.7420	-21.4952	-37.3947	-49.4010	-58.8998	-57.1836	-56.2866	-50.0082	-39.5215	-27.2354	-15.0133	-10.5109 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												2865.8391 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2362.0166 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												28.6584 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7700)												
mechanical ventilation fans (SFP = 0.7700)												145.4191 (330a)
Total electricity for the above, kWh/year												145.4191 (331)
Electricity for lighting (calculated in Appendix L)												153.5922 (332)

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

PV generation	-435.6920 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	5622.6740 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			280.0000 (367)
Space and Water heating from Heat pump	1867.0913	0.1553	158.9346 (367)
Electrical energy for heat distribution (space & water)	28.6584	0.0000	7.7663 (372)
Overall CO2 factor for heat network			0.0545 (386)
Total CO2 associated with community systems			285.1333 (373)
Energy for instantaneous electric shower(s)	531.4990	0.1391	73.9433 (264a)
Space and water heating			285.1333 (376)
Pumps, fans and electric keep-hot	145.4191	0.1387	20.1714 (378)
Energy for lighting	153.5922	0.1443	22.1681 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-435.6920	0.1315	-57.2933
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-57.2933 (380)
Total CO2, kg/year			344.1227 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.5600 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	1867.0913	1.5749	1611.9204 (467)
Electrical energy for heat distribution (space & water)	28.6584	0.0000	81.0151 (472)
Overall CO2 factor for heat network			0.5690 (486)
Total CO2 associated with community systems			2974.4112 (473)
Energy for instantaneous electric shower(s)	531.4990	1.5143	804.8670 (278a)
Space and water heating			2974.4112 (476)
Pumps, fans and electric keep-hot	145.4191	1.5128	219.9900 (478)
Energy for lighting	153.5922	1.5338	235.5849 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-435.6920	1.4858	-647.3628
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-647.3628 (480)
Total Primary energy kWh/year			3587.4903 (483)
Dwelling Primary energy Rate (DPER)			57.9400 (484)

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

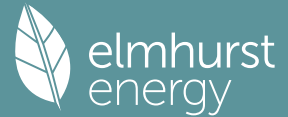
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	61.9200 (1b)	2.5000 (2b)	154.8000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	154.8000 (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	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	(6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 20.0000 / (5) = 0.1292 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3792 (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) = 0.3223 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
Effective ac	0.4110	0.4029	0.3948	0.3546	0.3465	0.3062	0.3062	0.2981	0.3223	0.3465	0.3626	0.3787	(22b)
	0.5844	0.5812	0.5779	0.5629	0.5600	0.5469	0.5469	0.5444	0.5519	0.5600	0.5657	0.5717	(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
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			13.5800	1.1450	15.5496		(27)
External Wall	60.1000	15.4700	44.6300	0.1800	8.0334		(29a)
Roof	61.9200		61.9200	0.1100	6.8112		(30)
Total net area of external elements Aum(A, m2)			122.0200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	32.2842	(33)
Main dwelling							
Party Wall			23.8000	0.0000	0.0000		(32)

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

120.5194 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.1500	0.0500	0.4075
E4 Jamb	21.2000	0.0500	1.0600
E7 Party floor between dwellings (in blocks of flats)	16.7800	0.0700	1.1746
E16 Corner (normal)	7.5000	0.0900	0.6750
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.2600	0.0200	0.1452
E18 Party wall between dwellings	2.5000	0.0600	0.1500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.5200	0.0000	0.0000
E3 Sill	1.8100	0.0500	0.0905
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
E15 Flat roof with parapet	24.0400	0.5600	13.4624
P4 Party wall - Roof (insulation at ceiling level)	9.5200	0.1200	1.1424

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

18.2326 (36)

Point Thermal bridges

(33a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 50.5168 (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	29.8557	29.6882	29.5240	28.7528	28.6085	27.9368	27.9368	27.8124	28.1955	28.6085	28.9004	29.2056	(38)
Heat transfer coeff	80.3725	80.2050	80.0408	79.2696	79.1253	78.4536	78.4536	78.3293	78.7124	79.1253	79.4172	79.7224	(39)
Average = Sum(39)m / 12 =													79.2689

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2980	1.2953	1.2926	1.2802	1.2779	1.2670	1.2670	1.2650	1.2712	1.2779	1.2826	1.2875	(40)
HLP (average)													1.2802
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

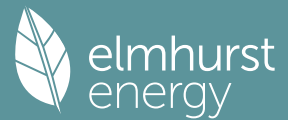
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0354	(42)
Hot water usage for mixer showers														
58.3460	57.4692	56.1915	53.7468	51.9427	49.9308	48.7872	50.0552	51.4453	53.6054	56.1026	58.1225	58.1225	(42a)	
Hot water usage for baths														
25.2139	24.8395	24.3121	23.3398	22.6118	21.8045	21.3685	21.8921	22.4623	23.3261	24.3184	25.1287	25.1287	(42b)	
Hot water usage for other uses														
35.4742	34.1842	32.8943	31.6043	30.3143	29.0243	29.0243	30.3143	31.6043	32.8943	34.1842	35.4742	35.4742	(42c)	
Average daily hot water use (litres/day)													109.4196	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use														
119.0341	116.4929	113.3979	108.6909	104.8688	100.7597	99.1800	102.2617	105.5118	109.8258	114.6052	118.7253	118.7253	(44)	
Energy content (annual)	188.5209	165.8843	174.2883	148.7925	141.1736	123.8958	119.9497	126.6213	130.1066	149.0325	163.2761	185.8952	(45)	
Distribution loss (46)m = 0.15 x (45)m														
28.2781	24.8826	26.1432	22.3189	21.1760	18.5844	17.9924	18.9932	19.5160	22.3549	24.4914	27.8843	27.8843	(46)	
Water storage loss (or HIU loss):														
Store volume													150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):													1.3938	(48)
Temperature factor from Table 2b													0.5400	(49)
Enter (49) or (54) in (55)													0.7527	(55)
Total storage loss														
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	(56)	
If cylinder contains dedicated solar storage														
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	(57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	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														
235.1158	207.9700	220.8832	193.8843	187.7685	168.9876	166.5446	173.2162	175.1984	195.6274	208.3680	232.4901	232.4901	(62)	
WWHRS	-26.6734	-23.5901	-24.7022	-20.4544	-19.0628	-16.3122	-15.2901	-16.2594	-16.8772	-19.8963	-22.5401	-26.1794	(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														
208.4425	184.3799	196.1810	173.4299	168.7057	152.6754	151.2545	156.9568	158.3212	175.7311	185.8278	206.3107	206.3107	(64)	
12Total per year (kWh/year)													2118.2165	(64)
Electric shower(s)													2118	(64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000	(64a)
Heat gains from water heating, kWh/month														
99.9591	88.8251	95.2268	85.5470	84.2161	77.2688	77.1592	79.3775	79.3339	86.8292	90.3628	99.0861	99.0861	(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	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684 (66)

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Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	89.7006	99.3114	89.7006	92.6907	89.7006	92.6907	89.7006	89.7006	92.6907	89.7006	92.6907	89.7006 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.7619	179.6066	174.9582	165.0624	152.5707	140.8302	132.9869	131.1423	135.7907	145.6865	158.1782	169.9186 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768 (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)	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147 (71)
Water heating gains (Table 5)	134.3537	132.1802	127.9930	118.8152	113.1937	107.3178	103.7086	106.6902	110.1860	116.7060	125.5039	133.1802 (72)
Total internal gains	458.3468	467.6287	449.1823	433.0988	411.9956	394.3692	379.9267	381.0637	392.1978	408.6236	432.9032	449.3300 (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					1.8400	10.6334	0.6300	0.7000			0.7700			5.9795 (74)
East					5.0400	19.6403	0.6300	0.7000			0.7700			30.2517 (76)
West					6.7000	19.6403	0.6300	0.7000			0.7700			40.2155 (80)

Solar gains	76.4467	149.2759	246.4348	362.2806	447.7797	460.3506	437.4444	373.0030	287.3766	177.1717	95.2408			62.9336 (83)
Total gains	534.7935	616.9046	695.6171	795.3794	859.7753	854.7199	817.3711	754.0667	679.5745	585.7953	528.1440			512.2636 (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	25.7916	25.8454	25.8985	26.1504	26.1981	26.4224	26.4224	26.4644	26.3355	26.1981	26.1018	26.0019
alpha	2.7194	2.7230	2.7266	2.7434	2.7465	2.7615	2.7615	2.7643	2.7557	2.7465	2.7401	2.7335
util living area	0.9491	0.9254	0.8835	0.7972	0.6738	0.5230	0.3988	0.4433	0.6471	0.8427	0.9261	0.9541 (86)
MIT	18.6600	18.9786	19.4668	20.0839	20.5585	20.8440	20.9457	20.9263	20.7080	20.0714	19.2686	18.6080 (87)
Th 2	19.8424	19.8445	19.8466	19.8564	19.8582	19.8668	19.8668	19.8683	19.8635	19.8582	19.8545	19.8506 (88)
util rest of house	0.9405	0.9131	0.8643	0.7642	0.6214	0.4475	0.3047	0.3463	0.5742	0.8089	0.9119	0.9464 (89)
MIT 2	17.1580	17.5572	18.1637	18.9137	19.4557	19.7554	19.8405	19.8300	19.6335	18.9219	17.9345	17.0976 (90)
Living area fraction	fLA = Living area / (4) = 0.4441 (91)											
MIT	17.8251	18.1885	18.7424	19.4334	19.9455	20.2389	20.3313	20.3169	20.1107	19.4324	18.5270	17.7684 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.8251	18.1885	18.7424	19.4334	19.9455	20.2389	20.3313	20.3169	20.1107	19.4324	18.5270	17.7684 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9205	0.8907	0.8419	0.7504	0.6257	0.4734	0.3444	0.3861	0.5913	0.7940	0.8907	0.9273 (94)
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	1087.0465	1065.8047	979.8919	834.9792	652.4272	442.3910	292.7350	306.8044	473.1166	698.8679	907.5010	1081.7016 (97)
Space heating kWh	442.5064	346.9744	293.3049	171.4490	85.1307	0.0000	0.0000	0.0000	0.0000	173.8913	314.6898	451.3695 (98a)
Space heating requirement - total per year (kWh/year)	2279.3161											
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	442.5064	346.9744	293.3049	171.4490	85.1307	0.0000	0.0000	0.0000	0.0000	173.8913	314.6898	451.3695 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2279.3161											
Space heating per m2	(98c) / (4) = 36.8107 (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)											
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
442.5064	346.9744	293.3049	171.4490	85.1307	0.0000	0.0000	0.0000	0.0000	0.0000	173.8913	314.6898	451.3695 (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)	479.4219	375.9203	317.7735	185.7519	92.2326	0.0000	0.0000	0.0000	0.0000	188.3980	340.9423	489.0244 (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	208.4425	184.3799	196.1810	173.4299	168.7057	152.6754	151.2545	156.9568	158.3212	175.7311	185.8278	206.3107 (64)
Efficiency of water heater (217)m	85.7048	85.4557	84.9597	84.0340	82.6079	79.8000	79.8000	79.8000	79.8000	84.0362	85.2311	79.8000 (216)
Fuel for water heating, kWh/month	243.2097	215.7608	230.9107	206.3805	204.2246	191.3226	189.5420	196.6877	198.3975	209.1136	218.0281	240.5515 (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)

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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	18.6380	14.9521	13.4627	9.8634	7.6187	6.2246	6.9501	9.0340	11.7342	15.3960	17.3897	19.1560	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-13.7800	-20.6981	-31.6771	-38.0026	-43.1088	-41.0319	-40.5403	-37.2092	-31.7193	-24.6976	-15.5964	-11.7707	(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	-4.3526	-9.4080	-19.1765	-29.5153	-39.7321	-40.1741	-39.6942	-33.2778	-23.9664	-13.6764	-5.8819	-3.4230	(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												2469.4649	(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												2544.1295	(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)												150.4195	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-612.1102	(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												4637.9038	(238)

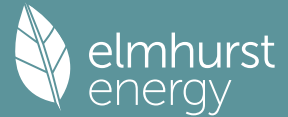
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2469.4649	0.2100	518.5876	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2544.1295	0.2100	534.2672	(264)
Space and water heating			1052.8548	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	150.4195	0.1443	21.7102	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-349.8321	0.1333	-46.6227	
PV Unit electricity exported	-262.2781	0.1252	-32.8349	
Total			-79.4577	(269)
Total CO2, kg/year			1007.0366	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.2600	(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	2469.4649	1.1300	2790.4954	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2544.1295	1.1300	2874.8664	(278)
Space and water heating			5665.3617	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	150.4195	1.5338	230.7185	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-349.8321	1.4925	-522.1155	
PV Unit electricity exported	-262.2781	0.4595	-120.5180	
Total			-642.6335	(283)
Total Primary energy kWh/year			5383.5475	(286)
Target Primary Energy Rate (TPER)			86.9400	(287)

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Plot Reference	B2 2B3P Top				Issued on Date	19/12/2025	
Assessment Reference	2B3P			Plot Type Ref	2B3P		
Plot Address					SAP Version	10.2	
SAP Rating	75 C		DER	5.56		TER	16.26
Environmental	96 A		% DER < TER				65.81
CO ₂ Emissions (t/year)	0.3		DFEE	45.18		TFEE	44.96
Compliance Check	See BREL		% DFEE < TFEE				-0.50
% DPER < TPER	33.36		DPER	57.94		TPER	86.94
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	61.9200 (1b)	2.5000 (2b)	154.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.9200		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	154.8000 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1292 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2792 (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) = 0.2373 (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)
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	0.3026	0.2966	0.2907	0.2611	0.2551	0.2255	0.2255	0.2195	0.2373	0.2551	0.2670	0.2788 (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	0.5458	0.5440	0.5423	0.5341	0.5325	0.5254	0.5254	0.5241	0.5282	0.5325	0.5356	0.5389 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			17.0900	0.9615	16.4327		(27)
External Wall	60.1000	18.9800	41.1200	0.1600	6.5792	14.0000	575.6800 (29a)
Roof	61.9200		61.9200	0.1300	8.0496	9.0000	557.2800 (30)
Total net area of external elements Aum(A, m ²)			122.0200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.9515		(33)
Main dwelling							
Party Wall			23.8000	0.0000	0.0000	20.0000	476.0000 (32)
Party Floor			61.9200			80.0000	4953.6000 (32d)
Stud			100.0000			9.0000	900.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	7462.5600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							120.5194 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				8.1500	0.0500	0.4075	
E4 Jamb				21.2000	0.0500	1.0600	
E7 Party floor between dwellings (in blocks of flats)				16.7800	0.0700	1.1746	

elmhurst
energy

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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	26.2182	26.2484	26.2780	26.4180	26.4444	26.5678	26.5678	26.5907	26.5201	26.4444	26.3911	26.3356
alpha	2.7479	2.7499	2.7519	2.7612	2.7630	2.7712	2.7712	2.7727	2.7680	2.7630	2.7594	2.7557
util living area	0.9694	0.9533	0.9245	0.8589	0.7548	0.6091	0.4769	0.5265	0.7299	0.8953	0.9545	0.9729 (86)
MIT	18.4379	18.7399	19.2202	19.8641	20.4079	20.7722	20.9160	20.8874	20.6016	19.8773	19.0475	18.3799 (87)
Th 2	19.8590	19.8601	19.8613	19.8666	19.8676	19.8722	19.8722	19.8731	19.8704	19.8676	19.8656	19.8635 (88)
util rest of house	0.9640	0.9451	0.9108	0.8324	0.7069	0.5305	0.3704	0.4192	0.6609	0.8697	0.9451	0.9681 (89)
MIT 2	17.5449	17.8426	18.3136	18.9345	19.4335	19.7405	19.8391	19.8252	19.6155	18.9623	18.1539	17.4906 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	17.9415	18.2411	18.7163	19.3474	19.8663	20.1987	20.3174	20.2970	20.0534	19.3686	18.5508	17.8856 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.9415	18.2411	18.7163	19.3474	19.8663	20.1987	20.3174	20.2970	20.0534	19.3686	18.5508	17.8856 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9516	0.9298	0.8935	0.8183	0.7069	0.5547	0.4143	0.4617	0.6733	0.8560	0.9307	0.9565 (94)
Useful gains	404.5997	459.0759	496.2896	521.9997	486.8243	381.5650	272.4755	279.6558	367.8188	400.1577	391.3822	388.5230 (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	1078.5604	1053.5975	963.6783	819.7703	640.1409	436.8357	290.0466	303.7963	465.3488	687.3603	899.4215	1077.2216 (97)
Space heating kWh	501.4268	399.5185	347.7372	214.3948	114.0675	0.0000	0.0000	0.0000	0.0000	213.6787	365.7883	512.3918 (98a)
Space heating requirement - total per year (kWh/year)	2669.0036											
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	501.4268	399.5185	347.7372	214.3948	114.0675	0.0000	0.0000	0.0000	0.0000	213.6787	365.7883	512.3918 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2669.0036											
Space heating per m2	(98c) / (4) = 43.1041 (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	733.4291	577.3803	592.4727	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7529	0.8172	0.7825	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	552.1953	471.8210	463.6050	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	770.9779	737.4718	678.3449	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000							
						157.5235	197.6442	159.7665	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											
Intermittency factor (Table 10b)												1.0000 (105)
	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	39.3809	49.4110	39.9416	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	128.7336 (107)											
Energy for space heating	43.1041 (99)											
Energy for space cooling	2.0790 (108)											
Total	45.1831 (109)											
Fabric Energy Efficiency (DFEE)	45.2 (109)											

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

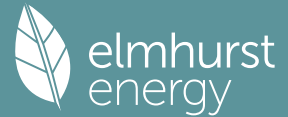
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	61.9200 (1b)	x 2.5000 (2b)	= 154.8000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	154.8000 (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	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	

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Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 20.0000 / (5) = 0.1292 (8)
 Pressure test Yes
 Pressure Test Method Blower Door
 Measured/design AP50 5.0000 (17)
 Infiltration rate 0.3792 (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) = 0.3223 (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	0.4110	0.4029	0.3948	0.3546	0.3465	0.3062	0.3062	0.2981	0.3223	0.3465	0.3626	0.3787	(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	0.5844	0.5812	0.5779	0.5629	0.5600	0.5469	0.5469	0.5444	0.5519	0.5600	0.5657	0.5717	(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	
Main dwelling								
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type			13.5800	1.1450	15.5496			(27)
External Wall	60.1000	15.4700	44.6300	0.1800	8.0334			(29a)
Roof	61.9200		61.9200	0.1100	6.8112			(30)
Total net area of external elements Aum(A, m2)			122.0200					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 32.2842			(33)
Main dwelling								
Party Wall			23.8000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 120.5194 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	8.1500	0.0500	0.4075	
E4 Jamb	21.2000	0.0500	1.0600	
E7 Party floor between dwellings (in blocks of flats)	16.7800	0.0700	1.1746	
E16 Corner (normal)	7.5000	0.0900	0.6750	
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.2600	0.0200	0.1452	
E18 Party wall between dwellings	2.5000	0.0600	0.1500	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.5200	0.0000	0.0000	
E3 Sill	1.8100	0.0500	0.0905	
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500	
E15 Flat roof with parapet	24.0400	0.5600	13.4624	
P4 Party wall - Roof (insulation at ceiling level)	9.5200	0.1200	1.1424	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 18.2326 (36)

Point Thermal bridges

Total fabric heat loss (33) + (36) + (36a) = 50.5168 (37)

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

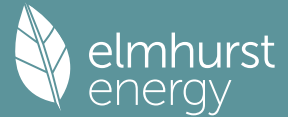
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.8557	29.6882	29.5240	28.7528	28.6085	27.9368	27.9368	27.8124	28.1955	28.6085	28.9004	29.2056	(38)
Heat transfer coeff	80.3725	80.2050	80.0408	79.2696	79.1253	78.4536	78.4536	78.3293	78.7124	79.1253	79.4172	79.7224	(39)
Average = Sum(39)m / 12 =												79.2689	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2980	1.2953	1.2926	1.2802	1.2779	1.2670	1.2670	1.2650	1.2712	1.2779	1.2826	1.2875	(40)
HLP (average)												1.2802	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0354 (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	0.0000	(42a)
Hot water usage for baths													
25.2139	24.8395	24.3121	23.3398	22.6118	21.8045	21.3685	21.8921	22.4623	23.3261	24.3184	25.1287	25.1287	(42b)
Hot water usage for other uses													
35.4742	34.1842	32.8943	31.6043	30.3143	29.0243	29.0243	30.3143	31.6043	32.8943	34.1842	35.4742	35.4742	(42c)
Average daily hot water use (litres/day)												55.6265	(43)
Daily hot water use													
60.6881	59.0237	57.2064	54.9441	52.9261	50.8289	50.3928	52.2064	54.0665	56.2203	58.5026	60.6029	60.6029	(44)
Energy conte	96.1151	84.0489	87.9241	75.2158	71.2487	62.5000	60.9458	64.6425	66.6695	76.2905	83.3477	94.8895	(45)
Energy content (annual)												923.8380	
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	0.0000	(46)
Water storage loss (or HIU 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	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	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													
81.6979	71.4416	74.7355	63.9334	60.5614	53.1250	51.8039	54.9461	56.6690	64.8469	70.8455	80.6560	80.6560	(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													
81.6979	71.4416	74.7355	63.9334	60.5614	53.1250	51.8039	54.9461	56.6690	64.8469	70.8455	80.6560	80.6560	(64)
Total per year (kWh/year)												785.2623	(64)
Electric shower(s)												785	(64)
46.7254	41.6327	45.4614	43.3832	44.1973	42.1599	43.5652	44.1973	43.3832	45.4614	44.6065	46.7254	46.7254	(64a)
Total Energy used by instantaneous electric shower (s) (kWh/year) = Sum(64a)m =												531.4990	(64a)
Heat gains from water heating, kWh/month													
32.1058	28.2686	30.0492	26.8292	26.1897	23.8212	23.8423	24.7858	25.0131	27.5771	28.8630	31.8454	31.8454	(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	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	89.7006	99.3114	89.7006	92.6907	89.7006	92.6907	89.7006	89.7006	92.6907	89.7006	92.6907	89.7006 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.7619	179.6066	174.9582	165.0624	152.5707	140.8302	132.9869	131.1423	135.7907	145.6865	158.1782	169.9186 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768 (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)	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147 (71)
Water heating gains (Table 5)	43.1530	42.0663	40.3887	37.2627	35.2012	33.0851	32.0461	33.3143	34.7404	37.0659	40.0875	42.8029 (72)
Total internal gains	364.1461	374.5148	358.5781	348.5463	331.0030	320.1365	308.2642	307.6878	316.7522	325.9836	344.4869	355.9527 (73)

6. Solar gains

[Jan]	Area m ²		Solar flux Table 6a W/m ²		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
North	1.8400		10.6334		0.6300		0.7000		0.7700		5.9795 (74)	
East	5.0400		19.6403		0.6300		0.7000		0.7700		30.2517 (76)	
West	6.7000		19.6403		0.6300		0.7000		0.7700		40.2155 (80)	
Solar gains	76.4467	149.2759	246.4348	362.2806	447.7797	460.3506	437.4444	373.0030	287.3766	177.1717	95.2408	62.9336 (83)
Total gains	440.5928	523.7907	605.0128	710.8269	778.7827	780.4871	745.7086	680.6908	604.1288	503.1553	439.7277	418.8863 (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	25.7916	25.8454	25.8985	26.1504	26.1981	26.4224	26.4224	26.4644	26.3355	26.1981	26.1018	26.0019
alpha	2.7194	2.7230	2.7266	2.7434	2.7465	2.7615	2.7615	2.7643	2.7557	2.7465	2.7401	2.7335
util living area	0.9670	0.9472	0.9111	0.8312	0.7120	0.5595	0.4315	0.4821	0.6936	0.8805	0.9501	0.9710 (86)
MIT	18.4315	18.7690	19.2890	19.9620	20.4884	20.8149	20.9338	20.9090	20.6493	19.9286	19.0677	18.3773 (87)
Th 2	19.8424	19.8445	19.8466	19.8564	19.8582	19.8668	19.8668	19.8683	19.8635	19.8582	19.8545	19.8506 (88)
util rest of house	0.9611	0.9381	0.8954	0.8014	0.6611	0.4821	0.3317	0.3796	0.6220	0.8522	0.9398	0.9658 (89)
MIT 2	17.5275	17.8601	18.3681	19.0141	19.4898	19.7622	19.8414	19.8307	19.6434	19.0015	18.1657	17.4795 (90)
Living area fraction	17.9290	18.2638	18.7771	19.4351	19.9333	20.2297	20.3266	20.3096	20.0901	19.4133	18.5663	17.8782 (92)
MIT	17.9290	18.2638	18.7771	19.4351	19.9333	20.2297	20.3266	20.3096	20.0901	19.4133	18.5663	17.8782 (93)
Temperature adjustment												0.0000
adjusted MIT	17.9290	18.2638	18.7771	19.4351	19.9333	20.2297	20.3266	20.3096	20.0901	19.4133	18.5663	17.8782 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9480	0.9218	0.8775	0.7888	0.6648	0.5081	0.3736	0.4213	0.6376	0.8390	0.9247	0.9536 (94)
Useful gains	417.6906	482.8304	530.8896	560.7146	517.7089	396.5760	278.5629	286.7528	385.1996	422.1325	406.6159	399.4700 (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	1095.3975	1071.8408	982.6674	835.1122	651.4629	441.6726	292.3619	306.2336	471.4985	697.3520	910.6203	1090.4620 (97)
Space heating kWh	504.2139	395.8150	336.1226	197.5662	99.5130	0.0000	0.0000	0.0000	0.0000	204.7633	362.8831	514.0981 (98a)
Space heating requirement - total per year (kWh/year)												2614.9752
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	504.2139	395.8150	336.1226	197.5662	99.5130	0.0000	0.0000	0.0000	0.0000	204.7633	362.8831	514.0981 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2614.9752
Space heating per m ²												(98c) / (4) = 42.2315 (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	737.4643	580.5570	595.3024	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7949	0.8518	0.8189	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	586.2212	494.4988	487.4848	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	879.1550	840.2681	766.0049	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	210.9124	257.2524	207.2190	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	52.7281	64.3131	51.8047	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												168.8459 (107)
Energy for space heating												42.2315 (99)
Energy for space cooling												2.7268 (108)
Total												44.9584 (109)
Fabric Energy Efficiency (TFEE)												45.0 (109)

Full SAP Calculation Printout



Plot Reference	B2 2B3P Top				Issued on Date	19/12/2025	
Assessment Reference	2B3P			Plot Type Ref	2B3P		
Plot Address					SAP Version	10.2	
SAP Rating	75 C		DER	5.56		TER	16.26
Environmental	96 A		% DER < TER				65.81
CO ₂ Emissions (t/year)	0.3		DFEE	45.18		TFEE	44.96
Compliance Check	See BREL		% DFEE < TFEE				-0.50
% DPER < TPER	33.36		DPER	57.94		TPER	86.94
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	61.9200 (1b)	2.5000 (2b)	154.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	154.8000 (5)

2. Ventilation rate

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

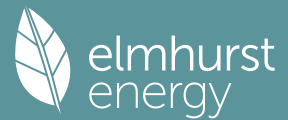
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000 (23c)
Effective ac	0.3026	0.2994	0.2962	0.2802	0.2771	0.2611	0.2611	0.2579	0.2675	0.2771	0.2834	0.2898 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			17.0900	0.9615	16.4327		(27)
External Wall	60.1000	18.9800	41.1200	0.1600	6.5792	14.0000	575.6800 (29a)
Roof	61.9200		61.9200	0.1300	8.0496	9.0000	557.2800 (30)
Total net area of external elements Aum(A, m ²)			122.0200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	32.9515	(33)
Main dwelling							
Party Wall			23.8000	0.0000	0.0000	20.0000	476.0000 (32)
Party Floor			61.9200			80.0000	4953.6000 (32d)
Stud			100.0000			9.0000	900.0000 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) =
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							7462.5600 (34)
List of Thermal Bridges							120.5194 (35)
K1 Element				Length	Psi-value	Total	

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E2 Other lintels (including other steel lintels)	8.1500	0.0500	0.4075
E4 Jamb	21.2000	0.0500	1.0600
E7 Party floor between dwellings (in blocks of flats)	16.7800	0.0700	1.1746
E16 Corner (normal)	7.5000	0.0900	0.6750
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.2600	0.0200	0.1452
E18 Party wall between dwellings	2.5000	0.0600	0.1500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.5200	0.0000	0.0000
E3 Sill	1.8100	0.0500	0.0905
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
E15 Flat roof with parapet	24.0400	0.5600	13.4624
P4 Party wall - Roof (insulation at ceiling level)	9.5200	0.1200	1.1424
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			18.2326 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	51.1841 (37)

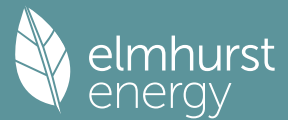
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	15.4561	15.2933	15.1304	14.3163	14.1535	13.3393	13.3393	13.1765	13.6650	14.1535	14.4791	14.8048 (38)
Average = Sum(39)m / 12 =	66.6402	66.4774	66.3145	65.5004	65.3376	64.5234	64.5234	64.3606	64.8491	65.3376	65.6632	65.9889 (39)
	66.6402	66.4774	66.3145	65.5004	65.3376	64.5234	64.5234	64.3606	64.8491	65.3376	65.6632	65.4597
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0762	1.0736	1.0710	1.0578	1.0552	1.0420	1.0420	1.0394	1.0473	1.0552	1.0605	1.0657 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.0354 (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	25.2139	24.8395	24.3121	23.3398	22.6118	21.8045	21.3685	21.8921	22.4623	23.3261	24.3184	25.1287 (42b)
Hot water usage for other uses	35.4742	34.1842	32.8943	31.6043	30.3143	29.0243	29.0243	30.3143	31.6043	32.8943	34.1842	35.4742 (42c)
Average daily hot water use (litres/day)												55.6265 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	60.6881	59.0237	57.2064	54.9441	52.9261	50.8289	50.3928	52.2064	54.0665	56.2203	58.5026	60.6029 (44)
Energy content (annual)	96.1151	84.0489	87.9241	75.2158	71.2487	62.5000	60.9458	64.6425	66.6695	76.2905	83.3477	94.8895 (45)
Distribution loss (46)m = 0.15 x (45)m	14.4173	12.6073	13.1886	11.2824	10.6873	9.3750	9.1419	9.6964	10.0004	11.4436	12.5022	14.2334 (46)
Water storage loss (or HIU loss):												110.0000 (47)
Store volume												
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	151.3919	133.9764	143.2009	128.7095	126.5255	115.9937	116.2226	119.9193	120.1631	131.5673	136.8414	150.1663 (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	151.3919	133.9764	143.2009	128.7095	126.5255	115.9937	116.2226	119.9193	120.1631	131.5673	136.8414	150.1663 (64)
12Total per year (kWh/year)												1574.6778 (64)
Electric shower(s)	46.7254	41.6327	45.4614	43.3832	44.1973	42.1599	43.5652	44.1973	43.3832	45.4614	44.6065	46.7254 (64a)
Heat gains from water heating, kWh/month	87.8611	78.2964	84.8215	78.6500	78.9610	74.1162	75.3772	76.7644	75.8083	80.9534	81.6597	87.4535 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684	101.7684 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	89.6605	99.2670	89.6605	92.6492	89.6605	92.6492	89.6605	89.6605	92.6492	89.6605	92.6492	89.6605 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	177.7619	179.6066	174.9582	165.0624	152.5707	140.8302	132.9869	131.1423	135.7907	145.6865	158.1782	169.9186 (68)
Pumps, fans	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147 (71)
Total internal gains	118.0929	116.5125	114.0074	109.2361	106.1303	102.9391	101.3135	103.1779	105.2894	108.8083	113.4162	117.5451 (72)
	439.0458	448.9165	432.1566	420.4781	401.8920	389.9491	377.4914	377.5112	387.2597	397.6858	417.7741	430.6547 (73)

6. Solar gains												
[Jan]			Area	Solar flux	g	FF	Access	Gains				
			m2	Table 6a	Specific data	Specific data	factor	W				
				W/m2	or Table 6b	or Table 6c	Table 6d					
North			2.3200	10.6334	0.4000	0.7000	0.7700	4.7869 (74)				

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East	6.3400		19.6403		0.4000		0.7000		0.7700		24.1617 (76)	
West	8.4300		19.6403		0.4000		0.7000		0.7700		32.1267 (80)	
Solar gains	61.0753	119.2600	196.8835	289.4406	357.7554	367.8022	349.4996	298.0093	229.5943	141.5467	76.0903	50.2794 (83)
Total gains	500.1211	568.1766	629.0402	709.9188	759.6474	757.7512	726.9910	675.5205	616.8540	539.2325	493.8643	480.9341 (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	31.1064	31.1825	31.2591	31.6477	31.7265	32.1268	32.1268	32.2081	31.9655	31.7265	31.5692	31.4134
alpha	3.0738	3.0788	3.0839	3.1098	3.1151	3.1418	3.1418	3.1472	3.1310	3.1151	3.1046	3.0942
util living area	0.9510	0.9278	0.8865	0.7966	0.6670	0.5049	0.3779	0.4193	0.6261	0.8364	0.9259	0.9558 (86)
MIT	19.0884	19.3694	19.7864	20.3150	20.6953	20.9079	20.9721	20.9611	20.8147	20.3099	19.6269	19.0469 (87)
Th 2	20.0203	20.0225	20.0246	20.0354	20.0376	20.0484	20.0484	20.0506	20.0441	20.0376	20.0333	20.0289 (88)
util rest of house	0.9434	0.9168	0.8693	0.7668	0.6205	0.4407	0.3009	0.3395	0.5621	0.8051	0.9128	0.9489 (89)
MIT 2	18.2930	18.5683	18.9728	19.4772	19.8160	19.9950	20.0370	20.0337	19.9269	19.4866	18.8321	18.2587 (90)
Living area fraction									fLA = Living area / (4) =			0.4441 (91)
MIT	18.6463	18.9240	19.3341	19.8493	20.2065	20.4005	20.4523	20.4456	20.3212	19.8522	19.1851	18.6088 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6463	18.9240	19.3341	19.8493	20.2065	20.4005	20.4523	20.4456	20.3212	19.8522	19.1851	18.6088 (93)
8. Space heating requirement												
Utilisation	0.9299	0.9020	0.8552	0.7605	0.6291	0.4651	0.3341	0.3734	0.5816	0.7984	0.8989	0.9361 (94)
Useful gains	465.0702	512.4791	537.9326	539.9073	477.9141	352.4408	242.8814	252.2551	358.7712	430.5073	443.9583	450.2041 (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	956.0375	932.2815	851.0883	717.1834	555.7945	374.2665	248.5632	260.3740	403.4358	604.5183	793.5451	950.8186 (97)
Space heating kWh	365.2797	282.1072	232.9878	127.6389	57.9430	0.0000	0.0000	0.0000	0.0000	129.4642	251.7025	372.4573 (98a)
Space heating requirement - total per year (kWh/year)												1819.5804
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	365.2797	282.1072	232.9878	127.6389	57.9430	0.0000	0.0000	0.0000	0.0000	129.4642	251.7025	372.4573 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1819.5804
Space heating per m2										(98c) / (4) =		29.3860 (99)
9b. Energy requirements												
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space and Water												1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500 (305)
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system												1.5000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	365.2797	282.1072	232.9878	127.6389	57.9430	0.0000	0.0000	0.0000	0.0000	129.4642	251.7025	372.4573 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	575.3155	444.3188	366.9558	201.0312	91.2602	0.0000	0.0000	0.0000	0.0000	203.9061	396.4314	586.6202
Space heating requirement	575.3155	444.3188	366.9558	201.0312	91.2602	0.0000	0.0000	0.0000	0.0000	203.9061	396.4314	586.6202 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement	151.3919	133.9764	143.2009	128.7095	126.5255	115.9937	116.2226	119.9193	120.1631	131.5673	136.8414	150.1663 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	227.0879	200.9646	214.8013	193.0642	189.7883	173.9906	174.3338	179.8789	180.2447	197.3509	205.2621	225.2494
Water heating fuel	227.0879	200.9646	214.8013	193.0642	189.7883	173.9906	174.3338	179.8789	180.2447	197.3509	205.2621	225.2494 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	12.3507	11.1554	12.3507	11.9523	12.3507	11.9523	12.3507	12.3507	11.9523	12.3507	11.9523	12.3507 (331)
Lighting	19.0311	15.2675	13.7467	10.0714	7.7794	6.3559	7.0967	9.2245	11.9817	15.7207	17.7565	19.5601 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-12.7420	-21.4952	-37.3947	-49.4010	-58.8998	-57.1836	-56.2866	-50.0082	-39.5215	-27.2354	-15.0133	-10.5109 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												2865.8391 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2362.0166 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												28.6584 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7700)												
mechanical ventilation fans (SFP = 0.7700)												145.4191 (330a)
Total electricity for the above, kWh/year												145.4191 (331)
Electricity for lighting (calculated in Appendix L)												153.5922 (332)

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

PV generation	-435.6920 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	5622.6740 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			280.0000 (367)
Space and Water heating from Heat pump	1867.0913	0.1553	158.9346 (367)
Electrical energy for heat distribution (space & water)	28.6584	0.0000	7.7663 (372)
Overall CO2 factor for heat network			0.0545 (386)
Total CO2 associated with community systems			285.1333 (373)
Energy for instantaneous electric shower(s)	531.4990	0.1391	73.9433 (264a)
Space and water heating			285.1333 (376)
Pumps, fans and electric keep-hot	145.4191	0.1387	20.1714 (378)
Energy for lighting	153.5922	0.1443	22.1681 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-435.6920	0.1315	-57.2933
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-57.2933 (380)
Total CO2, kg/year			344.1227 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.5600 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	1867.0913	1.5749	1611.9204 (467)
Electrical energy for heat distribution (space & water)	28.6584	0.0000	81.0151 (472)
Overall CO2 factor for heat network			0.5690 (486)
Total CO2 associated with community systems			2974.4112 (473)
Energy for instantaneous electric shower(s)	531.4990	1.5143	804.8670 (278a)
Space and water heating			2974.4112 (476)
Pumps, fans and electric keep-hot	145.4191	1.5128	219.9900 (478)
Energy for lighting	153.5922	1.5338	235.5849 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-435.6920	1.4858	-647.3628
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-647.3628 (480)
Total Primary energy kWh/year			3587.4903 (483)
Dwelling Primary energy Rate (DPER)			57.9400 (484)

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

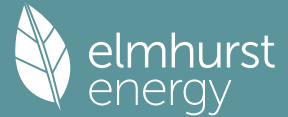
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	61.9200 (1b)	2.5000 (2b)	154.8000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	154.8000 (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	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	(6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 20.0000 / (5) = 0.1292 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3792 (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) = 0.3223 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4110	0.4029	0.3948	0.3546	0.3465	0.3062	0.3062	0.2981	0.3223	0.3465	0.3626	0.3787 (22b)
	0.5844	0.5812	0.5779	0.5629	0.5600	0.5469	0.5469	0.5444	0.5519	0.5600	0.5657	0.5717 (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
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			13.5800	1.1450	15.5496		(27)
External Wall	60.1000	15.4700	44.6300	0.1800	8.0334		(29a)
Roof	61.9200		61.9200	0.1100	6.8112		(30)
Total net area of external elements Aum(A, m2)			122.0200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	32.2842	(33)
Main dwelling							
Party Wall			23.8000	0.0000	0.0000		(32)

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

120.5194 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.1500	0.0500	0.4075
E4 Jamb	21.2000	0.0500	1.0600
E7 Party floor between dwellings (in blocks of flats)	16.7800	0.0700	1.1746
E16 Corner (normal)	7.5000	0.0900	0.6750
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.2600	0.0200	0.1452
E18 Party wall between dwellings	2.5000	0.0600	0.1500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.5200	0.0000	0.0000
E3 Sill	1.8100	0.0500	0.0905
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
E15 Flat roof with parapet	24.0400	0.5600	13.4624
P4 Party wall - Roof (insulation at ceiling level)	9.5200	0.1200	1.1424

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

18.2326 (36)

Point Thermal bridges

(33a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 50.5168 (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	29.8557	29.6882	29.5240	28.7528	28.6085	27.9368	27.9368	27.8124	28.1955	28.6085	28.9004	29.2056 (38)
Heat transfer coeff	80.3725	80.2050	80.0408	79.2696	79.1253	78.4536	78.4536	78.3293	78.7124	79.1253	79.4172	79.7224 (39)
Average = Sum(39)m / 12 =												79.2689

HLP	Jan 1.2980	Feb 1.2953	Mar 1.2926	Apr 1.2802	May 1.2779	Jun 1.2670	Jul 1.2670	Aug 1.2650	Sep 1.2712	Oct 1.2779	Nov 1.2826	Dec 1.2875 (40)
HLP (average)												1.2802
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

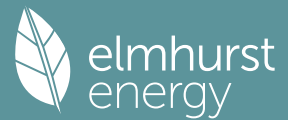
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0354 (42)
Hot water usage for mixer showers	58.3460	57.4692	56.1915	53.7468	51.9427	49.9308	48.7872	50.0552	51.4453	53.6054	56.1026	58.1225 (42a)
Hot water usage for baths	25.2139	24.8395	24.3121	23.3398	22.6118	21.8045	21.3685	21.8921	22.4623	23.3261	24.3184	25.1287 (42b)
Hot water usage for other uses	35.4742	34.1842	32.8943	31.6043	30.3143	29.0243	29.0243	30.3143	31.6043	32.8943	34.1842	35.4742 (42c)
Average daily hot water use (litres/day)												109.4196 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	119.0341	116.4929	113.3979	108.6909	104.8688	100.7597	99.1800	102.2617	105.5118	109.8258	114.6052	118.7253 (44)
Distribution loss (46)m = 0.15 x (45)m	188.5209	165.8843	174.2883	148.7925	141.1736	123.8958	119.9497	126.6213	130.1066	149.0325	163.2761	185.8952 (45)
Store volume										Total = Sum(45)m =		1817.4367
a) If manufacturer declared loss factor is known (kWh/day):	28.2781	24.8826	26.1432	22.3189	21.1760	18.5844	17.9924	18.9932	19.5160	22.3549	24.4914	27.8843 (46)
Temperature factor from Table 2b												150.0000 (47)
Enter (49) or (54) in (55)												1.3938 (48)
Total storage loss												0.5400 (49)
If cylinder contains dedicated solar storage												0.7527 (55)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Combi loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	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)
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 (61)
PV diverter	235.1158	207.9700	220.8832	193.8843	187.7685	168.9876	166.5446	173.2162	175.1984	195.6274	208.3680	232.4901 (62)
Solar input	-26.6734	-23.5901	-24.7022	-20.4544	-19.0628	-16.3122	-15.2901	-16.2594	-16.8772	-19.8963	-22.5401	-26.1794 (63a)
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 (63b)
Output from w/h	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)
12Total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Electric shower(s)	208.4425	184.3799	196.1810	173.4299	168.7057	152.6754	151.2545	156.9568	158.3212	175.7311	185.8278	206.3107 (64)
Heat gains from water heating, kWh/month								Total per year (kWh/year) = Sum(64)m =				2118.2165 (64)
												2118 (64)
	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)
												0.0000 (64a)
	99.9591	88.8251	95.2268	85.5470	84.2161	77.2688	77.1592	79.3775	79.3339	86.8292	90.3628	99.0861 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan 101.7684	Feb 101.7684	Mar 101.7684	Apr 101.7684	May 101.7684	Jun 101.7684	Jul 101.7684	Aug 101.7684	Sep 101.7684	Oct 101.7684	Nov 101.7684	Dec 101.7684 (66)

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Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	89.7006	99.3114	89.7006	92.6907	89.7006	92.6907	89.7006	89.7006	92.6907	89.7006	92.6907	89.7006 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.7619	179.6066	174.9582	165.0624	152.5707	140.8302	132.9869	131.1423	135.7907	145.6865	158.1782	169.9186 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768	33.1768 (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)	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147	-81.4147 (71)
Water heating gains (Table 5)	134.3537	132.1802	127.9930	118.8152	113.1937	107.3178	103.7086	106.6902	110.1860	116.7060	125.5039	133.1802 (72)
Total internal gains	458.3468	467.6287	449.1823	433.0988	411.9956	394.3692	379.9267	381.0637	392.1978	408.6236	432.9032	449.3300 (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					1.8400	10.6334	0.6300	0.7000			0.7700			5.9795 (74)
East					5.0400	19.6403	0.6300	0.7000			0.7700			30.2517 (76)
West					6.7000	19.6403	0.6300	0.7000			0.7700			40.2155 (80)

Solar gains	76.4467	149.2759	246.4348	362.2806	447.7797	460.3506	437.4444	373.0030	287.3766	177.1717	95.2408			62.9336 (83)
Total gains	534.7935	616.9046	695.6171	795.3794	859.7753	854.7199	817.3711	754.0667	679.5745	585.7953	528.1440			512.2636 (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	25.7916	25.8454	25.8985	26.1504	26.1981	26.4224	26.4224	26.4644	26.3355	26.1981	26.1018	26.0019
alpha	2.7194	2.7230	2.7266	2.7434	2.7465	2.7615	2.7615	2.7643	2.7557	2.7465	2.7401	2.7335
util living area	0.9491	0.9254	0.8835	0.7972	0.6738	0.5230	0.3988	0.4433	0.6471	0.8427	0.9261	0.9541 (86)
MIT	18.6600	18.9786	19.4668	20.0839	20.5585	20.8440	20.9457	20.9263	20.7080	20.0714	19.2686	18.6080 (87)
Th 2	19.8424	19.8445	19.8466	19.8564	19.8582	19.8668	19.8668	19.8683	19.8635	19.8582	19.8545	19.8506 (88)
util rest of house	0.9405	0.9131	0.8643	0.7642	0.6214	0.4475	0.3047	0.3463	0.5742	0.8089	0.9119	0.9464 (89)
MIT 2	17.1580	17.5572	18.1637	18.9137	19.4557	19.7554	19.8405	19.8300	19.6335	18.9219	17.9345	17.0976 (90)
Living area fraction	fLA = Living area / (4) = 0.4441 (91)											
MIT	17.8251	18.1885	18.7424	19.4334	19.9455	20.2389	20.3313	20.3169	20.1107	19.4324	18.5270	17.7684 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.8251	18.1885	18.7424	19.4334	19.9455	20.2389	20.3313	20.3169	20.1107	19.4324	18.5270	17.7684 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9205	0.8907	0.8419	0.7504	0.6257	0.4734	0.3444	0.3861	0.5913	0.7940	0.8907	0.9273 (94)
Ext temp.	492.2798	549.4737	585.6648	596.8556	538.0042	404.5917	281.4717	291.1228	401.8339	465.1430	470.4319	475.0222 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Space heating kWh	1087.0465	1065.8047	979.8919	834.9792	652.4272	442.3910	292.7350	306.8044	473.1166	698.8679	907.5010	1081.7016 (97)
Space heating requirement - total per year (kWh/year)	442.5064	346.9744	293.3049	171.4490	85.1307	0.0000	0.0000	0.0000	0.0000	173.8913	314.6898	451.3695 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	442.5064	346.9744	293.3049	171.4490	85.1307	0.0000	0.0000	0.0000	0.0000	173.8913	314.6898	451.3695 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2279.3161											
Space heating per m2	(98c) / (4) = 36.8107 (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)											
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating efficiency (main heating system 1)	442.5064	346.9744	293.3049	171.4490	85.1307	0.0000	0.0000	0.0000	0.0000	173.8913	314.6898	451.3695 (98)
Space heating fuel (main heating system)	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 efficiency (main heating system 2)	479.4219	375.9203	317.7735	185.7519	92.2326	0.0000	0.0000	0.0000	0.0000	188.3980	340.9423	489.0244 (211)
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 (212)
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 (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 requirement	208.4425	184.3799	196.1810	173.4299	168.7057	152.6754	151.2545	156.9568	158.3212	175.7311	185.8278	206.3107 (64)
Efficiency of water heater (217)m	85.7048	85.4557	84.9597	84.0340	82.6079	79.8000	79.8000	79.8000	79.8000	84.0362	85.2311	79.8000 (216)
Fuel for water heating, kWh/month	243.2097	215.7608	230.9107	206.3805	204.2246	191.3226	189.5420	196.6877	198.3975	209.1136	218.0281	240.5515 (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)

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Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	18.6380	14.9521	13.4627	9.8634	7.6187	6.2246	6.9501	9.0340	11.7342	15.3960	17.3897	(232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-13.7800	-20.6981	-31.6771	-38.0026	-43.1088	-41.0319	-40.5403	-37.2092	-31.7193	-24.6976	-15.5964	(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	(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	(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	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-4.3526	-9.4080	-19.1765	-29.5153	-39.7321	-40.1741	-39.6942	-33.2778	-23.9664	-13.6764	-5.8819	(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	(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	(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	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1											2469.4649	(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											2544.1295	(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)											150.4195	(232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation											-612.1102	(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											4637.9038	(238)

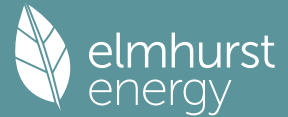
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2469.4649	0.2100	518.5876 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2544.1295	0.2100	534.2672 (264)
Space and water heating			1052.8548 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	150.4195	0.1443	21.7102 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-349.8321	0.1333	-46.6227
PV Unit electricity exported	-262.2781	0.1252	-32.8349
Total			-79.4577 (269)
Total CO2, kg/year			1007.0366 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.2600 (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	2469.4649	1.1300	2790.4954 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2544.1295	1.1300	2874.8664 (278)
Space and water heating			5665.3617 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	150.4195	1.5338	230.7185 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-349.8321	1.4925	-522.1155
PV Unit electricity exported	-262.2781	0.4595	-120.5180
Total			-642.6335 (283)
Total Primary energy kWh/year			5383.5475 (286)
Target Primary Energy Rate (TPER)			86.9400 (287)

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Plot Reference	B2 2B4P Ground				Issued on Date	19/12/2025
Assessment Reference	2B4P	Plot Type Ref	2B4P			
Plot Address					SAP Version	10.2
SAP Rating	76 C	DER	5.18	TER	14.97	
Environmental	96 A	% DER < TER				65.40
CO ₂ Emissions (t/year)	0.31	DFEE	42.54	TFEE	41.49	
Compliance Check	See BREL	% DFEE < TFEE				-2.52
% DPER < TPER	32.42	DPER	53.98	TPER	79.88	
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001
Client	ROK, Wilf Foster					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	68.1700 (1b)	x 2.5000 (2b)	= 170.4250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.1700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.4250 (5)

2. Ventilation rate

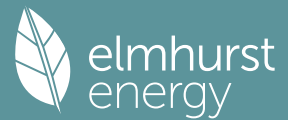
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												71.2000 (23c)
Effective ac	0.3066	0.3034	0.3002	0.2843	0.2811	0.2651	0.2651	0.2619	0.2715	0.2811	0.2874	0.2938 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			18.9900	0.9615	18.2596		(27)
Ground Floor			68.1700	0.1300	8.8621	110.0000	7498.7000 (28a)
External Wall	52.2700	18.9900	33.2800	0.1600	5.3248	14.0000	465.9200 (29a)
Communal Wall	41.5800	1.8900	39.6900	0.2100	8.3349	14.0000	555.6600 (29a)
Total net area of external elements Aum(A, m ²)			162.0200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.6714		(33)
Main dwelling							
Party Ceiling			68.1700			100.0000	6817.0000 (32b)
Stud			115.0000			9.0000	1035.0000 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 16372.2800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							240.1684 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value		Total

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E2 Other lintels (including other steel lintels)						9.0500		0.0500		0.4525		
E4 Jamb						27.5000		0.0500		1.3750		
E5 Ground floor (normal)						37.5400		0.1600		6.0064		
E7 Party floor between dwellings (in blocks of flats)						37.5400		0.0700		2.6278		
E16 Corner (normal)						12.5000		0.0900		1.1250		
E17 Corner (inverted - internal area greater than external area)						2.5000		-0.0900		-0.2250		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											11.3617	(36)
Point Thermal bridges											0.0000	
Total fabric heat loss									(33) + (36) + (36a) =		54.0331	(37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	17.2412	17.0619	16.8826	15.9863	15.8070	14.9107	14.9107	14.7314	15.2692	15.8070	16.1656	16.5241 (38)
Average = Sum(39)m / 12 =	71.2743	71.0950	70.9157	70.0194	69.8401	68.9438	68.9438	68.7645	69.3023	69.8401	70.1987	70.5572 (39)
												69.9746
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0455	1.0429	1.0403	1.0271	1.0245	1.0114	1.0114	1.0087	1.0166	1.0245	1.0298	1.0350 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31
												1.0265
												31

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.2009 (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												
	26.4074	26.0152	25.4629	24.4446	23.6821	22.8366	22.3799	22.9284	23.5255	24.4302	25.4695	26.3181 (42b)
Hot water usage for other uses												
	37.1693	35.8177	34.4661	33.1145	31.7629	30.4113	30.4113	31.7629	33.1145	34.4661	35.8177	37.1693 (42c)
Average daily hot water use (litres/day)												58.2741 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	63.5767	61.8329	59.9290	57.5591	55.4450	53.2479	52.7912	54.6912	56.6400	58.8963	61.2872	63.4874 (44)
Energy conte	100.6899	88.0492	92.1086	78.7955	74.6396	65.4745	63.8464	67.7192	69.8427	79.9217	87.3148	99.4060 (45)
Energy content (annual)										Total = Sum (45)m =		967.8081
Distribution loss (46)m = 0.15 x (45)m												
	15.1035	13.2074	13.8163	11.8193	11.1959	9.8212	9.5770	10.1579	10.4764	11.9883	13.0972	14.9109 (46)
Water storage loss (or HIU loss):												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage												
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	155.9667	137.9767	147.3855	132.2892	129.9164	118.9682	119.1232	122.9960	123.3364	135.1985	140.8085	154.6828 (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												
	155.9667	137.9767	147.3855	132.2892	129.9164	118.9682	119.1232	122.9960	123.3364	135.1985	140.8085	154.6828 (64)
12Total per year (kWh/year)									Total per year (kWh/year) = Sum(64)m =			1618.6479 (64)
Electric shower(s)												1619 (64)
	48.9480	43.6131	47.6238	45.4468	46.2996	44.1653	45.6375	46.2996	45.4468	47.6238	46.7283	48.9480 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												556.7804 (64a)
Heat gains from water heating, kWh/month												
	89.9378	80.1216	86.7535	80.3562	80.6140	75.6065	76.8597	78.3130	77.3794	82.7013	83.5092	89.5109 (65)

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

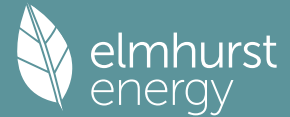
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	97.3407	107.7701	97.3407	100.5854	97.3407	100.5854	97.3407	97.3407	100.5854	97.3407	100.5854	97.3407 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	192.9888	194.9914	189.9449	179.2014	165.6397	152.8936	144.3784	142.3758	147.4223	158.1658	171.7275	184.4736 (68)
Pumps, fans	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356 (71)
Total internal gains	120.8842	119.2285	116.6042	111.6058	108.3522	105.0091	103.3061	105.2594	107.4713	111.1577	115.9850	120.3104 (72)
	467.2270	478.0034	459.9031	447.4059	427.3459	414.5014	401.0385	400.9892	411.4924	422.6776	444.3112	458.1380 (73)

6. Solar gains												

[Jan]				Area	Solar flux		g		FF		Access	Gains
				m2	Table 6a		Specific data		Specific data		factor	W
					W/m2		or Table 6b		or Table 6c		Table 6d	
South				4.2200	46.7521		0.4000		0.7000		0.7700	38.2829 (78)
West				14.7700	19.6403		0.4000		0.7000		0.7700	56.2884 (80)

Solar gains	94.5713	172.8096	261.2044	354.7373	418.1824	422.3168	404.3277	357.2310	294.3336	198.2824	115.5633	79.3688 (83)
Total gains	561.7983	650.8129	721.1075	802.1432	845.5283	836.8182	805.3662	758.2201	705.8260	620.9600	559.8745	537.5068 (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	63.8078	63.9687	64.1304	64.9514	65.1181	65.9647	65.9647	66.1366	65.6234	65.1181	64.7855	64.4563
alpha	5.2539	5.2646	5.2754	5.3301	5.3412	5.3976	5.3976	5.4091	5.3749	5.3412	5.3190	5.2971
util living area	0.9897	0.9773	0.9485	0.8641	0.7146	0.5193	0.3755	0.4150	0.6481	0.9003	0.9771	0.9917 (86)
MIT	19.9500	20.1576	20.4294	20.7440	20.9247	20.9888	20.9984	20.9973	20.9654	20.7219	20.2881	19.9179 (87)
Th 2	20.0456	20.0477	20.0499	20.0608	20.0630	20.0739	20.0739	20.0761	20.0695	20.0630	20.0586	20.0543 (88)
util rest of house	0.9867	0.9708	0.9343	0.8308	0.6580	0.4476	0.2971	0.3328	0.5719	0.8673	0.9695	0.9892 (89)
MIT 2	19.1053	19.3105	19.5740	19.8697	20.0169	20.0692	20.0735	20.0753	20.0528	19.8597	19.4494	19.0806 (90)
Living area fraction									fLA = Living area / (4) =			0.4034 (91)
MIT	19.4461	19.6522	19.9191	20.2224	20.3831	20.4402	20.4466	20.4472	20.4210	20.2075	19.7878	19.4184 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4461	19.6522	19.9191	20.2224	20.3831	20.4402	20.4466	20.4472	20.4210	20.2075	19.7878	19.4184 (93)

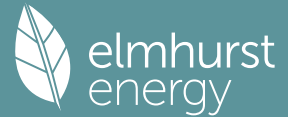
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9842	0.9676	0.9320	0.8370	0.6781	0.4763	0.3287	0.3660	0.6016	0.8730	0.9668	0.9871	(94)
Useful gains	552.9359	629.7254	672.0735	671.4286	573.3546	398.5774	264.7553	277.5270	424.6196	542.1157	541.2866	530.5480	(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	1079.5248	1048.8100	951.6236	792.7870	606.4304	402.6429	265.1984	278.3071	438.0586	670.9890	890.6637	1073.7673	(97)
Space heating kWh	391.7821	281.6248	207.9853	87.3780	24.6084	0.0000	0.0000	0.0000	0.0000	95.8817	251.5515	404.1551	(98a)
Space heating requirement - total per year (kWh/year)												1744.9670	
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	391.7821	281.6248	207.9853	87.3780	24.6084	0.0000	0.0000	0.0000	0.0000	95.8817	251.5515	404.1551	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1744.9670	
Space heating per m2											(98c) / (4) =	25.5973	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (301)
Fraction of space heat from community system													1.0000 (302)
Fraction of heat from community Heat pump-Space and Water													1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating													1.0500 (305)
Factor for charging method (Table 4c(3)) for water heating													1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system													1.5000 (306)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating:													
Space heating requirement	391.7821	281.6248	207.9853	87.3780	24.6084	0.0000	0.0000	0.0000	0.0000	95.8817	251.5515	404.1551 (98)	
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	617.0568	443.5591	327.5768	137.6204	38.7583	0.0000	0.0000	0.0000	0.0000	151.0136	396.1937	636.5443	
Space heating requirement	617.0568	443.5591	327.5768	137.6204	38.7583	0.0000	0.0000	0.0000	0.0000	151.0136	396.1937	636.5443 (307)	
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)													0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)	
Water heating													
Annual water heating requirement	155.9667	137.9767	147.3855	132.2892	129.9164	118.9682	119.1232	122.9960	123.3364	135.1985	140.8085	154.6828 (64)	
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	233.9501	206.9650	221.0782	198.4338	194.8746	178.4522	178.6848	184.4939	185.0046	202.7977	211.2127	232.0241	
Water heating fuel	233.9501	206.9650	221.0782	198.4338	194.8746	178.4522	178.6848	184.4939	185.0046	202.7977	211.2127	232.0241 (310)	
Cooling System Energy Efficiency Ratio													0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)	
Pumps and Fa	16.0695	14.5144	16.0695	15.5512	16.0695	15.5512	16.0695	16.0695	15.5512	16.0695	15.5512	16.0695 (331)	
Lighting	21.4240	17.1872	15.4751	11.3377	8.7576	7.1550	7.9890	10.3844	13.4883	17.6973	19.9891	22.0195 (332)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-12.8678	-21.8040	-38.1267	-50.6492	-60.6454	-58.9698	-58.0281	-51.4153	-40.4532	-27.7042	-15.1885	-10.6054 (333a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)	
Annual totals kWh/year													
Space heating fuel - community heating													2748.3230 (307)
Space heating fuel - secondary													0.0000 (309)
Water heating fuel - community heating													2427.9718 (310)
Efficiency of water heater													0.0000 (311)
Electricity used for heat distribution													27.4832 (313)
Space cooling fuel													0.0000 (321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9100)													
mechanical ventilation fans (SFP = 0.9100)													189.2058 (330a)
Total electricity for the above, kWh/year													189.2058 (331)
Electricity for lighting (calculated in Appendix L)													172.9042 (332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-446.4576 (333)
Wind generation													0.0000 (334)
Hydro-electric generation (Appendix N)													0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (335)
Appendix Q - special features													

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Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	5648.7277 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			280.0000 (367)
Space and Water heating from Heat pump	1848.6767	0.1567	153.7802 (367)
Electrical energy for heat distribution (space & water)	27.4832	0.0000	7.7153 (372)
Overall CO2 factor for heat network			0.0547 (386)
Total CO2 associated with community systems			283.2628 (373)
Energy for instantaneous electric shower(s)	556.7804	0.1391	77.4605 (264a)
Space and water heating			283.2628 (376)
Pumps, fans and electric keep-hot	189.2058	0.1387	26.2452 (378)
Energy for lighting	172.9042	0.1443	24.9554 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-446.4576	0.1314	-58.6687
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-58.6687 (380)
Total CO2, kg/year			353.2552 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.1800 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	1848.6767	1.5800	1550.8426 (467)
Electrical energy for heat distribution (space & water)	27.4832	0.0000	80.3098 (472)
Overall CO2 factor for heat network			0.5696 (486)
Total CO2 associated with community systems			2948.5155 (473)
Energy for instantaneous electric shower(s)	556.7804	1.5143	843.1516 (278a)
Space and water heating			2948.5155 (476)
Pumps, fans and electric keep-hot	189.2058	1.5128	286.2306 (478)
Energy for lighting	172.9042	1.5338	265.2062 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-446.4576	1.4855	-663.2071
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-663.2071 (480)
Total Primary energy kWh/year			3679.8969 (483)
Dwelling Primary energy Rate (DPER)			53.9800 (484)

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

1. Overall dwelling characteristics

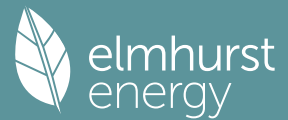
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	68.1700 (1b)	x 2.5000 (2b)	= 170.4250 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.1700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.4250 (5)

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	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 20.0000 / (5) = 0.1174 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3674 (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) = 0.3123 (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	0.3981	0.3903	0.3825	0.3435	0.3357	0.2966	0.2966	0.2888	0.3123	0.3357	0.3513	0.3669 (22b)
Effective ac	0.5792	0.5762	0.5732	0.5590	0.5563	0.5440	0.5440	0.5417	0.5488	0.5563	0.5617	0.5673 (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
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			15.1600	1.1450	17.3588		(27)
Ground Floor			68.1700	0.1300	8.8621		(28a)
External Wall	52.2700	15.1600	37.1100	0.1800	6.6798		(29a)
Communal Wall	41.5800	1.8900	39.6900	0.1800	7.1442		(29a)
Total net area of external elements Aum(A, m2)			162.0200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.9349		(33)

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

240.1684 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.0500	0.0500	0.4525
E4 Jamb	27.5000	0.0500	1.3750
E5 Ground floor (normal)	37.5400	0.1600	6.0064
E7 Party floor between dwellings (in blocks of flats)	37.5400	0.0700	2.6278
E16 Corner (normal)	12.5000	0.0900	1.1250
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.3617 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	53.2966 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	32.5771	32.4041	32.2344	31.4376	31.2885	30.5945	30.5945	30.4660	30.8618	31.2885	31.5901	31.9054 (38)
Average = Sum(39)m / 12 =	85.8737	85.7006	85.5310	84.7342	84.5851	83.8911	83.8911	83.7626	84.1584	84.5851	84.8867	85.2020 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2597	1.2572	1.2547	1.2430	1.2408	1.2306	1.2306	1.2287	1.2345	1.2408	1.2452	1.2498 (40)
HLP (average)												1.2430
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

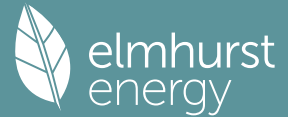
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2009 (42)
Hot water usage for mixer showers													
61.1213	60.2028	58.8643	56.3033	54.4134	52.3058	51.1078	52.4362	53.8923	56.1553	58.7712	60.8871	60.8871 (42a)	
Hot water usage for baths													
26.4074	26.0152	25.4629	24.4446	23.6821	22.8366	22.3799	22.9284	23.5255	24.4302	25.4695	26.3181	26.3181 (42b)	
Hot water usage for other uses													
37.1693	35.8177	34.4661	33.1145	31.7629	30.4113	30.4113	31.7629	33.1145	34.4661	35.8177	37.1693	37.1693 (42c)	
Average daily hot water use (litres/day)													114.6259 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
124.6980	122.0357	118.7933	113.8624	109.8584	105.5537	103.8990	107.1274	110.5323	115.0515	120.0584	124.3745	124.3745 (44)	
Energy content (annual)	197.4912	173.7772	182.5809	155.8720	147.8905	129.7906	125.6569	132.6461	136.2973	156.1238	171.0452	194.7405	194.7405 (45)
Distribution loss (46)m = 0.15 x (45)m													
29.6237	26.0666	27.3871	23.3808	22.1836	19.4686	18.8485	19.8969	20.4446	23.4186	25.6568	29.2111	29.2111 (46)	
Water storage loss (or HIU loss):													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.3938 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.7527 (55)
Total storage loss													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325 (56)	
If cylinder contains dedicated solar storage													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325 (57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	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													
244.0861	215.8629	229.1758	200.9638	194.4854	174.8824	172.2518	179.2410	181.3892	202.7187	216.1370	241.3354	241.3354 (62)	
WWHRS	-27.9421	-24.7122	-25.8772	-21.4274	-19.9695	-17.0881	-16.0173	-17.0328	-17.6800	-20.8427	-23.6123	-27.4247	-27.4247 (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	-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	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h													
216.1439	191.1507	203.2985	179.5364	174.5159	157.7943	156.2344	162.2082	163.7092	181.8760	192.5247	213.9107	213.9107 (64)	
12Total per year (kWh/year)													2192.9031 (64)
Electric shower(s)													2193 (64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month													
102.9417	91.4495	97.9841	87.9009	86.4495	79.2288	79.0568	81.3808	81.3923	89.1871	92.9460	102.0271	102.0271 (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	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	97.3459	107.7758	97.3459	100.5908	97.3459	100.5908	97.3459	97.3459	100.5908	97.3459	100.5908	97.3459 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	192.9888	194.9914	189.9449	179.2014	165.6397	152.8936	144.3784	142.3758	147.4223	158.1658	171.7275	184.4736 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044 (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)	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356 (71)
Water heating gains (Table 5)	138.3625	136.0855	131.6990	122.0846	116.1956	110.0401	106.2592	109.3827	113.0449	119.8751	129.0917	137.1332 (72)
Total internal gains	487.7106	497.8661	478.0031	460.8901	438.1945	419.5377	403.9968	405.1178	417.0713	434.4002	460.4233	477.9661 (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			
South				3.3700	46.7521	0.6300	0.7000	0.7700	48.1507 (78)			
West				11.7900	19.6403	0.6300	0.7000	0.7700	70.7674 (80)			
Solar gains	118.9180	217.2944	328.4359	446.0337	525.8006	530.9966	508.3791	449.1664	370.0888	249.3221	145.3136	99.8023 (83)
Total gains	606.6286	715.1605	806.4391	906.9238	963.9951	950.5343	912.3759	854.2841	787.1601	683.7223	605.7368	577.7684 (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	52.9598	53.0668	53.1720	53.6720	53.7666	54.2114	54.2114	54.2946	54.0392	53.7666	53.5756	53.3773	
alpha	4.5307	4.5378	4.5448	4.5781	4.5844	4.6141	4.6141	4.6196	4.6026	4.5844	4.5717	4.5585	
util living area	0.9882	0.9749	0.9455	0.8671	0.7289	0.5465	0.4008	0.4447	0.6794	0.9071	0.9763	0.9904 (86)	
MIT	19.6728	19.9141	20.2397	20.6190	20.8660	20.9721	20.9946	20.9914	20.9267	20.5859	20.0617	19.6313 (87)	
Th 2	19.8725	19.8745	19.8765	19.8858	19.8875	19.8956	19.8956	19.8971	19.8925	19.8875	19.8840	19.8803 (88)	
util rest of house	0.9846	0.9675	0.9297	0.8313	0.6657	0.4598	0.3022	0.3413	0.5914	0.8729	0.9680	0.9875 (89)	
MIT 2	18.3626	18.6673	19.0710	19.5235	19.7834	19.8809	19.8940	19.8943	19.8475	19.5009	18.8634	18.3156 (90)	
Living area fraction									fLA = Living area / (4) =				0.4034 (91)
MIT	18.8912	19.1703	19.5425	19.9654	20.2201	20.3211	20.3380	20.3368	20.2828	19.9386	19.3468	18.8463 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.8912	19.1703	19.5425	19.9654	20.2201	20.3211	20.3380	20.3368	20.2828	19.9386	19.3468	18.8463 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9804	0.9616	0.9240	0.8341	0.6857	0.4940	0.3421	0.3831	0.6241	0.8747	0.9628	0.9837 (94)
Useful gains	594.7133	687.7339	745.1598	756.4760	660.9791	469.5718	312.0875	327.2553	491.2325	598.0456	583.2305	568.3643 (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	1252.9966	1222.9715	1115.5366	937.6213	720.6772	479.9469	313.5817	329.7594	520.3367	789.9088	1039.5908	1247.8965 (97)
Space heating kWh	489.7628	359.6796	275.5603	130.4246	44.4154	0.0000	0.0000	0.0000	0.0000	142.7463	328.5794	505.5719 (98a)
Space heating requirement - total per year (kWh/year)												2276.7404
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	489.7628	359.6796	275.5603	130.4246	44.4154	0.0000	0.0000	0.0000	0.0000	142.7463	328.5794	505.5719 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2276.7404
Space heating per m2										(98c) / (4) =		33.3980 (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	489.7628	359.6796	275.5603	130.4246	44.4154	0.0000	0.0000	0.0000	0.0000	142.7463	328.5794	505.5719 (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)	530.6206	389.6854	298.5486	141.3051	48.1207	0.0000	0.0000	0.0000	0.0000	154.6547	355.9907	547.7486 (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	216.1439	191.1507	203.2985	179.5364	174.5159	157.7943	156.2344	162.2082	163.7092	181.8760	192.5247	213.9107 (64)
Efficiency of water heater	85.8358	85.4555	84.7424	83.3548	81.4753	79.8000	79.8000	79.8000	79.8000	83.5224	85.2479	79.8000 (216)
Fuel for water heating, kWh/month	251.8109	223.6846	239.9018	215.3883	214.1950	197.7373	195.7825	203.2684	205.1494	217.7572	225.8410	248.9679 (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	20.2266	16.2265	14.6102	10.7040	8.2681	6.7551	7.5424	9.8039	12.7344	16.7082	18.8718	20.7887 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-15.1275	-22.6981	-34.7004	-41.5797	-47.1174	-44.8236	-44.2807	-40.6629	-34.6977	-27.0579	-17.1114	-12.9238 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-4.8354	-10.4467	-21.2862	-32.7533	-44.0851	-44.5791	-44.0525	-36.9389	-26.6087	-15.1895	-6.5348	-3.8034 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												

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(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												2466.6744	(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												2639.4841	(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)												163.2399	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-673.8946	(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												4681.5037	(238)

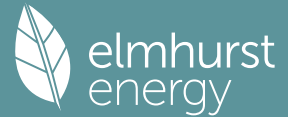
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2466.6744	0.2100	518.0016 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2639.4841	0.2100	554.2917 (264)
Space and water heating			1072.2933 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	163.2399	0.1443	23.5606 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-382.7811	0.1333	-51.0237
PV Unit electricity exported	-291.1135	0.1252	-36.4462
Total			-87.4699 (269)
Total CO2, kg/year			1020.3132 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.9700 (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	2466.6744	1.1300	2787.3420 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2639.4841	1.1300	2982.6170 (278)
Space and water heating			5769.9591 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	163.2399	1.5338	250.3828 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-382.7811	1.4926	-571.3277
PV Unit electricity exported	-291.1135	0.4595	-133.7728
Total			-705.1006 (283)
Total Primary energy kWh/year			5445.3420 (286)
Target Primary Energy Rate (TPER)			79.8800 (287)

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Plot Reference	B2 2B4P Ground				Issued on Date	19/12/2025	
Assessment Reference	2B4P			Plot Type Ref	2B4P		
Plot Address					SAP Version	10.2	
SAP Rating	76 C		DER	5.18		TER	14.97
Environmental	96 A		% DER < TER				65.40
CO ₂ Emissions (t/year)	0.31		DFEE	42.54		TFEE	41.49
Compliance Check	See BREL		% DFEE < TFEE				-2.52
% DPER < TPER	32.42		DPER	53.98		TPER	79.88
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	68.1700 (1b)	2.5000 (2b)	170.4250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.1700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	170.4250 (5)

2. Ventilation rate

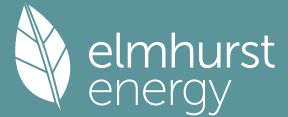
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1174 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2674 (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) = 0.2273 (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)
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	0.2897	0.2841	0.2784	0.2500	0.2443	0.2159	0.2159	0.2102	0.2273	0.2443	0.2557	0.2670 (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	0.5420	0.5403	0.5387	0.5312	0.5298	0.5233	0.5233	0.5221	0.5258	0.5298	0.5327	0.5356 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			18.9900	0.9615	18.2596		(27)
Ground Floor			68.1700	0.1300	8.8621	110.0000	7498.7000 (28a)
External Wall	52.2700	18.9900	33.2800	0.1600	5.3248	14.0000	465.9200 (29a)
Communal Wall	41.5800	1.8900	39.6900	0.2100	8.3349	14.0000	555.6600 (29a)
Total net area of external elements Aum(A, m ²)			162.0200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.6714		(33)
Main dwelling							
Party Ceiling			68.1700			100.0000	6817.0000 (32b)
Stud			115.0000			9.0000	1035.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	16372.2800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							240.1684 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				9.0500	0.0500	0.4525	
E4 Jamb				27.5000	0.0500	1.3750	
E5 Ground floor (normal)				37.5400	0.1600	6.0064	

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E7 Party floor between dwellings (in blocks of flats)	37.5400	0.0700	2.6278	
E16 Corner (normal)	12.5000	0.0900	1.1250	
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				11.3617 (36)
Point Thermal bridges				0.0000
Total fabric heat loss				(33) + (36) + (36a) = 54.0331 (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	
30.4809	30.3892	30.2993	29.8773	29.7983	29.4307	29.4307	29.3627	29.5723	29.7983	29.9581	30.1251	(38)
(38)m												
Heat transfer coeff	84.5140	84.4223	84.3325	83.9104	83.8314	83.4639	83.4639	83.3958	83.6054	83.8314	83.9912	84.1582 (39)
Average = Sum(39)m / 12 =												83.9100
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2398	1.2384	1.2371	1.2309	1.2297	1.2243	1.2243	1.2234	1.2264	1.2297	1.2321	1.2345 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2009 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths												26.4074 (42b)
Hot water usage for other uses												37.1693 (42c)
Average daily hot water use (litres/day)												58.2741 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	63.5767	61.8329	59.9290	57.5591	55.4450	53.2479	52.7912	54.6912	56.6400	58.8963	61.2872	63.4874 (44)
Energy content (annual)	100.6899	88.0492	92.1086	78.7955	74.6396	65.4745	63.8464	67.7192	69.8427	79.9217	87.3148	99.4060 (45)
Distribution loss (46)m = 0.15 x (45)m												967.8081
Water storage loss (or HIU loss):												0.0000 (46)
Total storage loss												0.0000 (56)
If cylinder contains dedicated solar storage												0.0000 (57)
Primary loss												0.0000 (59)
Combi loss												0.0000 (61)
Total heat required for water heating calculated for each month												
WWHRS	85.5865	74.8418	78.2924	66.9762	63.4437	55.6533	54.2694	57.5613	59.3663	67.9334	74.2176	84.4951 (62)
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 (63a)
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 (63b)
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 (63c)
Output from w/h	85.5865	74.8418	78.2924	66.9762	63.4437	55.6533	54.2694	57.5613	59.3663	67.9334	74.2176	84.4951 (64)
12Total per year (kWh/year)												822.6369 (64)
Electric shower(s)	48.9480	43.6131	47.6238	45.4468	46.2996	44.1653	45.6375	46.2996	45.4468	47.6238	46.7283	48.9480 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												556.7804 (64a)
Heat gains from water heating, kWh/month	33.6336	29.6137	31.4790	28.1057	27.4358	24.9547	24.9767	25.9652	26.2033	28.8893	30.2365	33.3608 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	97.3407	107.7701	97.3407	100.5854	97.3407	100.5854	97.3407	97.3407	100.5854	97.3407	100.5854	97.3407 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	192.9888	194.9914	189.9449	179.2014	165.6397	152.8936	144.3784	142.3758	147.4223	158.1658	171.7275	184.4736 (68)
Pumps, fans	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356 (71)
Total internal gains	45.2065	44.0680	42.3105	39.0358	36.8761	34.6592	33.5709	34.8995	36.3934	38.8297	41.9951	44.8397 (72)
	391.5493	402.8429	385.6094	374.8359	355.8698	344.1516	331.3033	330.6293	340.4145	350.3496	370.3213	382.6674 (73)

6. Solar gains

[Jan]												
	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
South	4.2200	46.7521	0.4000	0.7000	0.7700	38.2829 (78)						
West	14.7700	19.6403	0.4000	0.7000	0.7700	56.2884 (80)						
Solar gains	94.5713	172.8096	261.2044	354.7373	418.1824	422.3168	404.3277	357.2310	294.3336	198.2824	115.5633	79.3688 (83)
Total gains	486.1206	575.6524	646.8139	729.5732	774.0523	766.4684	735.6310	687.8603	634.7481	548.6319	485.8846	462.0362 (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)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	53.8119	53.8703	53.9277	54.1989	54.2500	54.4889	54.4889	54.5334	54.3966	54.2500	54.1468	54.0394

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alpha	4.5875	4.5914	4.5952	4.6133	4.6167	4.6326	4.6326	4.6356	4.6264	4.6167	4.6098	4.6026
util living area	0.9951	0.9887	0.9740	0.9274	0.8249	0.6513	0.4890	0.5406	0.7808	0.9528	0.9897	0.9961 (86)
MIT	19.5194	19.7388	20.0534	20.4585	20.7744	20.9440	20.9880	20.9812	20.8700	20.4418	19.9026	19.4765 (87)
Th 2	19.8883	19.8894	19.8904	19.8954	19.8963	19.9006	19.9006	19.9014	19.8989	19.8963	19.8944	19.8925 (88)
util rest of house	0.9935	0.9852	0.9655	0.9033	0.7698	0.5572	0.3720	0.4199	0.6973	0.9320	0.9857	0.9948 (89)
MIT 2	18.5565	18.7746	19.0844	19.4739	19.7504	19.8760	19.8976	19.8963	19.8314	19.4677	18.9424	18.5170 (90)
Living area fraction	18.9449	19.1635	19.4753	19.8711	20.1634	20.3068	20.3375	20.3339	FLA = Living area / (4) =		0.4034	0.4034 (91)
MIT	18.9449	19.1635	19.4753	19.8711	20.1634	20.3068	20.3375	20.3339	20.2504	19.8607	19.3297	18.9040 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9449	19.1635	19.4753	19.8711	20.1634	20.3068	20.3375	20.3339	20.2504	19.8607	19.3297	18.9040 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9916	0.9821	0.9615	0.9026	0.7844	0.5936	0.4194	0.4688	0.7265	0.9311	0.9830	0.9932 (94)
Useful gains	482.0418	565.3435	621.8849	658.5402	607.1732	454.9452	308.5418	322.4382	461.1167	510.8560	477.6401	458.9161 (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	1237.7008	1204.1612	1094.2395	920.5887	709.5025	476.3148	311.9453	328.0718	514.2068	776.3354	1027.1888	1237.4654 (97)
Space heating kWh	562.2103	429.2855	351.4318	188.6749	76.1330	0.0000	0.0000	0.0000	0.0000	197.5167	395.6751	579.2407 (98a)
Space heating requirement - total per year (kWh/year)												2780.1680
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	562.2103	429.2855	351.4318	188.6749	76.1330	0.0000	0.0000	0.0000	0.0000	197.5167	395.6751	579.2407 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2780.1680
Space heating per m2										(98c) / (4) =		40.7829 (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	784.5602	617.6325	633.8079	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8578	0.9183	0.8928	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	672.9671	567.1908	565.8699	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	859.4166	825.2787	771.3296	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	134.2437	192.0174	152.8620	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	33.5609	48.0044	38.2155	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												119.7808 (107)
Energy for space heating												40.7829 (99)
Energy for space cooling												1.7571 (108)
Total												42.5400 (109)
Fabric Energy Efficiency (DFEE)												42.5 (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)
Main dwelling	68.1700 (1b)	x 2.5000 (2b)	= 170.4250 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.1700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.4250 (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	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	20.0000 / (5) = 0.1174 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3674 (18)
Number of sides sheltered	2 (19)

elmhurst
energy

Infiltration rate adjusted to include shelter factor

$$\begin{aligned}(20) &= 1 - [0.075 \times (19)] = 0.8500 \quad (20) \\(21) &= (18) \times (20) = 0.3123 \quad (21)\end{aligned}$$

	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	0.3981	0.3903	0.3825	0.3435	0.3357	0.2966	0.2966	0.2888	0.3123	0.3357	0.3513	0.3669 (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	0.5792	0.5762	0.5732	0.5590	0.5563	0.5440	0.5440	0.5417	0.5488	0.5563	0.5617	0.5673 (25)

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
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			15.1600	1.1450	17.3588		(27)
Ground Floor			68.1700	0.1300	8.8621		(28a)
External Wall	52.2700	15.1600	37.1100	0.1800	6.6798		(29a)
Communal Wall	41.5800	1.8900	39.6900	0.1800	7.1442		(29a)
Total net area of external elements Aum (A, m2)			162.0200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.9349		(33)

240.1684 (35)

Dist of thermal bridges	Length	Psi-value	Total
K1 Element	9.0500	0.0500	0.4525
E2 Other lintels (including other steel lintels)	27.5000	0.0500	1.3750
E4 Jamb	37.5400	0.1600	6.0064
E5 Ground floor (normal)	37.5400	0.0700	2.6278
E7 Party floor between dwellings (in blocks of flats)	12.5000	0.0900	1.1250
E16 Corner (normal)	2.5000	-0.0900	-0.2250
E17 Corner (inverted - internal area greater than external area)			

11.3617 (36)

$$(36a) = 0.0000$$
$$(33) + (36) + (36a) = 53.2966 \quad (37)$$
[illegible]

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2597	1.2572	1.2547	1.2430	1.2408	1.2306	1.2306	1.2287	1.2345	1.2408	1.2452	1.2498 (40)
HLP (average)												1.2430
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

2,2009 (42)

[illegible]

26.4074	26.0152	25.4629	24.4446	23.6821	22.8366	22.3799	22.9284	23.5255	24.4302	25.4695	26.3181	(42b)
---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	-------

37.1693	35.8177	34.4661	33.1145	31.7629	30.4113	30.4113	31.7629	33.1145	34.4661	35.8177	37.1693	(42c)
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Daily hot water use	63.5767	61.9320	59.9200	57.5501	55.4450	53.2470	52.7012	54.6012	56.6400	59.9962	61.2972	62.4974	444
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Energy content	100.6899	88.0492	92.1086	78.7955	74.6396	65.4745	63.8464	67.7192	69.8427	79.9217	87.3148	99.4060 (45)
Energy content (annual)										Total =	Sum (45) =	967.8081

$$\text{Distribution loss} = \frac{0.46\text{m}}{(46)\text{m}} = 0.15 \times \frac{(45)\text{m}}{(46)\text{m}}$$

Water storage loss (01 m10 loss):

Total storage loss

If cylinder contains dedicated solar storage

[illegible]

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Total heat required for water heating calculated for each month	25.5365	74.2410	78.2024	66.2762	62.4427	55.6522	54.2604	57.5612	59.2662	67.2324	74.2176	84.4051

[illegible][illegible]

Output from `wfit`

12Total per year (kWh/year)

48.9480	43.6131	47.6238	45.4468	46.2996	44.1653	45.6375	46.2996	45.4468	47.6238	46.7283	48.9480	(64a)
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Heat gains from water heating, kWh/month

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

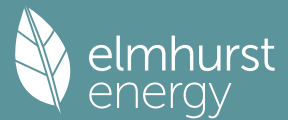
Metabolic gains (Table 5), watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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Lighting gains (calculated in Appendix L, equation L9 or L9a; also see Table 5)

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

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

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Pumps, fans	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044 (69)
Losses e.g. evaporation	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)
(negative values) (Table 5)	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356 (71)
Water heating gains (Table 5)	45.2065	44.0680	42.3105	39.0358	36.8761	34.6592	33.5709	34.8995	36.3934	38.8297	41.9951	44.8397 (72)
Total internal gains	391.5545	402.8486	385.6147	374.8413	355.8750	344.1569	331.3085	330.6345	340.4199	350.3548	370.3267	382.6726 (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				3.3700	46.7521	0.6300	0.7000	0.7700	48.1507 (78)			
West				11.7900	19.6403	0.6300	0.7000	0.7700	70.7674 (80)			
Solar gains	118.9180	217.2944	328.4359	446.0337	525.8006	530.9966	508.3791	449.1664	370.0888	249.3221	145.3136	99.8023 (83)
Total gains	510.4725	620.1430	714.0506	820.8749	881.6756	875.1535	839.6876	779.8009	710.5086	599.6769	515.6403	482.4749 (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	52.9598	53.0668	53.1720	53.6720	53.7666	54.2114	54.2114	54.2946	54.0392	53.7666	53.5756	53.3773
alpha	4.5307	4.5378	4.5448	4.5781	4.5844	4.6141	4.6141	4.6196	4.6026	4.5844	4.5717	4.5585
util living area	0.9940	0.9852	0.9638	0.8986	0.7712	0.5869	0.4340	0.4843	0.7302	0.9377	0.9871	0.9953 (86)
MIT	19.5264	19.7769	20.1214	20.5412	20.8297	20.9628	20.9925	20.9878	20.9011	20.4936	19.9302	19.4847 (87)
Th 2	19.8725	19.8745	19.8765	19.8858	19.8875	19.8956	19.8956	19.8971	19.8925	19.8875	19.8840	19.8803 (88)
util rest of house	0.9921	0.9806	0.9524	0.8682	0.7102	0.4964	0.3279	0.3731	0.6428	0.9119	0.9822	0.9938 (89)
MIT 2	18.5514	18.8003	19.1379	19.5377	19.7817	19.8799	19.8938	19.8939	19.8433	19.5065	18.9613	18.5159 (90)
Living area fraction	18.9447	19.1943	19.5347	19.9426	20.2045	20.3168	20.3370	20.3352	20.2700	19.9047	19.3522	18.9067 (92)
MIT	18.9447	19.1943	19.5347	19.9426	20.2045	20.3168	20.3370	20.3352	20.2700	19.9047	19.3522	18.9067 (93)
Temperature adjustment												0.0000
adjusted MIT	18.9447	19.1943	19.5347	19.9426	20.2045	20.3168	20.3370	20.3352	20.2700	19.9047	19.3522	18.9067 (93)

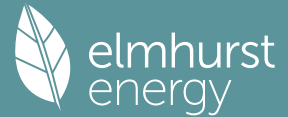
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9899	0.9770	0.9482	0.8700	0.7288	0.5320	0.3709	0.4181	0.6747	0.9124	0.9792	0.9920 (94)
Ext temp.	505.3352	605.8695	677.0317	714.1280	642.6083	465.5952	311.4099	326.0283	479.3688	547.1154	504.9069	478.6287 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Space heating kWh	1257.5960	1225.0295	1114.8681	935.6820	719.3499	479.5850	313.5027	329.6196	519.2614	787.0395	1040.0458	1253.0419 (97)
Space heating requirement - total per year (kWh/year)	559.6820	416.0755	325.7503	159.5189	57.0957	0.0000	0.0000	0.0000	0.0000	178.5035	385.3000	576.1634 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	559.6820	416.0755	325.7503	159.5189	57.0957	0.0000	0.0000	0.0000	0.0000	178.5035	385.3000	576.1634 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2658.0894
Space heating per m ²												(98c) / (4) = 38.9921 (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	788.5764	620.7942	636.5957	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9002	0.9458	0.9257	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	709.8829	587.1745	589.3071	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	986.4454	946.8977	878.7872	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	199.1250	267.6340	215.3732	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	49.7813	66.9085	53.8433	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												170.5331 (107)
Energy for space heating												38.9921 (99)
Energy for space cooling												2.5016 (108)
Total												41.4937 (109)
Fabric Energy Efficiency (TFEE)												41.5 (109)

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Plot Reference	B2 2B4P Ground				Issued on Date	19/12/2025
Assessment Reference	2B4P	Plot Type Ref	2B4P			
Plot Address					SAP Version	10.2
SAP Rating	76 C	DER	5.18	TER	14.97	
Environmental	96 A	% DER < TER				65.40
CO ₂ Emissions (t/year)	0.31	DFEE	42.54	TFEE	41.49	
Compliance Check	See BREL	% DFEE < TFEE				-2.52
% DPER < TPER	32.42	DPER	53.98	TPER	79.88	
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001
Client	ROK, Wilf Foster					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	68.1700 (1b)	x 2.5000 (2b)	= 170.4250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.1700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.4250 (5)

2. Ventilation rate

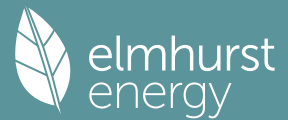
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												71.2000 (23c)
Effective ac	0.3066	0.3034	0.3002	0.2843	0.2811	0.2651	0.2651	0.2619	0.2715	0.2811	0.2874	0.2938 (25)

3. Heat losses and heat loss parameter

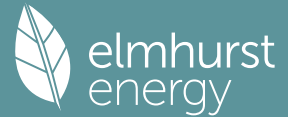
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			18.9900	0.9615	18.2596		(27)
Ground Floor			68.1700	0.1300	8.8621	110.0000	7498.7000 (28a)
External Wall	52.2700	18.9900	33.2800	0.1600	5.3248	14.0000	465.9200 (29a)
Communal Wall	41.5800	1.8900	39.6900	0.2100	8.3349	14.0000	555.6600 (29a)
Total net area of external elements Aum(A, m ²)			162.0200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.6714		(33)
Main dwelling							
Party Ceiling			68.1700			100.0000	6817.0000 (32b)
Stud			115.0000			9.0000	1035.0000 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 16372.2800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							240.1684 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value		Total

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E2 Other lintels (including other steel lintels)						9.0500	0.0500	0.4525				
E4 Jamb						27.5000	0.0500	1.3750				
E5 Ground floor (normal)						37.5400	0.1600	6.0064				
E7 Party floor between dwellings (in blocks of flats)						37.5400	0.0700	2.6278				
E16 Corner (normal)						12.5000	0.0900	1.1250				
E17 Corner (inverted - internal area greater than external area)						2.5000	-0.0900	-0.2250				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											11.3617	(36)
Point Thermal bridges											0.0000	
Total fabric heat loss									(33) + (36) + (36a) =		54.0331	(37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	17.2412	17.0619	16.8826	15.9863	15.8070	14.9107	14.9107	14.7314	15.2692	15.8070	16.1656	16.5241 (38)
Average = Sum(39)m / 12 =	71.2743	71.0950	70.9157	70.0194	69.8401	68.9438	68.9438	68.7645	69.3023	69.8401	70.1987	70.5572 (39)
												69.9746
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0455	1.0429	1.0403	1.0271	1.0245	1.0114	1.0114	1.0087	1.0166	1.0245	1.0298	1.0350 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31
												1.0265
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.2009 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths												26.4074 (42b)
Hot water usage for other uses												37.1693 (42c)
Average daily hot water use (litres/day)												35.8177 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	63.5767	61.8329	59.9290	57.5591	55.4450	53.2479	52.7912	54.6912	56.6400	58.8963	61.2872	63.4874 (44)
Energy conte	100.6899	88.0492	92.1086	78.7955	74.6396	65.4745	63.8464	67.7192	69.8427	79.9217	87.3148	99.4060 (45)
Energy content (annual)												967.8081
Distribution loss												15.1035 (46)
Water storage loss (or HIU loss):												13.2074 (47)
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												0.0152 (51)
Hot water storage loss factor from Table 2 (kWh/litre/day)												1.0294 (52)
Volume factor from Table 2a												0.6000 (53)
Temperature factor from Table 2b												1.0327 (55)
Enter (49) or (54) in (55)												
Total storage loss												32.0144 (56)
If cylinder contains dedicated solar storage												32.0144 (57)
Primary loss												23.2624 (59)
Combi loss												0.0000 (61)
Total heat required for water heating calculated for each month												155.9667 (62)
WWHRS												0.0000 (63a)
PV diverter												-0.0000 (63b)
Solar input												0.0000 (63c)
FGHRS												0.0000 (63d)
Output from w/h												155.9667 (64)
12Total per year (kWh/year)												1618.6479 (64)
Electric shower(s)												48.9480 (64a)
												43.6131 (64a)
												47.6238 (64a)
												45.4468 (64a)
												46.2996 (64a)
												44.1653 (64a)
												45.6375 (64a)
												46.2996 (64a)
												45.4468 (64a)
												47.6238 (64a)
												46.7283 (64a)
												556.7804 (64a)
Heat gains from water heating, kWh/month												89.9378 (65)
												80.1216 (65)
												86.7535 (65)
												80.3562 (65)
												80.6140 (65)
												75.6065 (65)
												76.8597 (65)
												78.3130 (65)
												77.3794 (65)
												82.7013 (65)
												83.5092 (65)
												89.5109 (65)
5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	97.3407	107.7701	97.3407	100.5854	97.3407	100.5854	97.3407	97.3407	100.5854	97.3407	100.5854	97.3407 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	192.9888	194.9914	189.9449	179.2014	165.6397	152.8936	144.3784	142.3758	147.4223	158.1658	171.7275	184.4736 (68)
Pumps, fans	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356 (71)
Total internal gains	120.8842	119.2285	116.6042	111.6058	108.3522	105.0091	103.3061	105.2594	107.4713	111.1577	115.9850	120.3104 (72)
	467.2270	478.0034	459.9031	447.4059	427.3459	414.5014	401.0385	400.9892	411.4924	422.6776	444.3112	458.1380 (73)
6. Solar gains												
[Jan]												
	Area											
	m2											
	Solar flux											
	Table 6a											
	W/m2											
	Specific data											
	or Table 6b											
	g											
	Specific data											
	or Table 6c											
	FF											
	Access											
	factor											
	Table 6d											
	Gains											
	W											
South	4.2200											38.2829 (78)
West	14.7700											56.2884 (80)
Solar gains	94.5713	172.8096	261.2044	354.7373	418.1824	422.3168	404.3277	357.2310	294.3336	198.2824	115.5633	79.3688 (83)
Total gains	561.7983	650.8129	721.1075	802.1432	845.5283	836.8182	805.3662	758.2201	705.8260	620.9600	559.8745	537.5068 (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	63.8078	63.9687	64.1304	64.9514	65.1181	65.9647	65.9647	66.1366	65.6234	65.1181	64.7855	64.4563
alpha	5.2539	5.2646	5.2754	5.3301	5.3412	5.3976	5.3976	5.4091	5.3749	5.3412	5.3190	5.2971
util living area	0.9897	0.9773	0.9485	0.8641	0.7146	0.5193	0.3755	0.4150	0.6481	0.9003	0.9771	0.9917 (86)
MIT	19.9500	20.1576	20.4294	20.7440	20.9247	20.9888	20.9984	20.9973	20.9654	20.7219	20.2881	19.9179 (87)
Th 2	20.0456	20.0477	20.0499	20.0608	20.0630	20.0739	20.0739	20.0761	20.0695	20.0630	20.0586	20.0543 (88)
util rest of house	0.9867	0.9708	0.9343	0.8308	0.6580	0.4476	0.2971	0.3328	0.5719	0.8673	0.9695	0.9892 (89)
MIT 2	19.1053	19.3105	19.5740	19.8697	20.0169	20.0692	20.0735	20.0753	20.0528	19.8597	19.4494	19.0806 (90)
Living area fraction	fLA = Living area / (4) = 0.4034 (91)											
MIT	19.4461	19.6522	19.9191	20.2224	20.3831	20.4402	20.4466	20.4472	20.4210	20.2075	19.7878	19.4184 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.4461	19.6522	19.9191	20.2224	20.3831	20.4402	20.4466	20.4472	20.4210	20.2075	19.7878	19.4184 (93)

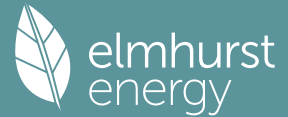
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9842	0.9676	0.9320	0.8370	0.6781	0.4763	0.3287	0.3660	0.6016	0.8730	0.9668	0.9871	(94)
Useful gains	552.9359	629.7254	672.0735	671.4286	573.3546	398.5774	264.7553	277.5270	424.6196	542.1157	541.2866	530.5480	(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	1079.5248	1048.8100	951.6236	792.7870	606.4304	402.6429	265.1984	278.3071	438.0586	670.9890	890.6637	1073.7673	(97)
Space heating kWh	391.7821	281.6248	207.9853	87.3780	24.6084	0.0000	0.0000	0.0000	0.0000	95.8817	251.5515	404.1551	(98a)
Space heating requirement - total per year (kWh/year)												1744.9670	
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	391.7821	281.6248	207.9853	87.3780	24.6084	0.0000	0.0000	0.0000	0.0000	95.8817	251.5515	404.1551	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1744.9670	
Space heating per m2										(98c) / (4) =		25.5973	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (301)
Fraction of space heat from community system													1.0000 (302)
Fraction of heat from community Heat pump-Space and Water													1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating													1.0500 (305)
Factor for charging method (Table 4c(3)) for water heating													1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system													1.5000 (306)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating:													
Space heating requirement	391.7821	281.6248	207.9853	87.3780	24.6084	0.0000	0.0000	0.0000	0.0000	95.8817	251.5515	404.1551 (98)	
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	617.0568	443.5591	327.5768	137.6204	38.7583	0.0000	0.0000	0.0000	0.0000	151.0136	396.1937	636.5443	
Space heating requirement	617.0568	443.5591	327.5768	137.6204	38.7583	0.0000	0.0000	0.0000	0.0000	151.0136	396.1937	636.5443 (307)	
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)													0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)	
Water heating													
Annual water heating requirement	155.9667	137.9767	147.3855	132.2892	129.9164	118.9682	119.1232	122.9960	123.3364	135.1985	140.8085	154.6828 (64)	
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	233.9501	206.9650	221.0782	198.4338	194.8746	178.4522	178.6848	184.4939	185.0046	202.7977	211.2127	232.0241	
Water heating fuel	233.9501	206.9650	221.0782	198.4338	194.8746	178.4522	178.6848	184.4939	185.0046	202.7977	211.2127	232.0241 (310)	
Cooling System Energy Efficiency Ratio													0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)	
Pumps and Fa	16.0695	14.5144	16.0695	15.5512	16.0695	15.5512	16.0695	16.0695	15.5512	16.0695	15.5512	16.0695 (331)	
Lighting	21.4240	17.1872	15.4751	11.3377	8.7576	7.1550	7.9890	10.3844	13.4883	17.6973	19.9891	22.0195 (332)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-12.8678	-21.8040	-38.1267	-50.6492	-60.6454	-58.9698	-58.0281	-51.4153	-40.4532	-27.7042	-15.1885	-10.6054 (333a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)	
Annual totals kWh/year													
Space heating fuel - community heating													2748.3230 (307)
Space heating fuel - secondary													0.0000 (309)
Water heating fuel - community heating													2427.9718 (310)
Efficiency of water heater													0.0000 (311)
Electricity used for heat distribution													27.4832 (313)
Space cooling fuel													0.0000 (321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9100)													
mechanical ventilation fans (SFP = 0.9100)													189.2058 (330a)
Total electricity for the above, kWh/year													189.2058 (331)
Electricity for lighting (calculated in Appendix L)													172.9042 (332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-446.4576 (333)
Wind generation													0.0000 (334)
Hydro-electric generation (Appendix N)													0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (335)
Appendix Q - special features													

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Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	5648.7277 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			280.0000 (367)
Space and Water heating from Heat pump	1848.6767	0.1567	153.7802 (367)
Electrical energy for heat distribution (space & water)	27.4832	0.0000	7.7153 (372)
Overall CO2 factor for heat network			0.0547 (386)
Total CO2 associated with community systems			283.2628 (373)
Energy for instantaneous electric shower(s)	556.7804	0.1391	77.4605 (264a)
Space and water heating			283.2628 (376)
Pumps, fans and electric keep-hot	189.2058	0.1387	26.2452 (378)
Energy for lighting	172.9042	0.1443	24.9554 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-446.4576	0.1314	-58.6687
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-58.6687 (380)
Total CO2, kg/year			353.2552 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.1800 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	1848.6767	1.5800	1550.8426 (467)
Electrical energy for heat distribution (space & water)	27.4832	0.0000	80.3098 (472)
Overall CO2 factor for heat network			0.5696 (486)
Total CO2 associated with community systems			2948.5155 (473)
Energy for instantaneous electric shower(s)	556.7804	1.5143	843.1516 (278a)
Space and water heating			2948.5155 (476)
Pumps, fans and electric keep-hot	189.2058	1.5128	286.2306 (478)
Energy for lighting	172.9042	1.5338	265.2062 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-446.4576	1.4855	-663.2071
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-663.2071 (480)
Total Primary energy kWh/year			3679.8969 (483)
Dwelling Primary energy Rate (DPER)			53.9800 (484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

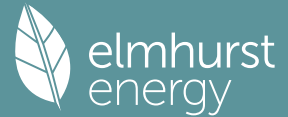
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	68.1700 (1b)	x 2.5000 (2b)	= 170.4250 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.1700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.4250 (5)

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	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 20.0000 / (5) = 0.1174 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3674 (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) = 0.3123 (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	0.3981	0.3903	0.3825	0.3435	0.3357	0.2966	0.2966	0.2888	0.3123	0.3357	0.3513	0.3669 (22b)
Effective ac	0.5792	0.5762	0.5732	0.5590	0.5563	0.5440	0.5440	0.5417	0.5488	0.5563	0.5617	0.5673 (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
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			15.1600	1.1450	17.3588		(27)
Ground Floor			68.1700	0.1300	8.8621		(28a)
External Wall	52.2700	15.1600	37.1100	0.1800	6.6798		(29a)
Communal Wall	41.5800	1.8900	39.6900	0.1800	7.1442		(29a)
Total net area of external elements Aum(A, m2)			162.0200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		41.9349		(33)

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

240.1684 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.0500	0.0500	0.4525
E4 Jamb	27.5000	0.0500	1.3750
E5 Ground floor (normal)	37.5400	0.1600	6.0064
E7 Party floor between dwellings (in blocks of flats)	37.5400	0.0700	2.6278
E16 Corner (normal)	12.5000	0.0900	1.1250
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.3617 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	53.2966 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	32.5771	32.4041	32.2344	31.4376	31.2885	30.5945	30.5945	30.4660	30.8618	31.2885	31.5901	31.9054 (38)
Average = Sum(39)m / 12 =	85.8737	85.7006	85.5310	84.7342	84.5851	83.8911	83.8911	83.7626	84.1584	84.5851	84.8867	85.2020 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2597	1.2572	1.2547	1.2430	1.2408	1.2306	1.2306	1.2287	1.2345	1.2408	1.2452	1.2498 (40)
HLP (average)												1.2430
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

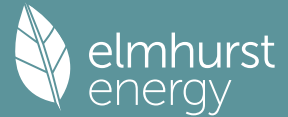
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2009 (42)
Hot water usage for mixer showers													
61.1213	60.2028	58.8643	56.3033	54.4134	52.3058	51.1078	52.4362	53.8923	56.1553	58.7712	60.8871	(42a)	
Hot water usage for baths													
26.4074	26.0152	25.4629	24.4446	23.6821	22.8366	22.3799	22.9284	23.5255	24.4302	25.4695	26.3181	(42b)	
Hot water usage for other uses													
37.1693	35.8177	34.4661	33.1145	31.7629	30.4113	30.4113	31.7629	33.1145	34.4661	35.8177	37.1693	(42c)	
Average daily hot water use (litres/day)													114.6259 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
124.6980	122.0357	118.7933	113.8624	109.8584	105.5537	103.8990	107.1274	110.5323	115.0515	120.0584	124.3745	(44)	
Energy content (annual)	197.4912	173.7772	182.5809	155.8720	147.8905	129.7906	125.6569	132.6461	136.2973	156.1238	171.0452	194.7405	(45)
Distribution loss (46)m = 0.15 x (45)m													
29.6237	26.0666	27.3871	23.3808	22.1836	19.4686	18.8485	19.8969	20.4446	23.4186	25.6568	29.2111	(46)	
Water storage loss (or HIU loss):													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.3938 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.7527 (55)
Total storage loss													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)	
If cylinder contains dedicated solar storage													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	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	(61)	
Total heat required for water heating calculated for each month													
244.0861	215.8629	229.1758	200.9638	194.4854	174.8824	172.2518	179.2410	181.3892	202.7187	216.1370	241.3354	(62)	
WWHRS	-27.9421	-24.7122	-25.8772	-21.4274	-19.9695	-17.0881	-16.0173	-17.0328	-17.6800	-20.8427	-23.6123	-27.4247	(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													
216.1439	191.1507	203.2985	179.5364	174.5159	157.7943	156.2344	162.2082	163.7092	181.8760	192.5247	213.9107	(64)	
12Total per year (kWh/year)													2192.9031 (64)
Electric shower(s)													2193 (64)
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													
102.9417	91.4495	97.9841	87.9009	86.4495	79.2288	79.0568	81.3808	81.3923	89.1871	92.9460	102.0271	(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	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	97.3459	107.7758	97.3459	100.5908	97.3459	100.5908	97.3459	97.3459	100.5908	97.3459	100.5908	97.3459 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	192.9888	194.9914	189.9449	179.2014	165.6397	152.8936	144.3784	142.3758	147.4223	158.1658	171.7275	184.4736 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044 (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)	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356 (71)
Water heating gains (Table 5)	138.3625	136.0855	131.6990	122.0846	116.1956	110.0401	106.2592	109.3827	113.0449	119.8751	129.0917	137.1332 (72)
Total internal gains	487.7106	497.8661	478.0031	460.8901	438.1945	419.5377	403.9968	405.1178	417.0713	434.4002	460.4233	477.9661 (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			
South				3.3700	46.7521	0.6300	0.7000	0.7700	48.1507 (78)			
West				11.7900	19.6403	0.6300	0.7000	0.7700	70.7674 (80)			
Solar gains	118.9180	217.2944	328.4359	446.0337	525.8006	530.9966	508.3791	449.1664	370.0888	249.3221	145.3136	99.8023 (83)
Total gains	606.6286	715.1605	806.4391	906.9238	963.9951	950.5343	912.3759	854.2841	787.1601	683.7223	605.7368	577.7684 (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	52.9598	53.0668	53.1720	53.6720	53.7666	54.2114	54.2114	54.2946	54.0392	53.7666	53.5756	53.3773	
alpha	4.5307	4.5378	4.5448	4.5781	4.5844	4.6141	4.6141	4.6196	4.6026	4.5844	4.5717	4.5585	
util living area	0.9882	0.9749	0.9455	0.8671	0.7289	0.5465	0.4008	0.4447	0.6794	0.9071	0.9763	0.9904 (86)	
MIT	19.6728	19.9141	20.2397	20.6190	20.8660	20.9721	20.9946	20.9914	20.9267	20.5859	20.0617	19.6313 (87)	
Th 2	19.8725	19.8745	19.8765	19.8858	19.8875	19.8956	19.8956	19.8971	19.8925	19.8875	19.8840	19.8803 (88)	
util rest of house	0.9846	0.9675	0.9297	0.8313	0.6657	0.4598	0.3022	0.3413	0.5914	0.8729	0.9680	0.9875 (89)	
MIT 2	18.3626	18.6673	19.0710	19.5235	19.7834	19.8809	19.8940	19.8943	19.8475	19.5009	18.8634	18.3156 (90)	
Living area fraction									fLA = Living area / (4) =				0.4034 (91)
MIT	18.8912	19.1703	19.5425	19.9654	20.2201	20.3211	20.3380	20.3368	20.2828	19.9386	19.3468	18.8463 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.8912	19.1703	19.5425	19.9654	20.2201	20.3211	20.3380	20.3368	20.2828	19.9386	19.3468	18.8463 (93)	

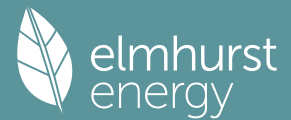
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9804	0.9616	0.9240	0.8341	0.6857	0.4940	0.3421	0.3831	0.6241	0.8747	0.9628	0.9837 (94)
Useful gains	594.7133	687.7339	745.1598	756.4760	660.9791	469.5718	312.0875	327.2553	491.2325	598.0456	583.2305	568.3643 (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	1252.9966	1222.9715	1115.5366	937.6213	720.6772	479.9469	313.5817	329.7594	520.3367	789.9088	1039.5908	1247.8965 (97)
Space heating kWh	489.7628	359.6796	275.5603	130.4246	44.4154	0.0000	0.0000	0.0000	0.0000	142.7463	328.5794	505.5719 (98a)
Space heating requirement - total per year (kWh/year)												2276.7404
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	489.7628	359.6796	275.5603	130.4246	44.4154	0.0000	0.0000	0.0000	0.0000	142.7463	328.5794	505.5719 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2276.7404
Space heating per m2										(98c) / (4) =		33.3980 (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	489.7628	359.6796	275.5603	130.4246	44.4154	0.0000	0.0000	0.0000	0.0000	142.7463	328.5794	505.5719 (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)	530.6206	389.6854	298.5486	141.3051	48.1207	0.0000	0.0000	0.0000	0.0000	154.6547	355.9907	547.7486 (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	216.1439	191.1507	203.2985	179.5364	174.5159	157.7943	156.2344	162.2082	163.7092	181.8760	192.5247	213.9107 (64)
Efficiency of water heater (217)m	85.8358	85.4555	84.7424	83.3548	81.4753	79.8000	79.8000	79.8000	79.8000	83.5224	85.2479	79.8000 (216)
Fuel for water heating, kWh/month	251.8109	223.6846	239.9018	215.3883	214.1950	197.7373	195.7825	203.2684	205.1494	217.7572	225.8410	248.9679 (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	20.2266	16.2265	14.6102	10.7040	8.2681	6.7551	7.5424	9.8039	12.7344	16.7082	18.8718	20.7887 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-15.1275	-22.6981	-34.7004	-41.5797	-47.1174	-44.8236	-44.2807	-40.6629	-34.6977	-27.0579	-17.1114	-12.9238 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-4.8354	-10.4467	-21.2862	-32.7533	-44.0851	-44.5791	-44.0525	-36.9389	-26.6087	-15.1895	-6.5348	-3.8034 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												

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(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												2466.6744	(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												2639.4841	(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)												163.2399	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-673.8946	(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												4681.5037	(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	2466.6744	0.2100	518.0016 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2639.4841	0.2100	554.2917 (264)
Space and water heating			1072.2933 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	163.2399	0.1443	23.5606 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-382.7811	0.1333	-51.0237
PV Unit electricity exported	-291.1135	0.1252	-36.4462
Total			-87.4699 (269)
Total CO2, kg/year			1020.3132 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.9700 (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	2466.6744	1.1300	2787.3420 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2639.4841	1.1300	2982.6170 (278)
Space and water heating			5769.9591 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	163.2399	1.5338	250.3828 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-382.7811	1.4926	-571.3277
PV Unit electricity exported	-291.1135	0.4595	-133.7728
Total			-705.1006 (283)
Total Primary energy kWh/year			5445.3420 (286)
Target Primary Energy Rate (TPER)			79.8800 (287)

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Plot Reference	B2 2B4P Mid				Issued on Date	19/12/2025	
Assessment Reference	2B4P		Plot Type Ref	2B4P			
Plot Address					SAP Version	10.2	
SAP Rating	80 C	DER	3.90	TER	11.94		
Environmental	97 A	% DER < TER				67.34	
CO ₂ Emissions (t/year)	0.23	DFEE	27.64	TFEE	27.65		
Compliance Check	See BREL	% DFEE < TFEE				0.03	
% DPER < TPER	35.47	DPER	41.02	TPER	63.57		
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	68.1700 (1b)	x 2.5000 (2b)	= 170.4250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.1700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.4250 (5)

2. Ventilation rate

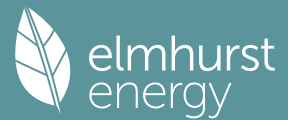
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												71.2000 (23c)
Effective ac	0.3066	0.3034	0.3002	0.2843	0.2811	0.2651	0.2651	0.2619	0.2715	0.2811	0.2874	0.2938 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			18.9900	0.9615	18.2596		(27)
External Wall	49.3900	18.9900	30.4000	0.1600	4.8640	14.0000	425.6000 (29a)
Communal Wall	20.6600	1.8900	18.7700	0.2100	3.9417	14.0000	262.7800 (29a)
Total net area of external elements Aum(A, m ²)			70.0500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	28.9553	(33)
Main dwelling							
Party Wall			23.8000	0.0000	0.0000	20.0000	476.0000 (32)
Party Floor			68.1700			80.0000	5453.6000 (32d)
Party Ceiling			68.1700			100.0000	6817.0000 (32b)
Stud			115.0000			9.0000	1035.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	14469.9800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							212.2632 (35)
List of Thermal Bridges							

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K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.0500	0.0500	0.4525
E4 Jamb	27.5000	0.0500	1.3750
E7 Party floor between dwellings (in blocks of flats)	44.9400	0.0700	3.1458
E16 Corner (normal)	7.5000	0.0900	0.6750
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	11.1000	0.0200	0.2220
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - intermediate floor between dwellings (in blocks of flats)	19.0400	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9453 (36)
 Point Thermal Bridges 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 34.9006 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	17.2412	17.0619	16.8826	15.9863	15.8070	14.9107	14.9107	14.7314	15.2692	15.8070	16.1656	16.5241 (38)
Average = Sum(39)m / 12 =	52.1418	51.9625	51.7832	50.8869	50.7076	49.8113	49.8113	49.6320	50.1698	50.7076	51.0662	51.4247 (39)
												50.8421
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7649	0.7622	0.7596	0.7465	0.7438	0.7307	0.7307	0.7281	0.7360	0.7438	0.7491	0.7544 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2009 (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	26.4074	26.0152	25.4629	24.4446	23.6821	22.8366	22.3799	22.9284	23.5255	24.4302	25.4695	26.3181 (42b)
Hot water usage for other uses	37.1693	35.8177	34.4661	33.1145	31.7629	30.4113	30.4113	31.7629	33.1145	34.4661	35.8177	37.1693 (42c)
Average daily hot water use (litres/day)												58.2741 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	63.5767	61.8329	59.9290	57.5591	55.4450	53.2479	52.7912	54.6912	56.6400	58.8963	61.2872	63.4874 (44)
Energy content (annual)	100.6899	88.0492	92.1086	78.7955	74.6396	65.4745	63.8464	67.7192	69.8427	79.9217	87.3148	99.4060 (45)
Distribution loss (46)m = 0.15 x (45)m	15.1035	13.2074	13.8163	11.8193	11.1959	9.8212	9.5770	10.1579	10.4764	11.9883	13.0972	14.9109 (46)
Water storage loss (or HIU loss):	110.0000 (47)											
Store volume	110.0000 (47)											
b) If manufacturer declared loss factor is not known :	0.0152 (51)											
Hot water storage loss factor from Table 2 (kWh/litre/day)	1.0294 (52)											
Volume factor from Table 2a	0.6000 (53)											
Temperature factor from Table 2b	1.0327 (55)											
Enter (49) or (54) in (55)	1.0327 (55)											
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	155.9667	137.9767	147.3855	132.2892	129.9164	118.9682	119.1232	122.9960	123.3364	135.1985	140.8085	154.6828 (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	155.9667	137.9767	147.3855	132.2892	129.9164	118.9682	119.1232	122.9960	123.3364	135.1985	140.8085	154.6828 (64)
Total per year (kWh/year)	1618.6479 (64)											
Electric shower(s)	48.9480	43.6131	47.6238	45.4468	46.2996	44.1653	45.6375	46.2996	45.4468	47.6238	46.7283	48.9480 (64a)
Heat gains from water heating, kWh/month	89.9378	80.1216	86.7535	80.3562	80.6140	75.6065	76.8597	78.3130	77.3794	82.7013	83.5092	89.5109 (65)

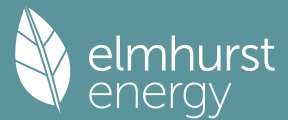
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	97.3407	107.7701	97.3407	100.5854	97.3407	100.5854	97.3407	97.3407	100.5854	97.3407	100.5854	97.3407 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	192.9888	194.9914	189.9449	179.2014	165.6397	152.8936	144.3784	142.3758	147.4223	158.1658	171.7275	184.4736 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044 (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)	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356 (71)
Water heating gains (Table 5)	120.8842	119.2285	116.6042	111.6058	108.3522	105.0091	103.3061	105.2594	107.4713	111.1577	115.9850	120.3104 (72)
Total internal gains	467.2270	478.0034	459.9031	447.4059	427.3459	414.5014	401.0385	400.9892	411.4924	422.6776	444.3112	458.1380 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
South	4.2200	46.7521	0.4000	0.7000	0.7700	38.2829 (78)
West	14.7700	19.6403	0.4000	0.7000	0.7700	56.2884 (80)

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Solar gains	94.5713	172.8096	261.2044	354.7373	418.1824	422.3168	404.3277	357.2310	294.3336	198.2824	115.5633	79.3688 (83)
Total gains	561.7983	650.8129	721.1075	802.1432	845.5283	836.8182	805.3662	758.2201	705.8260	620.9600	559.8745	537.5068 (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	77.0867	77.3527	77.6205	78.9877	79.2669	80.6933	80.6933	80.9848	80.1166	79.2669	78.7104	78.1616	
alpha	6.1391	6.1568	6.1747	6.2658	6.2845	6.3796	6.3796	6.3990	6.3411	6.2845	6.2474	6.2108	
util living area	0.9748	0.9433	0.8774	0.7278	0.5514	0.3805	0.2721	0.3010	0.4877	0.7834	0.9416	0.9795 (86)	
MIT	20.3731	20.5677	20.7705	20.9377	20.9895	20.9992	20.9999	20.9999	20.9962	20.9202	20.6444	20.3438 (87)	
Th 2	20.2839	20.2862	20.2885	20.3000	20.3023	20.3138	20.3138	20.3161	20.3092	20.3023	20.2977	20.2931 (88)	
util rest of house	0.9692	0.9320	0.8563	0.6942	0.5120	0.3399	0.2297	0.2563	0.4400	0.7456	0.9281	0.9749 (89)	
MIT 2	19.7233	19.9116	20.1010	20.2546	20.2958	20.3134	20.3138	20.3161	20.3073	20.2458	19.9972	19.7027 (90)	
Living area fraction									fLA = Living area / (4) =				0.4034 (91)
MIT	19.9855	20.1763	20.3711	20.5302	20.5756	20.5901	20.5906	20.5919	20.5852	20.5179	20.2583	19.9613 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.9855	20.1763	20.3711	20.5302	20.5756	20.5901	20.5906	20.5919	20.5852	20.5179	20.2583	19.9613 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9665	0.9301	0.8589	0.7055	0.5275	0.3562	0.2468	0.2743	0.4591	0.7577	0.9273	0.9723 (94)
Useful gains	542.9723	605.3176	619.3814	565.8907	446.0198	298.1059	198.7556	208.0145	324.0650	470.5317	519.1556	522.6134 (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	817.8676	793.7943	718.2895	591.8236	450.0621	298.3727	198.7755	208.0529	325.3615	502.9118	671.9419	810.5199 (97)
Space heating kWh	204.5221	126.6564	73.5876	18.6717	3.0075	0.0000	0.0000	0.0000	0.0000	24.0908	110.0061	214.2025 (98a)
Space heating requirement - total per year (kWh/year)												774.7448
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	204.5221	126.6564	73.5876	18.6717	3.0075	0.0000	0.0000	0.0000	0.0000	24.0908	110.0061	214.2025 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												774.7448
Space heating per m2											(98c) / (4) =	11.3649 (99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space and Water												1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500 (305)
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system												1.5000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	204.5221	126.6564	73.5876	18.6717	3.0075	0.0000	0.0000	0.0000	0.0000	24.0908	110.0061	214.2025 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	322.1224	199.4838	115.9005	29.4079	4.7368	0.0000	0.0000	0.0000	0.0000	37.9430	173.2596	337.3689
Space heating requirement	322.1224	199.4838	115.9005	29.4079	4.7368	0.0000	0.0000	0.0000	0.0000	37.9430	173.2596	337.3689 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement	155.9667	137.9767	147.3855	132.2892	129.9164	118.9682	119.1232	122.9960	123.3364	135.1985	140.8085	154.6828 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	233.9501	206.9650	221.0782	198.4338	194.8746	178.4522	178.6848	184.4939	185.0046	202.7977	211.2127	232.0241
Water heating fuel	233.9501	206.9650	221.0782	198.4338	194.8746	178.4522	178.6848	184.4939	185.0046	202.7977	211.2127	232.0241 (310)
Cooling System Energy Efficiency Ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	16.0695	14.5144	16.0695	15.5512	16.0695	15.5512	16.0695	16.0695	15.5512	16.0695	15.5512	16.0695 (331)
Lighting	21.4240	17.1872	15.4751	11.3377	8.7576	7.1550	7.9890	10.3844	13.4883	17.6973	19.9891	22.0195 (332)
Electricity generated by PVs (Appendix M) (negative quantity)	-12.8678	-21.8040	-38.1267	-50.6492	-60.6454	-58.9698	-58.0281	-51.4153	-40.4532	-27.7042	-15.1885	-10.6054 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												1220.2230 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2427.9718 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												12.2022 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9100)												
mechanical ventilation fans (SFP = 0.9100)												189.2058 (330a)
Total electricity for the above, kWh/year												189.2058 (331)
Electricity for lighting (calculated in Appendix L)												172.9042 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-446.4576 (333)
Wind generation												0.0000 (334)

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Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4120.6277 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			280.0000 (367)
Space and Water heating from Heat pump	1302.9267	0.1584	69.0358 (367)
Electrical energy for heat distribution (space & water)	12.2022	0.0000	5.3425 (372)
Overall CO2 factor for heat network			0.0538 (386)
Total CO2 associated with community systems			196.1456 (373)
Energy for instantaneous electric shower(s)	556.7804	0.1391	77.4605 (264a)
Space and water heating			196.1456 (376)
Pumps, fans and electric keep-hot	189.2058	0.1387	26.2452 (378)
Energy for lighting	172.9042	0.1443	24.9554 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-446.4576	0.1314	-58.6687
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-58.6687 (380)
Total CO2, kg/year			266.1380 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.9000 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	1302.9267	1.5864	691.3329 (467)
Electrical energy for heat distribution (space & water)	12.2022	0.0000	56.2435 (472)
Overall CO2 factor for heat network			0.5660 (486)
Total CO2 associated with community systems			2064.9395 (473)
Energy for instantaneous electric shower(s)	556.7804	1.5143	843.1516 (278a)
Space and water heating			2064.9395 (476)
Pumps, fans and electric keep-hot	189.2058	1.5128	286.2306 (478)
Energy for lighting	172.9042	1.5338	265.2062 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-446.4576	1.4855	-663.2071
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-663.2071 (480)
Total Primary energy kWh/year			2796.3209 (483)
Dwelling Primary energy Rate (DPER)			41.0200 (484)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	68.1700 (1b)	x 2.5000 (2b)	= 170.4250 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.1700		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.4250 (5)

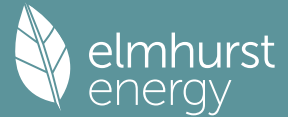
2. Ventilation rate

	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	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1174 (8)
Pressure Test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3674	(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) =		0.3123 (21)

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

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Effective ac	0.3981	0.3903	0.3825	0.3435	0.3357	0.2966	0.2966	0.2888	0.3123	0.3357	0.3513	0.3669 (22b)
	0.5792	0.5762	0.5732	0.5590	0.5563	0.5440	0.5440	0.5417	0.5488	0.5563	0.5617	0.5673 (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
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			15.1600	1.1450	17.3588		(27)
External Wall	49.3900	15.1600	34.2300	0.1800	6.1614		(29a)
Communal Wall	20.6600	1.8900	18.7700	0.1800	3.3786		(29a)
Total net area of external elements Aum(A, m2)			70.0500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26) ... (30) + (32) =	28.7888	(33)
Main dwelling							
Party Wall			23.8000	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 212.2632 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.0500	0.0500	0.4525
E4 Jamb	27.5000	0.0500	1.3750
E7 Party floor between dwellings (in blocks of flats)	44.9400	0.0700	3.1458
E16 Corner (normal)	7.5000	0.0900	0.6750
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	11.1000	0.0200	0.2220
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	19.0400	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9453 (36)

Point Thermal Bridges

Total fabric heat loss (33) + (36) + (36a) = 34.7341 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	32.5771	32.4041	32.2344	31.4376	31.2885	30.5945	30.5945	30.4660	30.8618	31.2885	31.5901	31.9054 (38)
Average = Sum(39)m / 12 =	67.3112	67.1381	66.9685	66.1717	66.0226	65.3286	65.3286	65.2001	65.5959	66.0226	66.3242	66.6395 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9874	0.9849	0.9824	0.9707	0.9685	0.9583	0.9583	0.9564	0.9622	0.9685	0.9729	0.9775 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2009 (42)

Hot water usage for mixer showers	61.1213	60.2028	58.8643	56.3033	54.4134	52.3058	51.1078	52.4362	53.8923	56.1553	58.7712	60.8871 (42a)
Hot water usage for baths	26.4074	26.0152	25.4629	24.4446	23.6821	22.8366	22.3799	22.9284	23.5255	24.4302	25.4695	26.3181 (42b)
Hot water usage for other uses	37.1693	35.8177	34.4661	33.1145	31.7629	30.4113	30.4113	31.7629	33.1145	34.4661	35.8177	37.1693 (42c)
Average daily hot water use (litres/day)												114.6259 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	124.6980	122.0357	118.7933	113.8624	109.8584	105.5537	103.8990	107.1274	110.5323	115.0515	120.0584	124.3745 (44)
Energy content (annual)	197.4912	173.7772	182.5809	155.8720	147.8905	129.7906	125.6569	132.6461	136.2973	156.1238	171.0452	194.7405 (45)
Distribution loss (46)m = 0.15 x (45)m	29.6237	26.0666	27.3871	23.3808	22.1836	19.4686	18.8485	19.8969	20.4446	23.4186	25.6568	29.2111 (46)

Water storage loss (or HIU loss): 150.0000 (47)

Store volume 1.3938 (48)

a) If manufacturer declared loss factor is known (kWh/day): 0.5400 (49)

Temperature factor from Table 2b 0.7527 (55)

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

Total storage loss 23.3325 21.0745 23.3325 22.5798 23.3325 22.5798 23.3325 23.3325 22.5798 23.3325 22.5798 23.3325 (56)

If cylinder contains dedicated solar storage 23.3325 21.0745 23.3325 22.5798 23.3325 22.5798 23.3325 23.3325 22.5798 23.3325 22.5798 23.3325 (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 244.0861 215.8629 229.1758 200.9638 194.4854 174.8824 172.2518 179.2410 181.3892 202.7187 216.1370 241.3354 (62)

WWHRS -27.9421 -24.7122 -25.8772 -21.4274 -19.9695 -17.0881 -16.0173 -17.0328 -17.6800 -20.8427 -23.6123 -27.4247 (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 216.1439 191.1507 203.2985 179.5364 174.5159 157.7943 156.2344 162.2082 163.7092 181.8760 192.5247 213.9107 (64)

Total per year (kWh/year) = Sum(64)m = 2192.9031 (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)

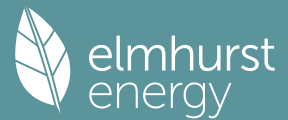
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month 102.9417 91.4495 97.9841 87.9009 86.4495 79.2288 79.0568 81.3808 81.3923 89.1871 92.9460 102.0271 (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	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	97.3459	107.7758	97.3459	100.5908	97.3459	100.5908	97.3459	97.3459	100.5908	97.3459	100.5908	97.3459 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	192.9888	194.9914	189.9449	179.2014	165.6397	152.8936	144.3784	142.3758	147.4223	158.1658	171.7275	184.4736 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044 (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)												

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	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356 (71)
Water heating gains (Table 5)	138.3625	136.0855	131.6990	122.0846	116.1956	110.0401	106.2592	109.3827	113.0449	119.8751	129.0917	137.1332 (72)
Total internal gains	487.7106	497.8661	478.0031	460.8901	438.1945	419.5377	403.9968	405.1178	417.0713	434.4002	460.4233	477.9661 (73)

6. Solar gains

[Jan]	Area m2		Solar flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		FF Access factor Table 6d		Gains W	
South	3.3700		46.7521		0.6300		0.7000		0.7700		48.1507 (78)	
West	11.7900		19.6403		0.6300		0.7000		0.7700		70.7674 (80)	
Solar gains	118.9180	217.2944	328.4359	446.0337	525.8006	530.9966	508.3791	449.1664	370.0888	249.3221	145.3136	99.8023 (83)
Total gains	606.6286	715.1605	806.4391	906.9238	963.9951	950.5343	912.3759	854.2841	787.1601	683.7223	605.7368	577.7684 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	59.7142	59.8682	60.0198	60.7426	60.8797	61.5265	61.5265	61.6477	61.2757	60.8797	60.6029	60.3162
alpha	4.9809	4.9912	5.0013	5.0495	5.0586	5.1018	5.1018	5.1098	5.0850	5.0586	5.0402	5.0211
util living area	0.9781	0.9530	0.9004	0.7787	0.6117	0.4361	0.3145	0.3500	0.5598	0.8367	0.9552	0.9822 (86)
MIT	20.0194	20.2617	20.5469	20.8249	20.9548	20.9934	20.9990	20.9983	20.9778	20.7875	20.3637	19.9778 (87)
Th 2	20.0938	20.0960	20.0980	20.1078	20.1097	20.1182	20.1182	20.1198	20.1149	20.1097	20.1060	20.1021 (88)
util rest of house	0.9728	0.9424	0.8796	0.7411	0.5604	0.3776	0.2517	0.2836	0.4937	0.7974	0.9432	0.9778 (89)
MIT 2	18.9724	19.2745	19.6204	19.9424	20.0740	20.1144	20.1179	20.1191	20.1007	19.9130	19.4131	18.9265 (90)
Living area fraction	19.3948	19.6727	19.9941	20.2984	20.4293	20.4690	20.4733	20.4738	20.4545	20.2657	19.7966	19.3506 (92)
Temperature adjustment	19.3948	19.6727	19.9941	20.2984	20.4293	20.4690	20.4733	20.4738	20.4545	20.2657	19.7966	19.3506 (93)
adjusted MIT	19.3948	19.6727	19.9941	20.2984	20.4293	20.4690	20.4733	20.4738	20.4545	20.2657	19.7966	19.3506 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9676	0.9365	0.8770	0.7495	0.5792	0.4010	0.2771	0.3104	0.5195	0.8049	0.9382	0.9731 (94)
Useful gains	587.0030	669.7653	707.2414	679.7748	558.3605	381.1764	252.7742	265.1428	408.9310	550.3107	568.3080	562.2400 (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	1016.0475	991.8135	903.6818	754.2513	576.3338	383.4123	253.0376	265.6109	416.8316	638.1573	842.0903	1009.6296 (97)
Space heating kWh	319.2091	216.4164	146.1517	53.6231	13.3722	0.0000	0.0000	0.0000	0.0000	65.3578	197.1233	332.8579 (98a)
Space heating requirement - total per year (kWh/year)												1344.1114
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	319.2091	216.4164	146.1517	53.6231	13.3722	0.0000	0.0000	0.0000	0.0000	65.3578	197.1233	332.8579 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1344.1114
Space heating per m2										(98c) / (4) =		19.7171 (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	319.2091	216.4164	146.1517	53.6231	13.3722	0.0000	0.0000	0.0000	0.0000	65.3578	197.1233	332.8579 (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)	345.8387	234.4706	158.3442	58.0965	14.4877	0.0000	0.0000	0.0000	0.0000	70.8102	213.5680	360.6261 (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	216.1439	191.1507	203.2985	179.5364	174.5159	157.7943	156.2344	162.2082	163.7092	181.8760	192.5247	213.9107 (64)
Efficiency of water heater (217)m	84.9326	84.3389	83.3323	81.7045	80.3798	79.8000	79.8000	79.8000	79.8000	81.9969	84.1128	79.8000 (216)
Fuel for water heating, kWh/month	254.4887	226.6460	243.9612	219.7388	217.1141	197.7373	195.7825	203.2684	205.1494	221.8083	228.8888	85.0474 (217)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.0685	7.3041	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	20.2266	16.2265	14.6102	10.7040	8.2681	6.7551	7.5424	9.8039	12.7344	16.7082	18.8718	20.7887 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-15.1275	-22.6981	-34.7004	-41.5797	-47.1174	-44.8236	-44.2807	-40.6629	-34.6977	-27.0579	-17.1114	-12.9238 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												

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(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	-4.8354	-10.4467	-21.2862	-32.7533	-44.0851	-44.5791	-44.0525	-36.9389	-26.6087	-15.1895	-6.5348	-3.8034	(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												1456.2421	(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												2666.1028	(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)												163.2399	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-673.8946	(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												3697.6901	(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	1456.2421	0.2100	305.8108	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2666.1028	0.2100	559.8816	(264)
Space and water heating			865.6924	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	163.2399	0.1443	23.5606	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-382.7811	0.1333	-51.0237	
PV Unit electricity exported	-291.1135	0.1252	-36.4462	
Total			-87.4699	(269)
Total CO2, kg/year			813.7124	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.9400	(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	1456.2421	1.1300	1645.5535	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2666.1028	1.1300	3012.6961	(278)
Space and water heating			4658.2497	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	163.2399	1.5338	250.3828	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-382.7811	1.4926	-571.3277	
PV Unit electricity exported	-291.1135	0.4595	-133.7728	
Total			-705.1006	(283)
Total Primary energy kWh/year			4333.6327	(286)
Target Primary Energy Rate (TPER)			63.5700	(287)

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Plot Reference	B2 2B4P Mid			Issued on Date	19/12/2025
Assessment Reference	2B4P	Plot Type Ref	2B4P		
Plot Address				SAP Version	10.2
SAP Rating	80 C	DER	3.90	TER	11.94
Environmental	97 A	% DER < TER			67.34
CO ₂ Emissions (t/year)	0.23	DFEE	27.64	TFEE	27.65
Compliance Check	See BREL	% DFEE < TFEE			0.03
% DPER < TPER	35.47	DPER	41.02	TPER	63.57
Assessor Details	Mr. Matthew Stainrod			Assessor ID	AU83-0001
Client	ROK, Wilf Foster				

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	68.1700 (1b)	2.5000 (2b)	170.4250 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.1700		170.4250 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 170.4250 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1174 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2674 (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) = 0.2273 (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)
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	0.2897	0.2841	0.2784	0.2500	0.2443	0.2159	0.2159	0.2102	0.2273	0.2443	0.2557	0.2670 (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	0.5420	0.5403	0.5387	0.5312	0.5298	0.5233	0.5233	0.5221	0.5258	0.5298	0.5327	0.5356 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			18.9900	0.9615	18.2596		(27)
External Wall	49.3900	18.9900	30.4000	0.1600	4.8640	14.0000	425.6000 (29a)
Communal Wall	20.6600	1.8900	18.7700	0.2100	3.9417	14.0000	262.7800 (29a)
Total net area of external elements Aum(A, m ²)			70.0500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.9553		(33)
Main dwelling							
Party Wall			23.8000	0.0000	0.0000	20.0000	476.0000 (32)
Party Floor			68.1700			80.0000	5453.6000 (32a)
Party Ceiling			68.1700			100.0000	6817.0000 (32b)
Stud			115.0000			9.0000	1035.0000 (32c)
Heat capacity Cm = Sum (A x k)						(28)...(30) + (32) + (32a)...(32e) =	14469.9800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							212.2632 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				9.0500	0.0500	0.4525	
E4 Jamb				27.5000	0.0500	1.3750	

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E7 Party floor between dwellings (in blocks of flats)	44.9400	0.0700	3.1458									
E16 Corner (normal)	7.5000	0.0900	0.6750									
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250									
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	11.1000	0.0200	0.2220									
E18 Party wall between dwellings	5.0000	0.0600	0.3000									
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	19.0400	0.0000	0.0000									
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				5.9453 (36)								
Point Thermal bridges			(36a) =	0.0000								
Total fabric heat loss		(33) + (36) + (36a) =		34.9006 (37)								
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 30.4809	Feb 30.3892	Mar 30.2993	Apr 29.8773	May 29.7983	Jun 29.4307	Jul 29.4307	Aug 29.3627	Sep 29.5723	Oct 29.7983	Nov 29.9581	Dec 30.1251 (38)
Heat transfer coeff	65.3815	65.2898	65.2000	64.7779	64.6989	64.3314	64.3314	64.2633	64.4729	64.6989	64.8587	65.0257 (39)
Average = Sum(39)m / 12 =												64.7775
HLP	Jan 0.9591	Feb 0.9577	Mar 0.9564	Apr 0.9502	May 0.9491	Jun 0.9437	Jul 0.9437	Aug 0.9427	Sep 0.9458	Oct 0.9491	Nov 0.9514	Dec 0.9539 (40)
HLP (average)												0.9502
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.2009 (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	26.4074	26.0152	25.4629	24.4446	23.6821	22.8366	22.3799	22.9284	23.5255	24.4302	25.4695	26.3181 (42b)
Hot water usage for other uses	37.1693	35.8177	34.4661	33.1145	31.7629	30.4113	30.4113	31.7629	33.1145	34.4661	35.8177	37.1693 (42c)
Average daily hot water use (litres/day)												58.2741 (43)
Daily hot water use	Jan 63.5767	Feb 61.8329	Mar 59.9290	Apr 57.5591	May 55.4450	Jun 53.2479	Jul 52.7912	Aug 54.6912	Sep 56.6400	Oct 58.8963	Nov 61.2872	Dec 63.4874 (44)
Energy conte	100.6899	88.0492	92.1086	78.7955	74.6396	65.4745	63.8464	67.7192	69.8427	79.9217	87.3148	99.4060 (45)
Energy content (annual)										Total = Sum(45)m =		967.8081
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 (or HIU 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	85.5865	74.8418	78.2924	66.9762	63.4437	55.6533	54.2694	57.5613	59.3663	67.9334	74.2176	84.4951 (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	85.5865	74.8418	78.2924	66.9762	63.4437	55.6533	54.2694	57.5613	59.3663	67.9334	74.2176	84.4951 (64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				822.6369 (64)
Electric shower(s)	48.9480	43.6131	47.6238	45.4468	46.2996	44.1653	45.6375	46.2996	45.4468	47.6238	46.7283	48.9480 (64a)
Heat gains from water heating, kWh/month	33.6336	29.6137	31.4790	28.1057	27.4358	24.9547	24.9767	25.9652	26.2033	28.8893	30.2365	33.3608 (65)

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

Metabolic gains (Table 5), Watts	Jan (66)m 110.0445	Feb 110.0445	Mar 110.0445	Apr 110.0445	May 110.0445	Jun 110.0445	Jul 110.0445	Aug 110.0445	Sep 110.0445	Oct 110.0445	Nov 110.0445	Dec 110.0445 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	97.3407	107.7701	97.3407	100.5854	97.3407	100.5854	97.3407	97.3407	100.5854	97.3407	100.5854	97.3407 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	192.9888	194.9914	189.9449	179.2014	165.6397	152.8936	144.3784	142.3758	147.4223	158.1658	171.7275	184.4736 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044 (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)	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356 (71)
Water heating gains (Table 5)	45.2065	44.0680	42.3105	39.0358	36.8761	34.6592	33.5709	34.8995	36.3934	38.8297	41.9951	44.8397 (72)
Total internal gains	391.5493	402.8429	385.6094	374.8359	355.8698	344.1516	331.3033	330.6293	340.4145	350.3496	370.3213	382.6674 (73)

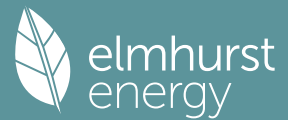
6. Solar gains												

[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	4.2200			46.7521		0.4000		0.7000		0.7700		38.2829 (78)
West	14.7700			19.6403		0.4000		0.7000		0.7700		56.2884 (80)
Solar gains	94.5713	172.8096	261.2044	354.7373	418.1824	422.3168	404.3277	357.2310	294.3336	198.2824	115.5633	79.3688 (83)
Total gains	486.1206	575.6524	646.8139	729.5732	774.0523	766.4684	735.6310	687.8603	634.7481	548.6319	485.8846	462.0362 (84)

7. Mean internal temperature (heating season)												

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.4767	61.5630	61.6479	62.0495	62.1253	62.4802	62.4802	62.5464	62.3430	62.1253	61.9723	61.8131
alpha	5.0984	5.1042	5.1099	5.1366	5.1417	5.1653	5.1653	5.1698	5.1562	5.1417	5.1315	5.1209
util living area	0.9910	0.9785	0.9496	0.8655	0.7171	0.5269	0.3831	0.4266	0.6631	0.9095	0.9802	0.9929 (86)
MIT	19.8658	20.0928	20.3840	20.7162	20.9132	20.9853	20.9977	20.9960	20.9553	20.6761	20.2081	19.8207 (87)
Th 2	20.1176	20.1187	20.1198	20.1250	20.1260	20.1305	20.1305	20.1314	20.1288	20.1260	20.1240	20.1219 (88)
util rest of house	0.9886	0.9731	0.9372	0.8356	0.6654	0.4594	0.3083	0.3476	0.5925	0.8817	0.9743	0.9910 (89)
MIT 2	19.0884	19.3127	19.5956	19.9062	20.0700	20.1237	20.1298	20.1301	20.1052	19.8790	19.4326	19.0473 (90)
Living area fraction									FLA = Living area / (4) =			0.4034 (91)
MIT	19.4020	19.6274	19.9136	20.2330	20.4101	20.4713	20.4799	20.4794	20.4481	20.2005	19.7454	19.3593 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4020	19.6274	19.9136	20.2330	20.4101	20.4713	20.4799	20.4794	20.4481	20.2005	19.7454	19.3593 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9861	0.9694	0.9338	0.8396	0.6829	0.4862	0.3385	0.3795	0.6192	0.8844	0.9711	0.9889 (94)
Useful gains	479.3736	558.0420	603.9750	612.5766	528.5923	372.6918	248.9796	261.0456	393.0649	485.2150	471.8276	456.9193 (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	987.3923	961.5478	874.5679	734.1265	563.5346	377.7084	249.6007	262.1560	409.2836	621.1451	820.1662	985.7440 (97)
Space heating kWh	377.9659	271.1559	201.3211	87.5159	25.9971	0.0000	0.0000	0.0000	0.0000	101.1320	250.8038	393.4456 (98a)
Space heating requirement - total per year (kWh/year)												1709.3372
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	377.9659	271.1559	201.3211	87.5159	25.9971	0.0000	0.0000	0.0000	0.0000	101.1320	250.8038	393.4456 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1709.3372
Space heating per m2										(98c) / (4) =		25.0746 (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	604.7147	476.0520	488.4009	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.9455	0.9633	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	571.7775	463.8963	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	859.4166	825.2787	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	207.1002	268.8685	223.8489	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	51.7751	67.2171	55.9622	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												174.9544 (107)
Energy for space heating												25.0746 (99)
Energy for space cooling												2.5664 (108)
Total												27.6411 (109)
Fabric Energy Efficiency (DFEE)												27.6 (109)

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

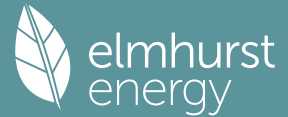
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	68.1700	2.5000	170.4250
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.1700		170.4250 (1b) - (3b)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	170.4250 (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	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	(6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 20.0000 / (5) = 0.1174 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)

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Infiltration rate												0.3674 (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) = 0.3123 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	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)
Adj infilt rate	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)
	0.3981	0.3903	0.3825	0.3435	0.3357	0.2966	0.2966	0.2888	0.3123	0.3357	0.3513	0.3669 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.5792	0.5762	0.5732	0.5590	0.5563	0.5440	0.5440	0.5417	0.5488	0.5563	0.5617	0.0000 (23c)
												0.5673 (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					
Main dwelling												
TER Opaque door			1.8900	1.0000	1.8900			(26)				
TER Opening Type			15.1600	1.1450	17.3588			(27)				
External Wall	49.3900	15.1600	34.2300	0.1800	6.1614			(29a)				
Communal Wall	20.6600	1.8900	18.7700	0.1800	3.3786			(29a)				
Total net area of external elements Aum(A, m2)			70.0500					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.7888			(33)				
Main dwelling												
Party Wall			23.8000	0.0000	0.0000			(32)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								212.2632 (35)				
List of Thermal Bridges												
K1 Element				Length	Psi-value		Total					
E2 Other lintels (including other steel lintels)				9.0500	0.0500		0.4525					
E4 Jamb				27.5000	0.0500		1.3750					
E7 Party floor between dwellings (in blocks of flats)				44.9400	0.0700		3.1458					
E16 Corner (normal)				7.5000	0.0900		0.6750					
E17 Corner (inverted - internal area greater than external area)				2.5000	-0.0900		-0.2250					
E23 Balcony within or between dwellings, balcony support penetrates wall insulation				11.1000	0.0200		0.2220					
E18 Party wall between dwellings				5.0000	0.0600		0.3000					
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				19.0400	0.0000		0.0000					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								5.9453 (36)				
Point Thermal bridges							(36a) =	0.0000				
Total fabric heat loss							(33) + (36) + (36a) =	34.7341 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	32.5771	32.4041	32.2344	31.4376	31.2885	30.5945	30.5945	30.4660	30.8618	31.2885	31.5901	31.9054 (38)
Average = Sum(39)m / 12 =	67.3112	67.1381	66.9685	66.1717	66.0226	65.3286	65.3286	65.2001	65.5959	66.0226	66.3242	66.6395 (39)
												66.1710
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9874	0.9849	0.9824	0.9707	0.9685	0.9583	0.9583	0.9564	0.9622	0.9685	0.9729	0.9775 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

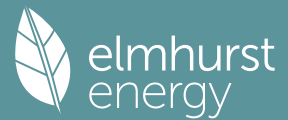
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2009 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses	26.4074	26.0152	25.4629	24.4446	23.6821	22.8366	22.3799	22.9284	23.5255	24.4302	25.4695	26.3181 (42c)
Average daily hot water use (litres/day)	37.1693	35.8177	34.4661	33.1145	31.7629	30.4113	30.4113	31.7629	33.1145	34.4661	35.8177	37.1693 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	63.5767	61.8329	59.9290	57.5591	55.4450	53.2479	52.7912	54.6912	56.6400	58.8963	61.2872	63.4874 (44)
Energy content (annual)	100.6899	88.0492	92.1086	78.7955	74.6396	65.4745	63.8464	67.7192	69.8427	79.9217	87.3148	99.4060 (45)
Distribution loss (46)m = 0.15 x (45)m												967.8081
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	
Water storage loss (or HIU loss):												0.0000 (46)
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	85.5865	74.8418	78.2924	66.9762	63.4437	55.6533	54.2694	57.5613	59.3663	67.9334	74.2176	84.4951 (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	85.5865	74.8418	78.2924	66.9762	63.4437	55.6533	54.2694	57.5613	59.3663	67.9334	74.2176	84.4951 (64)
12Total per year (kWh/year)												822.6369 (64)
Electric shower(s)	48.9480	43.6131	47.6238	45.4468	46.2996	44.1653	45.6375	46.2996	45.4468	47.6238	46.7283	48.9480 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												556.7804 (64a)
Heat gains from water heating, kWh/month	33.6336	29.6137	31.4790	28.1057	27.4358	24.9547	24.9767	25.9652	26.2033	28.8893	30.2365	33.3608 (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
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(66)m	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	97.3459	107.7758	97.3459	100.5908	97.3459	100.5908	97.3459	97.3459	100.5908	97.3459	100.5908	97.3459	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	192.9888	194.9914	189.9449	179.2014	165.6397	152.8936	144.3784	142.3758	147.4223	158.1658	171.7275	184.4736	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	(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)	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	(71)
Water heating gains (Table 5)	45.2065	44.0680	42.3105	39.0358	36.8761	34.6592	33.5709	34.8995	36.3934	38.8297	41.9951	44.8397	(72)
Total internal gains	391.5545	402.8486	385.6147	374.8413	355.8750	344.1569	331.3085	330.6345	340.4199	350.3548	370.3267	382.6726	(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				3.3700	46.7521	0.6300	0.7000		0.7700		48.1507 (78)	
West				11.7900	19.6403	0.6300	0.7000		0.7700		70.7674 (80)	
Solar gains	118.9180	217.2944	328.4359	446.0337	525.8006	530.9966	508.3791	449.1664	370.0888	249.3221	145.3136	99.8023 (83)
Total gains	510.4725	620.1430	714.0506	820.8749	881.6756	875.1535	839.6876	779.8009	710.5086	599.6769	515.6403	482.4749 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	59.7142	59.8682	60.0198	60.7426	60.8797	61.5265	61.5265	61.6477	61.2757	60.8797	60.6029	60.3162
alpha	4.9809	4.9912	5.0013	5.0495	5.0586	5.1018	5.1018	5.1098	5.0850	5.0586	5.0402	5.0211
util living area	0.9892	0.9724	0.9324	0.8241	0.6582	0.4719	0.3414	0.3828	0.6121	0.8859	0.9757	0.9916 (86)
MIT	19.8560	20.1165	20.4354	20.7697	20.9376	20.9905	20.9985	20.9974	20.9671	20.7118	20.2238	19.8129 (87)
Th 2	20.0938	20.0960	20.0980	20.1078	20.1097	20.1182	20.1182	20.1198	20.1149	20.1097	20.1060	20.1021 (88)
util rest of house	0.9864	0.9656	0.9167	0.7896	0.6058	0.4093	0.2735	0.3105	0.5426	0.8535	0.9685	0.9894 (89)
MIT 2	19.0599	19.3169	19.6243	19.9346	20.0705	20.1139	20.1178	20.1190	20.0981	19.8944	19.4328	19.0238 (90)
Living area fraction	fLA = Living area / (4) = 0.4034 (91)											
MIT	19.3811	19.6394	19.9515	20.2715	20.4203	20.4675	20.4731	20.4733	20.4486	20.2241	19.7519	19.3422 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.3811	19.6394	19.9515	20.2715	20.4203	20.4675	20.4731	20.4733	20.4486	20.2241	19.7519	19.3422 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9835	0.9614	0.9138	0.7964	0.6246	0.4343	0.3009	0.3397	0.5694	0.8581	0.9650	0.9870	(94)
Useful gains	502.0669	596.2196	652.4658	653.7283	550.7090	380.1048	252.6340	264.8686	404.5923	514.6027	497.6088	476.2060	(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	1015.1242	989.5780	900.8292	752.4695	575.7366	383.3186	253.0229	265.5825	416.4444	635.4112	839.1257	1009.0656	(97)
Space heating kWh	381.7146	264.3369	184.7824	71.0937	18.6205	0.0000	0.0000	0.0000	0.0000	89.8816	245.8922	396.4476	(98a)
Space heating requirement - total per year (kWh/year)												1652.7694	
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	381.7146	264.3369	184.7824	71.0937	18.6205	0.0000	0.0000	0.0000	0.0000	89.8816	245.8922	396.4476	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1652.7694	
Space heating per m2										(98c) / (4) =		24.2448	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan 4.3000	Feb 4.9000	Mar 6.5000	Apr 8.9000	May 11.7000	Jun 14.6000	Jul 16.6000	Aug 16.4000	Sep 14.1000	Oct 10.6000	Nov 7.1000	Dec 4.2000
Heat loss rate W												
	0.0000	0.0000	0.0000	0.0000	0.0000	614.0889	483.4317	495.5207	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9644	0.9839	0.9759	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	592.2243	475.6381	483.5933	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	986.4454	946.8977	878.7872	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	283.8392	350.6171	294.0243	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	70.9598	87.6543	73.5061	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	232.1201 (107)											
Energy for space heating	24.2448 (99)											
Energy for space cooling	3.4050 (108)											
Total	27.6498 (109)											
Fabric Energy Efficiency (TFEE)	27.6 (109)											

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Plot Reference	B2 2B4P Mid				Issued on Date	19/12/2025	
Assessment Reference	2B4P		Plot Type Ref	2B4P			
Plot Address					SAP Version	10.2	
SAP Rating	80 C	DER	3.90	TER	11.94		
Environmental	97 A	% DER < TER				67.34	
CO ₂ Emissions (t/year)	0.23	DFEE	27.64	TFEE	27.65		
Compliance Check	See BREL	% DFEE < TFEE				0.03	
% DPER < TPER	35.47	DPER	41.02	TPER	63.57		
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	68.1700 (1b)	x 2.5000 (2b)	= 170.4250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.1700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.4250 (5)

2. Ventilation rate

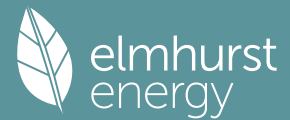
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												71.2000 (23c)
Effective ac	0.3066	0.3034	0.3002	0.2843	0.2811	0.2651	0.2651	0.2619	0.2715	0.2811	0.2874	0.2938 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			18.9900	0.9615	18.2596		(27)
External Wall	49.3900	18.9900	30.4000	0.1600	4.8640	14.0000	425.6000 (29a)
Communal Wall	20.6600	1.8900	18.7700	0.2100	3.9417	14.0000	262.7800 (29a)
Total net area of external elements Aum(A, m ²)			70.0500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	28.9553	(33)
Main dwelling							
Party Wall			23.8000	0.0000	0.0000	20.0000	476.0000 (32)
Party Floor			68.1700			80.0000	5453.6000 (32d)
Party Ceiling			68.1700			100.0000	6817.0000 (32b)
Stud			115.0000			9.0000	1035.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	14469.9800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							212.2632 (35)
List of Thermal Bridges							

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K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.0500	0.0500	0.4525
E4 Jamb	27.5000	0.0500	1.3750
E7 Party floor between dwellings (in blocks of flats)	44.9400	0.0700	3.1458
E16 Corner (normal)	7.5000	0.0900	0.6750
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	11.1000	0.0200	0.2220
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - intermediate floor between dwellings (in blocks of flats)	19.0400	0.0000	0.0000

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

Point Thermal Bridges (36a) = 5.9453 (36)

Total fabric heat loss (33) + (36) + (36a) = 34.9006 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	17.2412	17.0619	16.8826	15.9863	15.8070	14.9107	14.9107	14.7314	15.2692	15.8070	16.1656	16.5241 (38)
Average = Sum(39)m / 12 =	52.1418	51.9625	51.7832	50.8869	50.7076	49.8113	49.8113	49.6320	50.1698	50.7076	51.0662	51.4247 (39)
												50.8421
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7649	0.7622	0.7596	0.7465	0.7438	0.7307	0.7307	0.7281	0.7360	0.7438	0.7491	0.7544 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2009 (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	26.4074	26.0152	25.4629	24.4446	23.6821	22.8366	22.3799	22.9284	23.5255	24.4302	25.4695	26.3181	(42b)
Hot water usage for other uses	37.1693	35.8177	34.4661	33.1145	31.7629	30.4113	30.4113	31.7629	33.1145	34.4661	35.8177	37.1693	(42c)
Average daily hot water use (litres/day)													58.2741 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	63.5767	61.8329	59.9290	57.5591	55.4450	53.2479	52.7912	54.6912	56.6400	58.8963	61.2872	63.4874	(44)
Energy content (annual)	100.6899	88.0492	92.1086	78.7955	74.6396	65.4745	63.8464	67.7192	69.8427	79.9217	87.3148	99.4060	(45)
Distribution loss (46)m = 0.15 x (45)m	15.1035	13.2074	13.8163	11.8193	11.1959	9.8212	9.5770	10.1579	10.4764	11.9883	13.0972	14.9109	(46)
Water storage loss (or HIU loss):													
Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	155.9667	137.9767	147.3855	132.2892	129.9164	118.9682	119.1232	122.9960	123.3364	135.1985	140.8085	154.6828	(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	155.9667	137.9767	147.3855	132.2892	129.9164	118.9682	119.1232	122.9960	123.3364	135.1985	140.8085	154.6828	(64)
Total per year (kWh/year)													1618.6479 (64)
Electric shower(s)	48.9480	43.6131	47.6238	45.4468	46.2996	44.1653	45.6375	46.2996	45.4468	47.6238	46.7283	48.9480	(64a)
Heat gains from water heating, kWh/month	89.9378	80.1216	86.7535	80.3562	80.6140	75.6065	76.8597	78.3130	77.3794	82.7013	83.5092	89.5109	(65)

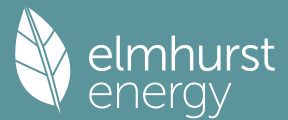
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	97.3407	107.7701	97.3407	100.5854	97.3407	100.5854	97.3407	97.3407	100.5854	97.3407	100.5854	97.3407	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	192.9888	194.9914	189.9449	179.2014	165.6397	152.8936	144.3784	142.3758	147.4223	158.1658	171.7275	184.4736	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	(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)	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	(71)
Water heating gains (Table 5)	120.8842	119.2285	116.6042	111.6058	108.3522	105.0091	103.3061	105.2594	107.4713	111.1577	115.9850	120.3104	(72)
Total internal gains	467.2270	478.0034	459.9031	447.4059	427.3459	414.5014	401.0385	400.9892	411.4924	422.6776	444.3112	458.1380	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
South	4.2200	46.7521	0.4000	0.7000	0.7700	38.2829 (78)
West	14.7700	19.6403	0.4000	0.7000	0.7700	56.2884 (80)

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Solar gains	94.5713	172.8096	261.2044	354.7373	418.1824	422.3168	404.3277	357.2310	294.3336	198.2824	115.5633	79.3688 (83)
Total gains	561.7983	650.8129	721.1075	802.1432	845.5283	836.8182	805.3662	758.2201	705.8260	620.9600	559.8745	537.5068 (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	77.0867	77.3527	77.6205	78.9877	79.2669	80.6933	80.6933	80.9848	80.1166	79.2669	78.7104	78.1616	
alpha	6.1391	6.1568	6.1747	6.2658	6.2845	6.3796	6.3796	6.3990	6.3411	6.2845	6.2474	6.2108	
util living area	0.9748	0.9433	0.8774	0.7278	0.5514	0.3805	0.2721	0.3010	0.4877	0.7834	0.9416	0.9795 (86)	
MIT	20.3731	20.5677	20.7705	20.9377	20.9895	20.9992	20.9999	20.9999	20.9962	20.9202	20.6444	20.3438 (87)	
Th 2	20.2839	20.2862	20.2885	20.3000	20.3023	20.3138	20.3138	20.3161	20.3092	20.3023	20.2977	20.2931 (88)	
util rest of house	0.9692	0.9320	0.8563	0.6942	0.5120	0.3399	0.2297	0.2563	0.4400	0.7456	0.9281	0.9749 (89)	
MIT 2	19.7233	19.9116	20.1010	20.2546	20.2958	20.3134	20.3138	20.3161	20.3073	20.2458	19.9972	19.7027 (90)	
Living area fraction									fLA = Living area / (4) =				0.4034 (91)
MIT	19.9855	20.1763	20.3711	20.5302	20.5756	20.5901	20.5906	20.5919	20.5852	20.5179	20.2583	19.9613 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.9855	20.1763	20.3711	20.5302	20.5756	20.5901	20.5906	20.5919	20.5852	20.5179	20.2583	19.9613 (93)	

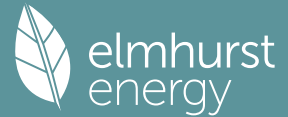
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9665	0.9301	0.8589	0.7055	0.5275	0.3562	0.2468	0.2743	0.4591	0.7577	0.9273	0.9723 (94)
Useful gains	542.9723	605.3176	619.3814	565.8907	446.0198	298.1059	198.7556	208.0145	324.0650	470.5317	519.1556	522.6134 (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	817.8676	793.7943	718.2895	591.8236	450.0621	298.3727	198.7755	208.0529	325.3615	502.9118	671.9419	810.5199 (97)
Space heating kWh	204.5221	126.6564	73.5876	18.6717	3.0075	0.0000	0.0000	0.0000	0.0000	24.0908	110.0061	214.2025 (98a)
Space heating requirement - total per year (kWh/year)												774.7448
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	204.5221	126.6564	73.5876	18.6717	3.0075	0.0000	0.0000	0.0000	0.0000	24.0908	110.0061	214.2025 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												774.7448
Space heating per m2										(98c) / (4) =		11.3649 (99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space and Water												1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500 (305)
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system												1.5000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	204.5221	126.6564	73.5876	18.6717	3.0075	0.0000	0.0000	0.0000	0.0000	24.0908	110.0061	214.2025 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	322.1224	199.4838	115.9005	29.4079	4.7368	0.0000	0.0000	0.0000	0.0000	37.9430	173.2596	337.3689
Space heating requirement	322.1224	199.4838	115.9005	29.4079	4.7368	0.0000	0.0000	0.0000	0.0000	37.9430	173.2596	337.3689 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement	155.9667	137.9767	147.3855	132.2892	129.9164	118.9682	119.1232	122.9960	123.3364	135.1985	140.8085	154.6828 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	233.9501	206.9650	221.0782	198.4338	194.8746	178.4522	178.6848	184.4939	185.0046	202.7977	211.2127	232.0241
Water heating fuel	233.9501	206.9650	221.0782	198.4338	194.8746	178.4522	178.6848	184.4939	185.0046	202.7977	211.2127	232.0241 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	16.0695	14.5144	16.0695	15.5512	16.0695	15.5512	16.0695	16.0695	15.5512	16.0695	15.5512	16.0695 (331)
Lighting	21.4240	17.1872	15.4751	11.3377	8.7576	7.1550	7.9890	10.3844	13.4883	17.6973	19.9891	22.0195 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-12.8678	-21.8040	-38.1267	-50.6492	-60.6454	-58.9698	-58.0281	-51.4153	-40.4532	-27.7042	-15.1885	-10.6054 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												1220.2230 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2427.9718 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												12.2022 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9100)												
mechanical ventilation fans (SFP = 0.9100)												189.2058 (330a)
Total electricity for the above, kWh/year												189.2058 (331)
Electricity for lighting (calculated in Appendix L)												172.9042 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-446.4576 (333)
Wind generation												0.0000 (334)

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Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4120.6277 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			280.0000 (367)
Space and Water heating from Heat pump	1302.9267	0.1584	69.0358 (367)
Electrical energy for heat distribution (space & water)	12.2022	0.0000	5.3425 (372)
Overall CO2 factor for heat network			0.0538 (386)
Total CO2 associated with community systems			196.1456 (373)
Energy for instantaneous electric shower(s)	556.7804	0.1391	77.4605 (264a)
Space and water heating			196.1456 (376)
Pumps, fans and electric keep-hot	189.2058	0.1387	26.2452 (378)
Energy for lighting	172.9042	0.1443	24.9554 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-446.4576	0.1314	-58.6687
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-58.6687 (380)
Total CO2, kg/year			266.1380 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.9000 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	1302.9267	1.5864	691.3329 (467)
Electrical energy for heat distribution (space & water)	12.2022	0.0000	56.2435 (472)
Overall CO2 factor for heat network			0.5660 (486)
Total CO2 associated with community systems			2064.9395 (473)
Energy for instantaneous electric shower(s)	556.7804	1.5143	843.1516 (278a)
Space and water heating			2064.9395 (476)
Pumps, fans and electric keep-hot	189.2058	1.5128	286.2306 (478)
Energy for lighting	172.9042	1.5338	265.2062 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-446.4576	1.4855	-663.2071
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-663.2071 (480)
Total Primary energy kWh/year			2796.3209 (483)
Dwelling Primary energy Rate (DPER)			41.0200 (484)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	68.1700 (1b)	x 2.5000 (2b)	= 170.4250 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.1700		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.4250 (5)

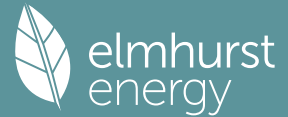
2. Ventilation rate

	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	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1174 (8)
Pressure Test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3674	(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) =		0.3123 (21)

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

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Effective ac	0.3981	0.3903	0.3825	0.3435	0.3357	0.2966	0.2966	0.2888	0.3123	0.3357	0.3513	0.3669 (22b)
	0.5792	0.5762	0.5732	0.5590	0.5563	0.5440	0.5440	0.5417	0.5488	0.5563	0.5617	0.5673 (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
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			15.1600	1.1450	17.3588		(27)
External Wall	49.3900	15.1600	34.2300	0.1800	6.1614		(29a)
Communal Wall	20.6600	1.8900	18.7700	0.1800	3.3786		(29a)
Total net area of external elements Aum(A, m2)			70.0500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26) ... (30) + (32) =	28.7888	(33)
Main dwelling							
Party Wall			23.8000	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 212.2632 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.0500	0.0500	0.4525
E4 Jamb	27.5000	0.0500	1.3750
E7 Party floor between dwellings (in blocks of flats)	44.9400	0.0700	3.1458
E16 Corner (normal)	7.5000	0.0900	0.6750
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	11.1000	0.0200	0.2220
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	19.0400	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9453 (36)

Point Thermal Bridges

Total fabric heat loss (33) + (36) + (36a) = 34.7341 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	32.5771	32.4041	32.2344	31.4376	31.2885	30.5945	30.5945	30.4660	30.8618	31.2885	31.5901	31.9054 (38)
Average = Sum(39)m / 12 =	67.3112	67.1381	66.9685	66.1717	66.0226	65.3286	65.3286	65.2001	65.5959	66.0226	66.3242	66.6395 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9874	0.9849	0.9824	0.9707	0.9685	0.9583	0.9583	0.9564	0.9622	0.9685	0.9729	0.9775 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2009 (42)

Hot water usage for mixer showers	61.1213	60.2028	58.8643	56.3033	54.4134	52.3058	51.1078	52.4362	53.8923	56.1553	58.7712	60.8871 (42a)
Hot water usage for baths	26.4074	26.0152	25.4629	24.4446	23.6821	22.8366	22.3799	22.9284	23.5255	24.4302	25.4695	26.3181 (42b)
Hot water usage for other uses	37.1693	35.8177	34.4661	33.1145	31.7629	30.4113	30.4113	31.7629	33.1145	34.4661	35.8177	37.1693 (42c)
Average daily hot water use (litres/day)												114.6259 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	124.6980	122.0357	118.7933	113.8624	109.8584	105.5537	103.8990	107.1274	110.5323	115.0515	120.0584	124.3745 (44)
Energy content (annual)	197.4912	173.7772	182.5809	155.8720	147.8905	129.7906	125.6569	132.6461	136.2973	156.1238	171.0452	194.7405 (45)
Distribution loss (46)m = 0.15 x (45)m	29.6237	26.0666	27.3871	23.3808	22.1836	19.4686	18.8485	19.8969	20.4446	23.4186	25.6568	29.2111 (46)

Water storage loss (or HIU loss): 150.0000 (47)

Store volume 1.3938 (48)

a) If manufacturer declared loss factor is known (kWh/day): 0.5400 (49)

Temperature factor from Table 2b 0.7527 (55)

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

Total storage loss 23.3325 21.0745 23.3325 22.5798 23.3325 22.5798 23.3325 23.3325 22.5798 23.3325 22.5798 23.3325 (56)

If cylinder contains dedicated solar storage 23.3325 21.0745 23.3325 22.5798 23.3325 22.5798 23.3325 23.3325 22.5798 23.3325 22.5798 23.3325 (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 244.0861 215.8629 229.1758 200.9638 194.4854 174.8824 172.2518 179.2410 181.3892 202.7187 216.1370 241.3354 (62)

WWHRS -27.9421 -24.7122 -25.8772 -21.4274 -19.9695 -17.0881 -16.0173 -17.0328 -17.6800 -20.8427 -23.6123 -27.4247 (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 216.1439 191.1507 203.2985 179.5364 174.5159 157.7943 156.2344 162.2082 163.7092 181.8760 192.5247 213.9107 (64)

12Total per year (kWh/year) Total per year (kWh/year) = Sum(64)m = 2192.9031 (64)

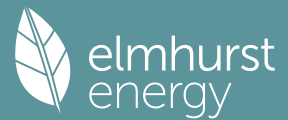
Electric shower(s) 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)

Heat gains from water heating, kWh/month 102.9417 91.4495 97.9841 87.9009 86.4495 79.2288 79.0568 81.3808 81.3923 89.1871 92.9460 102.0271 (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	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	97.3459	107.7758	97.3459	100.5908	97.3459	100.5908	97.3459	97.3459	100.5908	97.3459	100.5908	97.3459 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	192.9888	194.9914	189.9449	179.2014	165.6397	152.8936	144.3784	142.3758	147.4223	158.1658	171.7275	184.4736 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044 (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)												

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	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356 (71)
Water heating gains (Table 5)	138.3625	136.0855	131.6990	122.0846	116.1956	110.0401	106.2592	109.3827	113.0449	119.8751	129.0917	137.1332 (72)
Total internal gains	487.7106	497.8661	478.0031	460.8901	438.1945	419.5377	403.9968	405.1178	417.0713	434.4002	460.4233	477.9661 (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	3.3700		46.7521		0.6300		0.7000		0.7700		48.1507 (78)	
West	11.7900		19.6403		0.6300		0.7000		0.7700		70.7674 (80)	
Solar gains	118.9180	217.2944	328.4359	446.0337	525.8006	530.9966	508.3791	449.1664	370.0888	249.3221	145.3136	99.8023 (83)
Total gains	606.6286	715.1605	806.4391	906.9238	963.9951	950.5343	912.3759	854.2841	787.1601	683.7223	605.7368	577.7684 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.7142	59.8682	60.0198	60.7426	60.8797	61.5265	61.5265	61.6477	61.2757	60.8797	60.6029	60.3162	
alpha	4.9809	4.9912	5.0013	5.0495	5.0586	5.1018	5.1018	5.1098	5.0850	5.0586	5.0402	5.0211	
util living area	0.9781	0.9530	0.9004	0.7787	0.6117	0.4361	0.3145	0.3500	0.5598	0.8367	0.9552	0.9822 (86)	
MIT	20.0194	20.2617	20.5469	20.8249	20.9548	20.9934	20.9990	20.9983	20.9778	20.7875	20.3637	19.9778 (87)	
Th 2	20.0938	20.0960	20.0980	20.1078	20.1097	20.1182	20.1182	20.1198	20.1149	20.1097	20.1060	20.1021 (88)	
util rest of house	0.9728	0.9424	0.8796	0.7411	0.5604	0.3776	0.2517	0.2836	0.4937	0.7974	0.9432	0.9778 (89)	
MIT 2	18.9724	19.2745	19.6204	19.9424	20.0740	20.1144	20.1179	20.1191	20.1007	19.9130	19.4131	18.9265 (90)	
Living area fraction									fLA = Living area / (4) =				0.4034 (91)
MIT	19.3948	19.6727	19.9941	20.2984	20.4293	20.4690	20.4733	20.4738	20.4545	20.2657	19.7966	19.3506 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.3948	19.6727	19.9941	20.2984	20.4293	20.4690	20.4733	20.4738	20.4545	20.2657	19.7966	19.3506 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9676	0.9365	0.8770	0.7495	0.5792	0.4010	0.2771	0.3104	0.5195	0.8049	0.9382	0.9731 (94)
Useful gains	587.0030	669.7653	707.2414	679.7748	558.3605	381.1764	252.7742	265.1428	408.9310	550.3107	568.3080	562.2400 (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	1016.0475	991.8135	903.6818	754.2513	576.3338	383.4123	253.0376	265.6109	416.8316	638.1573	842.0903	1009.6296 (97)
Space heating kWh	319.2091	216.4164	146.1517	53.6231	13.3722	0.0000	0.0000	0.0000	0.0000	65.3578	197.1233	332.8579 (98a)
Space heating requirement - total per year (kWh/year)												1344.1114
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	319.2091	216.4164	146.1517	53.6231	13.3722	0.0000	0.0000	0.0000	0.0000	65.3578	197.1233	332.8579 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1344.1114
Space heating per m2										(98c) / (4) =		19.7171 (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	319.2091	216.4164	146.1517	53.6231	13.3722	0.0000	0.0000	0.0000	0.0000	65.3578	197.1233	332.8579 (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)	345.8387	234.4706	158.3442	58.0965	14.4877	0.0000	0.0000	0.0000	0.0000	70.8102	213.5680	360.6261 (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	216.1439	191.1507	203.2985	179.5364	174.5159	157.7943	156.2344	162.2082	163.7092	181.8760	192.5247	213.9107 (64)
Efficiency of water heater (217)m	84.9326	84.3389	83.3323	81.7045	80.3798	79.8000	79.8000	79.8000	79.8000	81.9969	84.1128	79.8000 (216)
Fuel for water heating, kWh/month	254.4887	226.6460	243.9612	219.7388	217.1141	197.7373	195.7825	203.2684	205.1494	221.8083	228.8888	85.0474 (217)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.0685	7.3041	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	20.2266	16.2265	14.6102	10.7040	8.2681	6.7551	7.5424	9.8039	12.7344	16.7082	18.8718	20.7887 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-15.1275	-22.6981	-34.7004	-41.5797	-47.1174	-44.8236	-44.2807	-40.6629	-34.6977	-27.0579	-17.1114	-12.9238 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												

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(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	-4.8354	-10.4467	-21.2862	-32.7533	-44.0851	-44.5791	-44.0525	-36.9389	-26.6087	-15.1895	-6.5348	-3.8034	(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												1456.2421	(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												2666.1028	(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)												163.2399	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-673.8946	(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												3697.6901	(238)

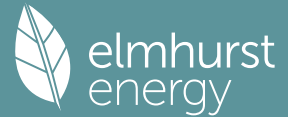
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1456.2421	0.2100	305.8108	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2666.1028	0.2100	559.8816	(264)
Space and water heating			865.6924	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	163.2399	0.1443	23.5606	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-382.7811	0.1333	-51.0237	
PV Unit electricity exported	-291.1135	0.1252	-36.4462	
Total			-87.4699	(269)
Total CO2, kg/year			813.7124	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.9400	(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	1456.2421	1.1300	1645.5535	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2666.1028	1.1300	3012.6961	(278)
Space and water heating			4658.2497	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	163.2399	1.5338	250.3828	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-382.7811	1.4926	-571.3277	
PV Unit electricity exported	-291.1135	0.4595	-133.7728	
Total			-705.1006	(283)
Total Primary energy kWh/year			4333.6327	(286)
Target Primary Energy Rate (TPER)			63.5700	(287)

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Plot Reference	B2 2B4P Top				Issued on Date	19/12/2025	
Assessment Reference	2B4P			Plot Type Ref	2B4P		
Plot Address					SAP Version	10.2	
SAP Rating	76 C		DER	5.31		TER	14.98
Environmental	96 A		% DER < TER				64.55
CO ₂ Emissions (t/year)	0.32		DFEE	42.41		TFEE	41.34
Compliance Check	See BREL		% DFEE < TFEE				-2.59
% DPER < TPER	30.72		DPER	55.39		TPER	79.94
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	68.1700 (1b)	2.5000 (2b)	170.4250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.1700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	170.4250 (5)

2. Ventilation rate

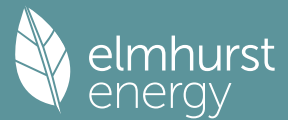
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												71.2000 (23c)
Effective ac	0.3066	0.3034	0.3002	0.2843	0.2811	0.2651	0.2651	0.2619	0.2715	0.2811	0.2874	0.2938 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			18.9900	0.9615	18.2596		(27)
External Wall	49.3900	18.9900	30.4000	0.1600	4.8640	14.0000	425.6000 (29a)
Communal Wall	20.6600	1.8900	18.7700	0.2100	3.9417	14.0000	262.7800 (29a)
Roof	68.1700		68.1700	0.1300	8.8621	9.0000	613.5300 (30)
Total net area of external elements Aum(A, m ²)			138.2200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.8174		(33)
Main dwelling							
Party Wall			23.8000	0.0000	0.0000	20.0000	476.0000 (32)
Party Floor			68.1700			80.0000	5453.6000 (32d)
Stud			115.0000			9.0000	1035.0000 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		8266.5100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							121.2632 (35)
List of Thermal Bridges							

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K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.0500	0.0500	0.4525
E4 Jamb	27.5000	0.0500	1.3750
E7 Party floor between dwellings (in blocks of flats)	16.9200	0.0700	1.1844
E16 Corner (normal)	7.5000	0.0900	0.6750
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	11.1000	0.0200	0.2220
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.5200	0.0000	0.0000
E15 Flat roof with parapet	19.7600	0.5600	11.0656
P4 Party wall - Roof (insulation at ceiling level)	9.5200	0.1200	1.1424
R7 Flat ceiling (inverted)	8.2600	0.0400	0.3304
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			16.5223 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	54.3397 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	17.2412	17.0619	16.8826	15.9863	15.8070	14.9107	14.9107	14.7314	15.2692	15.8070	16.1656	16.5241 (38)
Average = Sum(39)m / 12 =	71.5809	71.4016	71.2223	70.3260	70.1467	69.2504	69.2504	69.0711	69.6089	70.1467	70.5053	70.8638 (39)
												70.2812
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0500	1.0474	1.0448	1.0316	1.0290	1.0158	1.0158	1.0132	1.0211	1.0290	1.0343	1.0395 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.2009 (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												
	26.4074	26.0152	25.4629	24.4446	23.6821	22.8366	22.3799	22.9284	23.5255	24.4302	25.4695	26.3181 (42b)
Hot water usage for other uses												
	37.1693	35.8177	34.4661	33.1145	31.7629	30.4113	30.4113	31.7629	33.1145	34.4661	35.8177	37.1693 (42c)
Average daily hot water use (litres/day)												58.2741 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	63.5767	61.8329	59.9290	57.5591	55.4450	53.2479	52.7912	54.6912	56.6400	58.8963	61.2872	63.4874 (44)
Energy conte	100.6899	88.0492	92.1086	78.7955	74.6396	65.4745	63.8464	67.7192	69.8427	79.9217	87.3148	99.4060 (45)
Energy content (annual)										Total = Sum(45)m =		967.8081
Distribution loss (46)m = 0.15 x (45)m												
	15.1035	13.2074	13.8163	11.8193	11.1959	9.8212	9.5770	10.1579	10.4764	11.9883	13.0972	14.9109 (46)
Water storage loss (or HIU loss):												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage												
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	155.9667	137.9767	147.3855	132.2892	129.9164	118.9682	119.1232	122.9960	123.3364	135.1985	140.8085	154.6828 (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												
	155.9667	137.9767	147.3855	132.2892	129.9164	118.9682	119.1232	122.9960	123.3364	135.1985	140.8085	154.6828 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1619 (64)
Electric shower(s)												
	48.9480	43.6131	47.6238	45.4468	46.2996	44.1653	45.6375	46.2996	45.4468	47.6238	46.7283	48.9480 (64a)
Heat gains from water heating, kWh/month												
	89.9378	80.1216	86.7535	80.3562	80.6140	75.6065	76.8597	78.3130	77.3794	82.7013	83.5092	89.5109 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	97.3407	107.7701	97.3407	100.5854	97.3407	97.3407	97.3407	97.3407	100.5854	97.3407	100.5854	97.3407 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	192.9888	194.9914	189.9449	179.2014	165.6397	152.8936	144.3784	142.3758	147.4223	158.1658	171.7275	184.4736 (68)
Pumps, fans	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356 (71)
Total internal gains	120.8842	119.2285	116.6042	111.6058	108.3522	105.0091	103.3061	105.2594	107.4713	111.1577	115.9850	120.3104 (72)
	467.2270	478.0034	459.9031	447.4059	427.3459	414.5014	401.0385	400.9892	411.4924	422.6776	444.3112	458.1380 (73)

6. Solar gains												
[Jan]												
	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	W/m2	Specific data	factor	W						
				or Table 6b	Table 6d							
South	4.2200	46.7521	0.4000	0.7000	0.7700	38.2829 (78)						

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

PV generation	-446.4576	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5821.7909	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			280.0000 (367)
Space and Water heating from Heat pump	1910.4850	0.1555	162.2368 (367)
Electrical energy for heat distribution (space & water)	29.2139	0.0000	7.9521 (372)
Overall CO2 factor for heat network			0.0546 (386)
Total CO2 associated with community systems			291.9562 (373)
Energy for instantaneous electric shower(s)	556.7804	0.1391	77.4605 (264a)
Space and water heating			291.9562 (376)
Pumps, fans and electric keep-hot	189.2058	0.1387	26.2452 (378)
Energy for lighting	172.9042	0.1443	24.9554 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-446.4576	0.1314	-58.6687
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-58.6687 (380)
Total CO2, kg/year			361.9485 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.3100 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	1910.4850	1.5757	1643.9745 (467)
Electrical energy for heat distribution (space & water)	29.2139	0.0000	82.9175 (472)
Overall CO2 factor for heat network			0.5691 (486)
Total CO2 associated with community systems			3044.2551 (473)
Energy for instantaneous electric shower(s)	556.7804	1.5143	843.1516 (278a)
Space and water heating			3044.2551 (476)
Pumps, fans and electric keep-hot	189.2058	1.5128	286.2306 (478)
Energy for lighting	172.9042	1.5338	265.2062 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-446.4576	1.4855	-663.2071
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-663.2071 (480)
Total Primary energy kWh/year			3775.6364 (483)
Dwelling Primary energy Rate (DPER)			55.3900 (484)

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

1. Overall dwelling characteristics

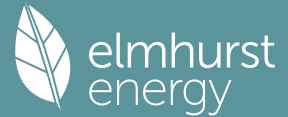
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	68.1700 (1b)	2.5000 (2b)	170.4250 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.1700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	170.4250 (5)

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	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	20.0000 / (5) = 0.1174 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3674 (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) = 0.3123 (21)

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

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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												
	0.3981	0.3903	0.3825	0.3435	0.3357	0.2966	0.2966	0.2888	0.3123	0.3357	0.3513	0.3669 (22b)
Effective ac	0.5792	0.5762	0.5732	0.5590	0.5563	0.5440	0.5440	0.5417	0.5488	0.5563	0.5617	0.5673 (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
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			15.1600	1.1450	17.3588		(27)
External Wall	49.3900	15.1600	34.2300	0.1800	6.1614		(29a)
Communal Wall	20.6600	1.8900	18.7700	0.1800	3.3786		(29a)
Roof	68.1700		68.1700	0.1100	7.4987		(30)
Total net area of external elements Aum(A, m2)			138.2200				(31)
Fabric heat loss, W/K = Sum (A x U)							(33)
Main dwelling							
Party Wall			23.8000	0.0000	0.0000		(32)

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

List of Thermal Bridges 121.2632 (35)

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.0500	0.0500	0.4525
E4 Jamb	27.5000	0.0500	1.3750
E7 Party floor between dwellings (in blocks of flats)	16.9200	0.0700	1.1844
E16 Corner (normal)	7.5000	0.0900	0.6750
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	11.1000	0.0200	0.2220
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.5200	0.0000	0.0000
E15 Flat roof with parapet	19.7600	0.5600	11.0656
P4 Party wall - Roof (insulation at ceiling level)	9.5200	0.1200	1.1424
R7 Flat ceiling (inverted)	8.2600	0.0400	0.3304

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.5223 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 52.8098 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	32.5771	32.4041	32.2344	31.4376	31.2885	30.5945	30.5945	30.4660	30.8618	31.2885	31.5901	31.9054 (38)
Average = Sum(39)m / 12 =	85.3869	85.2138	85.0442	84.2474	84.0983	83.4043	83.4043	83.2758	83.6716	84.0983	84.3999	84.7152 (39)
												84.2467

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2526	1.2500	1.2475	1.2358	1.2337	1.2235	1.2235	1.2216	1.2274	1.2337	1.2381	1.2427 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2009 (42)
Hot water usage for mixer showers												
61.1213	60.2028	58.8643	56.3033	54.4134	52.3058	51.1078	52.4362	53.8923	56.1553	58.7712	60.8871 (42a)	
Hot water usage for baths												
26.4074	26.0152	25.4629	24.4446	23.6821	22.8366	22.3799	22.9284	23.5255	24.4302	25.4695	26.3181 (42b)	
Hot water usage for other uses												
37.1693	35.8177	34.4661	33.1145	31.7629	30.4113	30.4113	31.7629	33.1145	34.4661	35.8177	37.1693 (42c)	
Average daily hot water use (litres/day)												114.6259 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	124.6980	122.0357	118.7933	113.8624	109.8584	105.5537	103.8990	107.1274	110.5323	115.0515	120.0584	124.3745 (44)
Energy content (annual)	197.4912	173.7772	182.5809	155.8720	147.8905	129.7906	125.6569	132.6461	136.2973	156.1238	171.0452	194.7405 (45)
Energy content (annual)										Total = Sum(45)m =		1903.9121

Water storage loss (or HIU loss):
Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day):
Temperature factor from Table 2b 1.3938 (48)
Enter (49) or (54) in (55) 0.5400 (49)
Total storage loss 0.7527 (55)

23.3325 21.0745 23.3325 22.5798 23.3325 22.5798 23.3325 23.3325 22.5798 23.3325 22.5798 23.3325 (56)

If cylinder contains dedicated solar storage 23.3325 21.0745 23.3325 22.5798 23.3325 22.5798 23.3325 23.3325 22.5798 23.3325 22.5798 23.3325 (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 244.0861 215.8629 229.1758 200.9638 194.4854 174.8824 172.2518 179.2410 181.3892 202.7187 216.1370 241.3354 (62)

WWHRS -27.9421 -24.7122 -25.8772 -21.4274 -19.9695 -17.0881 -16.0173 -17.0328 -17.6800 -20.8427 -23.6123 -27.4247 (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 216.1439 191.1507 203.2985 179.5364 174.5159 157.7943 156.2344 162.2082 163.7092 181.8760 192.5247 213.9107 (64)

12Total per year (kWh/year) Total per year (kWh/year) = Sum(64)m = 2192.9031 (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)

Heat gains from water heating, kWh/month 102.9417 91.4495 97.9841 87.9009 86.4495 79.2288 79.0568 81.3808 81.3923 89.1871 92.9460 102.0271 (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	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												

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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	97.3459	107.7758	97.3459	100.5908	97.3459	100.5908	97.3459	97.3459	100.5908	97.3459	100.5908	97.3459 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	192.9888	194.9914	189.9449	179.2014	165.6397	152.8936	144.3784	142.3758	147.4223	158.1658	171.7275	184.4736 (68)
Pumps, fans	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356 (71)
Total internal gains	138.3625	136.0855	131.6990	122.0846	116.1956	110.0401	106.2592	109.3827	113.0449	119.8751	129.0917	137.1332 (72)
	487.7106	497.8661	478.0031	460.8901	438.1945	419.5377	403.9968	405.1178	417.0713	434.4002	460.4233	477.9661 (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				3.3700	46.7521	0.6300	0.7000		0.7700	48.1507 (78)		
West				11.7900	19.6403	0.6300	0.7000		0.7700	70.7674 (80)		
Solar gains	118.9180	217.2944	328.4359	446.0337	525.8006	530.9966	508.3791	449.1664	370.0888	249.3221	145.3136	99.8023 (83)
Total gains	606.6286	715.1605	806.4391	906.9238	963.9951	950.5343	912.3759	854.2841	787.1601	683.7223	605.7368	577.7684 (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	26.8923	26.9469	27.0007	27.2561	27.3044	27.5316	27.5316	27.5741	27.4436	27.3044	27.2068	27.1056
alpha	2.7928	2.7965	2.8000	2.8171	2.8203	2.8354	2.8354	2.8383	2.8296	2.8203	2.8138	2.8070
util living area	0.9450	0.9154	0.8684	0.7795	0.6570	0.5077	0.3835	0.4218	0.6164	0.8212	0.9181	0.9511 (86)
MIT	18.8077	19.1545	19.6281	20.1926	20.6154	20.8673	20.9556	20.9410	20.7614	20.1903	19.4067	18.7470 (87)
Th 2	19.8782	19.8802	19.8822	19.8914	19.8932	19.9013	19.9013	19.9028	19.8981	19.8932	19.8897	19.8860 (88)
util rest of house	0.9360	0.9021	0.8478	0.7457	0.6054	0.4352	0.2947	0.3306	0.5450	0.7854	0.9029	0.9431 (89)
MIT 2	17.3630	17.7957	18.3809	19.0633	19.5432	19.8064	19.8796	19.8720	19.7116	19.0818	18.1252	17.2918 (90)
Living area fraction									FLA = Living area / (4) =			0.4034 (91)
MIT	17.9458	18.3438	18.8840	19.5189	19.9757	20.2344	20.3137	20.3032	20.1351	19.5290	18.6421	17.8789 (92)
Temperature adjustment												0.0000
adjusted MIT	17.9458	18.3438	18.8840	19.5189	19.9757	20.2344	20.3137	20.3032	20.1351	19.5290	18.6421	17.8789 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9154	0.8792	0.8259	0.7330	0.6095	0.4580	0.3288	0.3649	0.5614	0.7718	0.8813	0.9235 (94)
Useful gains	555.3337	628.7665	666.0617	664.7347	587.5247	435.3715	300.0221	311.7497	441.8987	527.6889	533.8200	533.5773 (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	1165.1716	1145.5981	1053.1874	894.6137	695.9753	469.9295	309.7383	325.0437	504.9655	750.9124	974.1548	1158.8077 (97)
Space heating kWh	453.7194	347.3108	288.0215	165.5129	80.6873	0.0000	0.0000	0.0000	0.0000	166.0783	317.0411	465.1714 (98a)
Space heating requirement - total per year (kWh/year)												2283.5427
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	453.7194	347.3108	288.0215	165.5129	80.6873	0.0000	0.0000	0.0000	0.0000	166.0783	317.0411	465.1714 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2283.5427
Space heating per m2										(98c) / (4) =		33.4978 (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)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	453.7194	347.3108	288.0215	165.5129	80.6873	0.0000	0.0000	0.0000	0.0000	166.0783	317.0411	465.1714 (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)	491.5703	376.2848	312.0493	179.3206	87.4185	0.0000	0.0000	0.0000	0.0000	179.9331	343.4898	503.9777 (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	216.1439	191.1507	203.2985	179.5364	174.5159	157.7943	156.2344	162.2082	163.7092	181.8760	192.5247	213.9107 (64)
Efficiency of water heater (217)m	85.6819	85.3816	84.8407	83.8778	82.4418	79.8000	79.8000	79.8000	79.8000	83.8566	85.1708	79.8000 (216)
Fuel for water heating, kWh/month	252.2632	223.8781	239.6237	214.0452	211.6838	197.7373	195.7825	203.2684	205.1494	216.8894	226.0456	249.4484 (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	20.2266	16.2265	14.6102	10.7040	8.2681	6.7551	7.5424	9.8039	12.7344	16.7082	18.8718	20.7887 (232)

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Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-15.1275	-22.6981	-34.7004	-41.5797	-47.1174	-44.8236	-44.2807	-40.6629	-34.6977	-27.0579	-17.1114	-12.9238	(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	-4.8354	-10.4467	-21.2862	-32.7533	-44.0851	-44.5791	-44.0525	-36.9389	-26.6087	-15.1895	-6.5348	-3.8034	(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												2474.0441	(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												2635.8149	(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)												163.2399	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-673.8946	(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												4685.2043	(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	2474.0441	0.2100	519.5493	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2635.8149	0.2100	553.5211	(264)
Space and water heating			1073.0704	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	163.2399	0.1443	23.5606	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-382.7811	0.1333	-51.0237	
PV Unit electricity exported	-291.1135	0.1252	-36.4462	
Total			-87.4699	(269)
Total CO2, kg/year			1021.0903	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.9800	(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	2474.0441	1.1300	2795.6699	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2635.8149	1.1300	2978.4709	(278)
Space and water heating			5774.1407	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	163.2399	1.5338	250.3828	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-382.7811	1.4926	-571.3277	
PV Unit electricity exported	-291.1135	0.4595	-133.7728	
Total			-705.1006	(283)
Total Primary energy kWh/year			5449.5237	(286)
Target Primary Energy Rate (TPER)			79.9400	(287)

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Plot Reference	B2 2B4P Top			Issued on Date	19/12/2025
Assessment Reference	2B4P	Plot Type Ref	2B4P		
Plot Address				SAP Version	10.2
SAP Rating	76 C	DER	5.31	TER	14.98
Environmental	96 A	% DER < TER			64.55
CO ₂ Emissions (t/year)	0.32	DFEE	42.41	TFEE	41.34
Compliance Check	See BREL	% DFEE < TFEE			-2.59
% DPER < TPER	30.72	DPER	55.39	TPER	79.94
Assessor Details	Mr. Matthew Stainrod			Assessor ID	AU83-0001
Client	ROK, Wilf Foster				

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	68.1700 (1b)	2.5000 (2b)	170.4250 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.1700		170.4250 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 170.4250 (5)

2. Ventilation rate

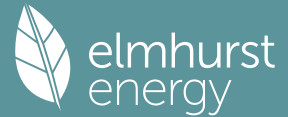
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1174 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2674 (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) = 0.2273 (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	0.2897	0.2841	0.2784	0.2500	0.2443	0.2159	0.2159	0.2102	0.2273	0.2443	0.2557	0.2670 (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	0.5420	0.5403	0.5387	0.5312	0.5298	0.5233	0.5233	0.5221	0.5258	0.5298	0.5327	0.5356 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			18.9900	0.9615	18.2596		(27)
External Wall	49.3900	18.9900	30.4000	0.1600	4.8640	14.0000	425.6000 (29a)
Communal Wall	20.6600	1.8900	18.7700	0.2100	3.9417	14.0000	262.7800 (29a)
Roof	68.1700		68.1700	0.1300	8.8621	9.0000	613.5300 (30)
Total net area of external elements Aum(A, m ²)			138.2200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 37.8174		(33)
Main dwelling							
Party Wall			23.8000	0.0000	0.0000	20.0000	476.0000 (32)
Party Floor			68.1700			80.0000	5453.6000 (32a)
Stud			115.0000			9.0000	1035.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	8266.5100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							121.2632 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				9.0500	0.0500	0.4525	
E4 Jamb				27.5000	0.0500	1.3750	

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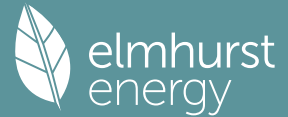
E7 Party floor between dwellings (in blocks of flats)	16.9200	0.0700	1.1844										
E16 Corner (normal)	7.5000	0.0900	0.6750										
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250										
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	11.1000	0.0200	0.2220										
E18 Party wall between dwellings	5.0000	0.0600	0.3000										
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.5200	0.0000	0.0000										
E15 Flat roof with parapet	19.7600	0.5600	11.0656										
P4 Party wall - Roof (insulation at ceiling level)	9.5200	0.1200	1.1424										
R7 Flat ceiling (inverted)	8.2600	0.0400	0.3304										
Thermal bridges (Sum(L x Psi) calculated using Appendix K)													
Point Thermal bridges			(36a) =	16.5223 (36)									
Total fabric heat loss		(33) + (36) + (36a) =		54.3397 (37)									
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	30.4809	30.3892	30.2993	29.8773	29.7983	29.4307	29.4307	29.3627	29.5723	29.7983	29.9581	30.1251	(38)
Average = Sum(39)m / 12 =	84.8206	84.7289	84.6391	84.2170	84.1380	83.7705	83.7705	83.7024	83.9120	84.1380	84.2978	84.4648	(39)
												84.2166	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2443	1.2429	1.2416	1.2354	1.2342	1.2288	1.2288	1.2278	1.2309	1.2342	1.2366	1.2390	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
												1.2354	
												31	

4. Water heating energy requirements (kWh/year)													
Assumed occupancy													
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	2.2009 (42)
Hot water usage for baths	26.4074	26.0152	25.4629	24.4446	23.6821	22.8366	22.3799	22.9284	23.5255	24.4302	25.4695	26.3181	(42a)
Hot water usage for other uses	37.1693	35.8177	34.4661	33.1145	31.7629	30.4113	30.4113	31.7629	33.1145	34.4661	35.8177	37.1693	(42b)
Average daily hot water use (litres/day)												58.2741	(42c)
													(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	63.5767	61.8329	59.9290	57.5591	55.4450	53.2479	52.7912	54.6912	56.6400	58.8963	61.2872	63.4874	(44)
Energy content (annual)	100.6899	88.0492	92.1086	78.7955	74.6396	65.4745	63.8464	67.7192	69.8427	79.9217	87.3148	99.4060	(45)
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	Total = Sum(45)m = 967.8081
Water storage loss (or HIU 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	(46)
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	85.5865	74.8418	78.2924	66.9762	63.4437	55.6533	54.2694	57.5613	59.3663	67.9334	74.2176	84.4951	(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	85.5865	74.8418	78.2924	66.9762	63.4437	55.6533	54.2694	57.5613	59.3663	67.9334	74.2176	84.4951	(64)
12Total per year (kWh/year)												822.6369	(64)
Electric shower(s)	48.9480	43.6131	47.6238	45.4468	46.2996	44.1653	45.6375	46.2996	45.4468	47.6238	46.7283	48.9480	(64a)
Heat gains from water heating, kWh/month	33.6336	29.6137	31.4790	28.1057	27.4358	24.9547	24.9767	25.9652	26.2033	28.8893	30.2365	33.3608	(64a)
												556.7804	(64a)

5. Internal gains (see Table 5 and 5a)													
Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	97.3407	107.7701	97.3407	100.5854	97.3407	100.5854	97.3407	97.3407	100.5854	97.3407	100.5854	97.3407	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	192.9888	194.9914	189.9449	179.2014	165.6397	152.8936	144.3784	142.3758	147.4223	158.1658	171.7275	184.4736	(68)
Pumps, fans	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	(69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Water heating gains (Table 5)	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	(71)
Total internal gains	45.2065	44.0680	42.3105	39.0358	36.8761	34.6592	33.5709	34.8995	36.3934	38.8297	41.9951	44.8397	(72)
	391.5493	402.8429	385.6094	374.8359	355.8698	344.1516	331.3033	330.6293	340.4145	350.3496	370.3213	382.6674	(73)

6. Solar gains													
[Jan]													
	Area												
	m2												
	Solar flux												
	Table 6a												
	W/m2												
	Specific data												
	or Table 6b												
	Specific data												
	or Table 6c												
	Access												
	factor												
	Table 6d												
	Gains												
	W												
South	4.2200												
West	14.7700												
	46.7521												
	19.6403												
	0.4000												
	0.4000												
	0.7000												
	0.7000												
Solar gains	94.5713	172.8096	261.2044	354.7373	418.1824	422.3168	404.3277	357.2310	294.3336	198.2824	115.5633	79.3688	(83)
Total gains	486.1206	575.6524	646.8139	729.5732	774.0523	766.4684	735.6310	687.8603	634.7481	548.6319	485.8846	462.0362	(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	27.0719	27.1012	27.1299	27.2659	27.2915	27.4112	27.4112	27.4335	27.3650	27.2915	27.2398	27.1859
alpha	2.8048	2.8067	2.8087	2.8177	2.8194	2.8274	2.8274	2.8289	2.8243	2.8194	2.8160	2.8124
util living area	0.9667	0.9467	0.9143	0.8463	0.7422	0.5968	0.4629	0.5062	0.7037	0.8798	0.9492	0.9709 (86)
MIT	18.5602	18.8877	19.3596	19.9621	20.4622	20.7963	20.9273	20.9046	20.6576	19.9856	19.1643	18.4948 (87)
Th 2	19.8848	19.8858	19.8869	19.8918	19.8927	19.8970	19.8970	19.8978	19.8953	19.8927	19.8908	19.8889 (88)
util rest of house	0.9609	0.9376	0.8992	0.8186	0.6940	0.5196	0.3604	0.4030	0.6340	0.8518	0.9389	0.9657 (89)
MIT 2	17.6815	18.0034	18.4644	19.0429	19.4995	19.7793	19.8683	19.8574	19.6783	19.0796	18.2838	17.6198 (90)
Living area fraction	18.0360	18.3602	18.8255	19.4137	19.8879	20.1895	20.2955	20.2798	20.0733	19.4451	18.6390	17.9728 (91)
MIT	18.0360	18.3602	18.8255	19.4137	19.8879	20.1895	20.2955	20.2798	20.0733	19.4451	18.6390	17.9728 (92)
Temperature adjustment												0.0000
adjusted MIT	18.0360	18.3602	18.8255	19.4137	19.8879	20.1895	20.2955	20.2798	20.0733	19.4451	18.6390	17.9728 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9479	0.9215	0.8816	0.8048	0.6938	0.5414	0.3989	0.4405	0.6463	0.8383	0.9237	0.9537 (94)
Useful gains	460.8051	530.4642	570.2200	587.1328	537.0347	414.9293	293.4748	303.0116	410.2430	459.9102	448.8247	440.6525 (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	1165.0946	1140.4648	1043.2225	885.4325	688.9108	468.2386	309.5769	324.7518	501.2345	744.2078	972.7124	1163.3165 (97)
Space heating kWh	523.9914	409.9204	351.9139	214.7758	112.9958	0.0000	0.0000	0.0000	0.0000	211.5175	377.1991	537.6620 (98a)
Space heating requirement - total per year (kWh/year)												2739.9759
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	523.9914	409.9204	351.9139	214.7758	112.9958	0.0000	0.0000	0.0000	0.0000	211.5175	377.1991	537.6620 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2739.9759
Space heating per m2										(98c) / (4) =		40.1933 (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	787.4423	619.9014	636.1381	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7701	0.8335	0.8053	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	606.4226	516.6940	512.2674	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	859.4166	825.2787	771.3296	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	182.1557	229.5870	192.7423	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	45.5389	57.3967	48.1856	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												151.1212 (107)
Energy for space heating												40.1933 (99)
Energy for space cooling												2.2168 (108)
Total												42.4101 (109)
Fabric Energy Efficiency (DFEE)												42.4 (109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

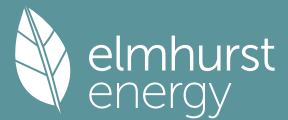
1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	68.1700 (1b)	x 2.5000 (2b)	= 170.4250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.1700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	170.4250 (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	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		Air changes per hour
		20.0000 / (5) = 0.1174 (8)

Full SAP Calculation Printout



Pressure test		Yes
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3674	(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) =	0.3123 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	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)
Adj infilt rate	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)
	0.3981	0.3903	0.3825	0.3435	0.3357	0.2966	0.2966	0.2888	0.3123	0.3357	0.3513	0.3669	(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	0.5792	0.5762	0.5732	0.5590	0.5563	0.5440	0.5440	0.5417	0.5488	0.5563	0.5617	0.5673	(25)

3. Heat losses and heat loss parameter

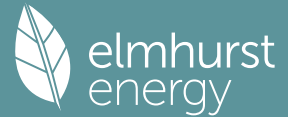
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type			15.1600	1.1450	17.3588			(27)
External Wall	49.3900	15.1600	34.2300	0.1800	6.1614			(29a)
Communal Wall	20.6600	1.8900	18.7700	0.1800	3.3786			(29a)
Roof	68.1700		68.1700	0.1100	7.4987			(30)
Total net area of external elements Aum(A, m2)			138.2200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.2875			(33)
Main dwelling								
Party Wall			23.8000	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							121.2632	(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		
E2 Other lintels (including other steel lintels)				9.0500	0.0500	0.4525		
E4 Jamb				27.5000	0.0500	1.3750		
E7 Party floor between dwellings (in blocks of flats)				16.9200	0.0700	1.1844		
E16 Corner (normal)				7.5000	0.0900	0.6750		
E17 Corner (inverted - internal area greater than external area)				2.5000	-0.0900	-0.2250		
E23 Balcony within or between dwellings, balcony support penetrates wall insulation				11.1000	0.0200	0.2220		
E18 Party wall between dwellings				5.0000	0.0600	0.3000		
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				9.5200	0.0000	0.0000		
E15 Flat roof with parapet				19.7600	0.5600	11.0656		
P4 Party wall - Roof (insulation at ceiling level)				9.5200	0.1200	1.1424		
R7 Flat ceiling (inverted)				8.2600	0.0400	0.3304		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.5223	(36)
Point Thermal bridges							(36a) =	0.0000
Total fabric heat loss							(33) + (36) + (36a) =	52.8098 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	32.5771	32.4041	32.2344	31.4376	31.2885	30.5945	30.5945	30.4660	30.8618	31.2885	31.5901	31.9054	(38)
Average = Sum(39)m / 12 =	85.3869	85.2138	85.0442	84.2474	84.0983	83.4043	83.4043	83.2758	83.6716	84.0983	84.3999	84.7152	(39)
												84.2467	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2526	1.2500	1.2475	1.2358	1.2337	1.2235	1.2235	1.2216	1.2274	1.2337	1.2381	1.2427	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2009 (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	0.0000 (42a)
Hot water usage for baths	26.4074	26.0152	25.4629	24.4446	23.6821	22.8366	22.3799	22.9284	23.5255	24.4302	25.4695	26.3181	(42b)
Hot water usage for other uses	37.1693	35.8177	34.4661	33.1145	31.7629	30.4113	30.4113	31.7629	33.1145	34.4661	35.8177	37.1693	(42c)
Average daily hot water use (litres/day)												58.2741	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	63.5767	61.8329	59.9290	57.5591	55.4450	53.2479	52.7912	54.6912	56.6400	58.8963	61.2872	63.4874	(44)
Energy content (annual)	100.6899	88.0492	92.1086	78.7955	74.6396	65.4745	63.8464	67.7192	69.8427	79.9217	87.3148	99.4060	(45)
Distribution loss (46)m = 0.15 x (45)m										Total =	Sum(45)m =	967.8081	
Water storage loss (or HIU 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	(46)
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	85.5865	74.8418	78.2924	66.9762	63.4437	55.6533	54.2694	57.5613	59.3663	67.9334	74.2176	84.4951	(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	85.5865	74.8418	78.2924	66.9762	63.4437	55.6533	54.2694	57.5613	59.3663	67.9334	74.2176	84.4951	(64)
12Total per year (kWh/year)										Total per year (kWh/year) =	Sum(64)m =	822.6369	(64)
Electric shower(s)	48.9480	43.6131	47.6238	45.4468	46.2996	44.1653	45.6375	46.2996	45.4468	47.6238	46.7283	48.9480	(64a)
												556.7804	(64a)
Heat gains from water heating, kWh/month	33.6336	29.6137	31.4790	28.1057	27.4358	24.9547	24.9767	25.9652	26.2033	28.8893	30.2365	33.3608	(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	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	97.3459	107.7758	97.3459	100.5908	97.3459	100.5908	97.3459	97.3459	100.5908	97.3459	100.5908	97.3459 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	192.9888	194.9914	189.9449	179.2014	165.6397	152.8936	144.3784	142.3758	147.4223	158.1658	171.7275	184.4736 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044 (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)	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356 (71)
Water heating gains (Table 5)	45.2065	44.0680	42.3105	39.0358	36.8761	34.6592	33.5709	34.8995	36.3934	38.8297	41.9951	44.8397 (72)
Total internal gains	391.5545	402.8486	385.6147	374.8413	355.8750	344.1569	331.3085	330.6345	340.4199	350.3548	370.3267	382.6726 (73)

6. Solar gains

[Jan]	Area m ²		Solar flux Table 6a W/m ²		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
South	3.3700		46.7521		0.6300		0.7000		0.7700		48.1507 (78)	
West	11.7900		19.6403		0.6300		0.7000		0.7700		70.7674 (80)	
Solar gains	118.9180	217.2944	328.4359	446.0337	525.8006	530.9966	508.3791	449.1664	370.0888	249.3221	145.3136	99.8023 (83)
Total gains	510.4725	620.1430	714.0506	820.8749	881.6756	875.1535	839.6876	779.8009	710.5086	599.6769	515.6403	482.4749 (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	26.8923	26.9469	27.0007	27.2561	27.3044	27.5316	27.5316	27.5741	27.4436	27.3044	27.2068	27.1056
alpha	2.7928	2.7965	2.8000	2.8171	2.8203	2.8354	2.8354	2.8383	2.8296	2.8203	2.8138	2.8070
util living area	0.9628	0.9374	0.8958	0.8119	0.6926	0.5410	0.4125	0.4557	0.6582	0.8580	0.9420	0.9677 (86)
MIT	18.5973	18.9657	19.4717	20.0881	20.5566	20.8436	20.9465	20.9280	20.7159	20.0689	19.2249	18.5340 (87)
Th 2	19.8782	19.8802	19.8822	19.8914	19.8932	19.9013	19.9013	19.9028	19.8981	19.8932	19.8897	19.8860 (88)
util rest of house	0.9564	0.9270	0.8783	0.7807	0.6419	0.4663	0.3184	0.3594	0.5870	0.8268	0.9305	0.9621 (89)
MIT 2	17.7134	18.0748	18.5665	19.1547	19.5748	19.8130	19.8806	19.8730	19.7218	19.1543	18.3412	17.6563 (90)
Living area fraction									fLA = Living area / (4) =			0.4034 (91)
MIT	18.0700	18.4342	18.9317	19.5312	19.9709	20.2287	20.3106	20.2986	20.1228	19.5233	18.6977	18.0104 (92)
Temperature adjustment												0.0000
adjusted MIT	18.0700	18.4342	18.9317	19.5312	19.9709	20.2287	20.3106	20.2986	20.1228	19.5233	18.6977	18.0104 (93)

8. Space heating requirement

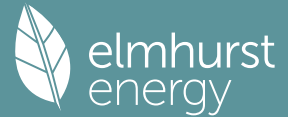
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9425	0.9099	0.8604	0.7693	0.6457	0.4896	0.3545	0.3954	0.6026	0.8145	0.9146	0.9494 (94)
Useful gains	481.1349	564.2735	614.3795	631.4873	569.2929	428.4810	297.6949	308.3380	428.1841	488.4551	471.6295	458.0472 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1175.7739	1153.3016	1057.2404	895.6522	695.5649	469.4596	309.4817	324.6600	503.9383	750.4310	978.8454	1169.9490 (97)
Space heating kWh	516.8114	395.8269	329.4885	190.1987	93.9463	0.0000	0.0000	0.0000	0.0000	194.9100	365.1955	529.6550 (98a)
Space heating requirement - total per year (kWh/year)												2616.0324
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	516.8114	395.8269	329.4885	190.1987	93.9463	0.0000	0.0000	0.0000	0.0000	194.9100	365.1955	529.6550 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2616.0324
Space heating per m ²										(98c) / (4) =		38.3751 (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	784.0005	617.1919	632.8960	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8173	0.8717	0.8461	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	640.7575	538.0019	535.5108	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	986.4454	946.8977	878.7872	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	248.8953	304.2185	255.3977	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	62.2238	76.0546	63.8494	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												202.1279 (107)
Energy for space heating												38.3751 (99)
Energy for space cooling												2.9651 (108)
Total												41.3402 (109)
Fabric Energy Efficiency (TFEE)												41.3 (109)

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Plot Reference	B2 2B4P Top				Issued on Date	19/12/2025	
Assessment Reference	2B4P			Plot Type Ref	2B4P		
Plot Address					SAP Version	10.2	
SAP Rating	76 C		DER	5.31		TER	14.98
Environmental	96 A		% DER < TER				64.55
CO ₂ Emissions (t/year)	0.32		DFEE	42.41		TFEE	41.34
Compliance Check	See BREL		% DFEE < TFEE				-2.59
% DPER < TPER	30.72		DPER	55.39		TPER	79.94
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	68.1700 (1b)	2.5000 (2b)	170.4250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.1700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	170.4250 (5)

2. Ventilation rate

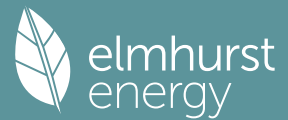
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												71.2000 (23c)
Effective ac	0.3066	0.3034	0.3002	0.2843	0.2811	0.2651	0.2651	0.2619	0.2715	0.2811	0.2874	0.2938 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			18.9900	0.9615	18.2596		(27)
External Wall	49.3900	18.9900	30.4000	0.1600	4.8640	14.0000	425.6000 (29a)
Communal Wall	20.6600	1.8900	18.7700	0.2100	3.9417	14.0000	262.7800 (29a)
Roof	68.1700		68.1700	0.1300	8.8621	9.0000	613.5300 (30)
Total net area of external elements Aum(A, m ²)			138.2200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.8174		(33)
Main dwelling							
Party Wall			23.8000	0.0000	0.0000	20.0000	476.0000 (32)
Party Floor			68.1700			80.0000	5453.6000 (32d)
Stud			115.0000			9.0000	1035.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	8266.5100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							121.2632 (35)
List of Thermal Bridges							

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K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.0500	0.0500	0.4525
E4 Jamb	27.5000	0.0500	1.3750
E7 Party floor between dwellings (in blocks of flats)	16.9200	0.0700	1.1844
E16 Corner (normal)	7.5000	0.0900	0.6750
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	11.1000	0.0200	0.2220
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.5200	0.0000	0.0000
E15 Flat roof with parapet	19.7600	0.5600	11.0656
P4 Party wall - Roof (insulation at ceiling level)	9.5200	0.1200	1.1424
R7 Flat ceiling (inverted)	8.2600	0.0400	0.3304
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			16.5223 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	54.3397 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	17.2412	17.0619	16.8826	15.9863	15.8070	14.9107	14.9107	14.7314	15.2692	15.8070	16.1656	16.5241 (38)
Average = Sum(39)m / 12 =	71.5809	71.4016	71.2223	70.3260	70.1467	69.2504	69.2504	69.0711	69.6089	70.1467	70.5053	70.8638 (39)
												70.2812
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0500	1.0474	1.0448	1.0316	1.0290	1.0158	1.0158	1.0132	1.0211	1.0290	1.0343	1.0395 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.2009 (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												
	26.4074	26.0152	25.4629	24.4446	23.6821	22.8366	22.3799	22.9284	23.5255	24.4302	25.4695	26.3181 (42b)
Hot water usage for other uses												
	37.1693	35.8177	34.4661	33.1145	31.7629	30.4113	30.4113	31.7629	33.1145	34.4661	35.8177	37.1693 (42c)
Average daily hot water use (litres/day)												58.2741 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	63.5767	61.8329	59.9290	57.5591	55.4450	53.2479	52.7912	54.6912	56.6400	58.8963	61.2872	63.4874 (44)
Energy conte	100.6899	88.0492	92.1086	78.7955	74.6396	65.4745	63.8464	67.7192	69.8427	79.9217	87.3148	99.4060 (45)
Energy content (annual)										Total = Sum(45)m =		967.8081
Distribution loss (46)m = 0.15 x (45)m												
	15.1035	13.2074	13.8163	11.8193	11.1959	9.8212	9.5770	10.1579	10.4764	11.9883	13.0972	14.9109 (46)
Water storage loss (or HIU loss):												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage												
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	155.9667	137.9767	147.3855	132.2892	129.9164	118.9682	119.1232	122.9960	123.3364	135.1985	140.8085	154.6828 (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												
	155.9667	137.9767	147.3855	132.2892	129.9164	118.9682	119.1232	122.9960	123.3364	135.1985	140.8085	154.6828 (64)
12Total per year (kWh/year)												
Electric shower(s)												
	48.9480	43.6131	47.6238	45.4468	46.2996	44.1653	45.6375	46.2996	45.4468	47.6238	46.7283	48.9480 (64a)
Heat gains from water heating, kWh/month												
	89.9378	80.1216	86.7535	80.3562	80.6140	75.6065	76.8597	78.3130	77.3794	82.7013	83.5092	89.5109 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	97.3407	107.7701	97.3407	100.5854	97.3407	97.3407	97.3407	97.3407	100.5854	97.3407	100.5854	97.3407 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	192.9888	194.9914	189.9449	179.2014	165.6397	152.8936	144.3784	142.3758	147.4223	158.1658	171.7275	184.4736 (68)
Pumps, fans	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356 (71)
Total internal gains	120.8842	119.2285	116.6042	111.6058	108.3522	105.0091	103.3061	105.2594	107.4713	111.1577	115.9850	120.3104 (72)
	467.2270	478.0034	459.9031	447.4059	427.3459	414.5014	401.0385	400.9892	411.4924	422.6776	444.3112	458.1380 (73)

6. Solar gains												
[Jan]												
	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	W/m2	Specific data	factor	W						
				or Table 6b	Table 6d							
South	4.2200	46.7521	0.4000	0.7000	0.7700	38.2829 (78)						

elmhurst
energy

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Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-446.4576 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	5821.7909 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			280.0000 (367)
Space and Water heating from Heat pump	1910.4850	0.1555	162.2368 (367)
Electrical energy for heat distribution (space & water)	29.2139	0.0000	7.9521 (372)
Overall CO2 factor for heat network			0.0546 (386)
Total CO2 associated with community systems			291.9562 (373)
Energy for instantaneous electric shower(s)	556.7804	0.1391	77.4605 (264a)
Space and water heating			291.9562 (376)
Pumps, fans and electric keep-hot	189.2058	0.1387	26.2452 (378)
Energy for lighting	172.9042	0.1443	24.9554 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-446.4576	0.1314	-58.6687
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-58.6687 (380)
Total CO2, kg/year			361.9485 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.3100 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	1910.4850	1.5757	1643.9745 (467)
Electrical energy for heat distribution (space & water)	29.2139	0.0000	82.9175 (472)
Overall CO2 factor for heat network			0.5691 (486)
Total CO2 associated with community systems			3044.2551 (473)
Energy for instantaneous electric shower(s)	556.7804	1.5143	843.1516 (278a)
Space and water heating			3044.2551 (476)
Pumps, fans and electric keep-hot	189.2058	1.5128	286.2306 (478)
Energy for lighting	172.9042	1.5338	265.2062 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-446.4576	1.4855	-663.2071
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-663.2071 (480)
Total Primary energy kWh/year			3775.6364 (483)
Dwelling Primary energy Rate (DPER)			55.3900 (484)

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

1. Overall dwelling characteristics

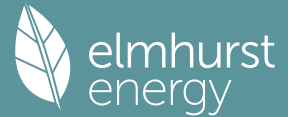
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	68.1700 (1b)	2.5000 (2b)	170.4250 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.1700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	170.4250 (5)

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	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	20.0000 / (5) = 0.1174 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3674 (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) = 0.3123 (21)

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

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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												
	0.3981	0.3903	0.3825	0.3435	0.3357	0.2966	0.2966	0.2888	0.3123	0.3357	0.3513	0.3669 (22b)
Effective ac	0.5792	0.5762	0.5732	0.5590	0.5563	0.5440	0.5440	0.5417	0.5488	0.5563	0.5617	0.5673 (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
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			15.1600	1.1450	17.3588		(27)
External Wall	49.3900	15.1600	34.2300	0.1800	6.1614		(29a)
Communal Wall	20.6600	1.8900	18.7700	0.1800	3.3786		(29a)
Roof	68.1700		68.1700	0.1100	7.4987		(30)
Total net area of external elements Aum(A, m2)			138.2200				(31)
Fabric heat loss, W/K = Sum (A x U)							(33)
Main dwelling							
Party Wall			23.8000	0.0000	0.0000		(32)

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

List of Thermal Bridges 121.2632 (35)

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.0500	0.0500	0.4525
E4 Jamb	27.5000	0.0500	1.3750
E7 Party floor between dwellings (in blocks of flats)	16.9200	0.0700	1.1844
E16 Corner (normal)	7.5000	0.0900	0.6750
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	11.1000	0.0200	0.2220
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.5200	0.0000	0.0000
E15 Flat roof with parapet	19.7600	0.5600	11.0656
P4 Party wall - Roof (insulation at ceiling level)	9.5200	0.1200	1.1424
R7 Flat ceiling (inverted)	8.2600	0.0400	0.3304

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.5223 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 52.8098 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	32.5771	32.4041	32.2344	31.4376	31.2885	30.5945	30.5945	30.4660	30.8618	31.2885	31.5901	31.9054 (38)
Average = Sum(39)m / 12 =	85.3869	85.2138	85.0442	84.2474	84.0983	83.4043	83.4043	83.2758	83.6716	84.0983	84.3999	84.7152 (39)
												84.2467

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2526	1.2500	1.2475	1.2358	1.2337	1.2235	1.2235	1.2216	1.2274	1.2337	1.2381	1.2427 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2009 (42)
Hot water usage for mixer showers												
61.1213	60.2028	58.8643	56.3033	54.4134	52.3058	51.1078	52.4362	53.8923	56.1553	58.7712	60.8871 (42a)	
Hot water usage for baths												
26.4074	26.0152	25.4629	24.4446	23.6821	22.8366	22.3799	22.9284	23.5255	24.4302	25.4695	26.3181 (42b)	
Hot water usage for other uses												
37.1693	35.8177	34.4661	33.1145	31.7629	30.4113	30.4113	31.7629	33.1145	34.4661	35.8177	37.1693 (42c)	
Average daily hot water use (litres/day)												114.6259 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	124.6980	122.0357	118.7933	113.8624	109.8584	105.5537	103.8990	107.1274	110.5323	115.0515	120.0584	124.3745 (44)
Energy content	197.4912	173.7772	182.5809	155.8720	147.8905	129.7906	125.6569	132.6461	136.2973	156.1238	171.0452	194.7405 (45)
Energy content (annual)										Total = Sum(45)m =		1903.9121

Water storage loss (or HIU loss):
Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day):
Temperature factor from Table 2b 1.3938 (48)
Enter (49) or (54) in (55) 0.5400 (49)
Total storage loss 0.7527 (55)

23.3325 21.0745 23.3325 22.5798 23.3325 22.5798 23.3325 23.3325 22.5798 23.3325 22.5798 23.3325 (56)

If cylinder contains dedicated solar storage 23.3325 21.0745 23.3325 22.5798 23.3325 22.5798 23.3325 23.3325 22.5798 23.3325 22.5798 23.3325 (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 244.0861 215.8629 229.1758 200.9638 194.4854 174.8824 172.2518 179.2410 181.3892 202.7187 216.1370 241.3354 (62)

WWHRS -27.9421 -24.7122 -25.8772 -21.4274 -19.9695 -17.0881 -16.0173 -17.0328 -17.6800 -20.8427 -23.6123 -27.4247 (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 216.1439 191.1507 203.2985 179.5364 174.5159 157.7943 156.2344 162.2082 163.7092 181.8760 192.5247 213.9107 (64)

12Total per year (kWh/year) Total per year (kWh/year) = Sum(64)m = 2192.9031 (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)

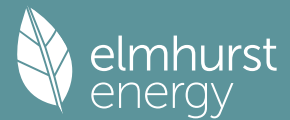
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month 102.9417 91.4495 97.9841 87.9009 86.4495 79.2288 79.0568 81.3808 81.3923 89.1871 92.9460 102.0271 (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	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445	110.0445 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												

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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	97.3459	107.7758	97.3459	100.5908	97.3459	100.5908	97.3459	97.3459	100.5908	97.3459	100.5908	97.3459 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	192.9888	194.9914	189.9449	179.2014	165.6397	152.8936	144.3784	142.3758	147.4223	158.1658	171.7275	184.4736 (68)
Pumps, fans	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044	34.0044 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356	-88.0356 (71)
Total internal gains	138.3625	136.0855	131.6990	122.0846	116.1956	110.0401	106.2592	109.3827	113.0449	119.8751	129.0917	137.1332 (72)
	487.7106	497.8661	478.0031	460.8901	438.1945	419.5377	403.9968	405.1178	417.0713	434.4002	460.4233	477.9661 (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				3.3700	46.7521		0.6300	0.7000	0.7700		48.1507 (78)	
West				11.7900	19.6403		0.6300	0.7000	0.7700		70.7674 (80)	
Solar gains	118.9180	217.2944	328.4359	446.0337	525.8006	530.9966	508.3791	449.1664	370.0888	249.3221	145.3136	99.8023 (83)
Total gains	606.6286	715.1605	806.4391	906.9238	963.9951	950.5343	912.3759	854.2841	787.1601	683.7223	605.7368	577.7684 (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	26.8923	26.9469	27.0007	27.2561	27.3044	27.5316	27.5316	27.5741	27.4436	27.3044	27.2068	27.1056
alpha	2.7928	2.7965	2.8000	2.8171	2.8203	2.8354	2.8354	2.8383	2.8296	2.8203	2.8138	2.8070
util living area	0.9450	0.9154	0.8684	0.7795	0.6570	0.5077	0.3835	0.4218	0.6164	0.8212	0.9181	0.9511 (86)
MIT	18.8077	19.1545	19.6281	20.1926	20.6154	20.8673	20.9556	20.9410	20.7614	20.1903	19.4067	18.7470 (87)
Th 2	19.8782	19.8802	19.8822	19.8914	19.8932	19.9013	19.9013	19.9028	19.8981	19.8932	19.8897	19.8860 (88)
util rest of house	0.9360	0.9021	0.8478	0.7457	0.6054	0.4352	0.2947	0.3306	0.5450	0.7854	0.9029	0.9431 (89)
MIT 2	17.3630	17.7957	18.3809	19.0633	19.5432	19.8064	19.8796	19.8720	19.7116	19.0818	18.1252	17.2918 (90)
Living area fraction									FLA = Living area / (4) =			0.4034 (91)
MIT	17.9458	18.3438	18.8840	19.5189	19.9757	20.2344	20.3137	20.3032	20.1351	19.5290	18.6421	17.8789 (92)
Temperature adjustment												0.0000
adjusted MIT	17.9458	18.3438	18.8840	19.5189	19.9757	20.2344	20.3137	20.3032	20.1351	19.5290	18.6421	17.8789 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9154	0.8792	0.8259	0.7330	0.6095	0.4580	0.3288	0.3649	0.5614	0.7718	0.8813	0.9235 (94)
Useful gains	555.3337	628.7665	666.0617	664.7347	587.5247	435.3715	300.0221	311.7497	441.8987	527.6889	533.8200	533.5773 (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	1165.1716	1145.5981	1053.1874	894.6137	695.9753	469.9295	309.7383	325.0437	504.9655	750.9124	974.1548	1158.8077 (97)
Space heating kWh	453.7194	347.3108	288.0215	165.5129	80.6873	0.0000	0.0000	0.0000	0.0000	166.0783	317.0411	465.1714 (98a)
Space heating requirement - total per year (kWh/year)												2283.5427
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	453.7194	347.3108	288.0215	165.5129	80.6873	0.0000	0.0000	0.0000	0.0000	166.0783	317.0411	465.1714 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2283.5427
Space heating per m2										(98c) / (4) =		33.4978 (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)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	453.7194	347.3108	288.0215	165.5129	80.6873	0.0000	0.0000	0.0000	0.0000	166.0783	317.0411	465.1714 (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)	491.5703	376.2848	312.0493	179.3206	87.4185	0.0000	0.0000	0.0000	0.0000	179.9331	343.4898	503.9777 (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	216.1439	191.1507	203.2985	179.5364	174.5159	157.7943	156.2344	162.2082	163.7092	181.8760	192.5247	213.9107 (64)
Efficiency of water heater (217)m	85.6819	85.3816	84.8407	83.8778	82.4418	79.8000	79.8000	79.8000	79.8000	83.8566	85.1708	79.8000 (216)
Fuel for water heating, kWh/month	252.2632	223.8781	239.6237	214.0452	211.6838	197.7373	195.7825	203.2684	205.1494	216.8894	226.0456	249.4484 (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	20.2266	16.2265	14.6102	10.7040	8.2681	6.7551	7.5424	9.8039	12.7344	16.7082	18.8718	20.7887 (232)

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Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-15.1275	-22.6981	-34.7004	-41.5797	-47.1174	-44.8236	-44.2807	-40.6629	-34.6977	-27.0579	-17.1114	-12.9238	(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	-4.8354	-10.4467	-21.2862	-32.7533	-44.0851	-44.5791	-44.0525	-36.9389	-26.6087	-15.1895	-6.5348	-3.8034	(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												2474.0441	(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												2635.8149	(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)												163.2399	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-673.8946	(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												4685.2043	(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	2474.0441	0.2100	519.5493	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2635.8149	0.2100	553.5211	(264)
Space and water heating			1073.0704	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	163.2399	0.1443	23.5606	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-382.7811	0.1333	-51.0237	
PV Unit electricity exported	-291.1135	0.1252	-36.4462	
Total			-87.4699	(269)
Total CO2, kg/year			1021.0903	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.9800	(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	2474.0441	1.1300	2795.6699	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2635.8149	1.1300	2978.4709	(278)
Space and water heating			5774.1407	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	163.2399	1.5338	250.3828	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-382.7811	1.4926	-571.3277	
PV Unit electricity exported	-291.1135	0.4595	-133.7728	
Total			-705.1006	(283)
Total Primary energy kWh/year			5449.5237	(286)
Target Primary Energy Rate (TPER)			79.9400	(287)

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Plot Reference	B2 3B5P Mid				Issued on Date	19/12/2025	
Assessment Reference	3B5P		Plot Type Ref	3B5P			
Plot Address					SAP Version	10.2	
SAP Rating	81 B		DER	3.43		TER	10.44
Environmental	97 A		% DER < TER				67.15
CO ₂ Emissions (t/year)	0.27		DFEE	25.06		TFEE	26.57
Compliance Check	See BREL		% DFEE < TFEE				5.70
% DPER < TPER	34.84		DPER	36.03		TPER	55.30
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	88.7300 (1b)	2.5000 (2b)	221.8250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.7300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	221.8250 (5)

2. Ventilation rate

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

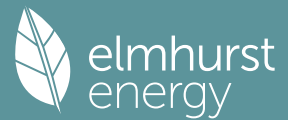
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												71.2000 (23c)
Effective ac	0.3066	0.3034	0.3002	0.2843	0.2811	0.2651	0.2651	0.2619	0.2715	0.2811	0.2874	0.2938 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			20.4900	0.9615	19.7019		(27)
External Wall	80.4800	22.3800	58.1000	0.1600	9.2960	14.0000	813.4000 (29a)
Total net area of external elements Aum(A, m ²)			80.4800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.8879		(33)
Main dwelling							
Party Wall			18.3300	0.0000	0.0000	20.0000	366.6000 (32)
Party Floor			88.7300			80.0000	7098.4000 (32d)
Party Ceiling			88.7300			100.0000	8873.0000 (32b)
Stud			100.0000			9.0000	900.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	18051.4000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							203.4419 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

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E2 Other lintels (including other steel lintels)	10.9100	0.0500	0.5455									
E4 Jamb	28.6200	0.0500	1.4310									
E7 Party floor between dwellings (in blocks of flats)	55.8700	0.0700	3.9109									
E16 Corner (normal)	10.0000	0.0900	0.9000									
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250									
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.5100	0.0200	0.1702									
E18 Party wall between dwellings	2.5000	0.0600	0.1500									
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	14.6600	0.0000	0.0000									
E3 Sill	2.7600	0.0500	0.1380									
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500									
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				7.1706 (36)								
Point Thermal bridges			(36a) =	0.0000								
Total fabric heat loss		(33) + (36) + (36a) =		38.0585 (37)								
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 22.4411	Feb 22.2077	Mar 21.9744	Apr 20.8077	May 20.5744	Jun 19.4077	Jul 19.4077	Aug 19.1744	Sep 19.8744	Oct 20.5744	Nov 21.0411	Dec 21.5077 (38)
Heat transfer coeff	60.4996	60.2663	60.0329	58.8663	58.6329	57.4663	57.4663	57.2329	57.9329	58.6329	59.0996	59.5663 (39)
Average = Sum(39)m / 12 =												58.8079
HLP	Jan 0.6818	Feb 0.6792	Mar 0.6766	Apr 0.6634	May 0.6608	Jun 0.6477	Jul 0.6477	Aug 0.6450	Sep 0.6529	Oct 0.6608	Nov 0.6661	Dec 0.6713 (40)
HLP (average)												0.6628
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.6079 (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	29.3423	28.9066	28.2929	27.1614	26.3142	25.3747	24.8673	25.4766	26.1401	27.1454	28.3002	29.2431 (42b)
Hot water usage for other uses	41.3379	39.8347	38.3315	36.8283	35.3251	33.8219	33.8219	35.3251	36.8283	38.3315	39.8347	41.3379 (42c)
Average daily hot water use (litres/day)												64.7848 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.6802	68.7412	66.6244	63.9897	61.6393	59.1966	58.6892	60.8017	62.9684	65.4769	68.1348	70.5810 (44)
Energy content	111.9402	97.8866	102.3992	87.5987	82.9783	72.7891	70.9794	75.2852	77.6463	88.8515	97.0706	110.5128 (45)
Energy content (annual)										Total = Sum(45)m =		1075.9379
Distribution loss (46)m = 0.15 x (45)m	16.7910	14.6830	15.3599	13.1398	12.4467	10.9184	10.6469	11.2928	11.6470	13.3277	14.5606	16.5769 (46)
Water storage loss (or HIU loss):												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	167.2170	147.8140	157.6760	141.0924	138.2551	126.2828	126.2563	130.5620	131.1400	144.1283	150.5642	165.7896 (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	167.2170	147.8140	157.6760	141.0924	138.2551	126.2828	126.2563	130.5620	131.1400	144.1283	150.5642	165.7896 (64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1726.7776 (64)
Electric shower(s)	54.4136	48.4830	52.9416	50.5215	51.4695	49.0969	50.7335	51.4695	50.5215	52.9416	51.9461	54.4136 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												618.9517 (64a)
Heat gains from water heating, kWh/month	95.0449	84.6100	91.5046	84.5519	84.6791	79.2716	80.5055	82.1212	81.2427	86.9999	88.0574	94.5703 (65)

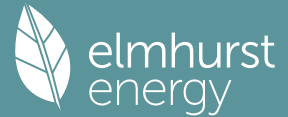
5. Internal gains (see Table 5 and 5a)												

Metabolic gains (Table 5), Watts												
(66)m	Jan 130.3968	Feb 130.3968	Mar 130.3968	Apr 130.3968	May 130.3968	Jun 130.3968	Jul 130.3968	Aug 130.3968	Sep 130.3968	Oct 130.3968	Nov 130.3968	Dec 130.3968 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.3989	132.1917	119.3989	123.3789	119.3989	123.3789	119.3989	119.3989	123.3789	119.3989	123.3789	119.3989 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.7218	239.1782	232.9881	219.8100	203.1751	187.5406	177.0958	174.6394	180.8295	194.0076	210.6425	226.2770 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397 (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)	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174 (71)
Water heating gains (Table 5)	127.7486	125.9077	122.9900	117.4332	113.8160	110.0994	108.2063	110.3779	112.8371	116.9354	122.3020	127.1107 (72)
Total internal gains	545.9883	559.3966	537.4960	522.7411	498.5091	483.1380	466.8201	466.5353	479.1646	492.4610	518.4424	534.9056 (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	5.5300	11.2829	0.4000	0.7000	0.7700	12.1071 (75)						
Southeast	6.5300	36.7938	0.4000	0.7000	0.7700	46.6208 (77)						
Southwest	8.4300	36.7938	0.4000	0.7000	0.7700	60.1858 (79)						

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Solar gains	118.9136	206.5753	293.3272	381.3508	443.4869	447.4682	428.4156	380.9604	323.6377	231.1898	143.1634	101.2914 (83)
Total gains	664.9019	765.9720	830.8232	904.0920	941.9960	930.6062	895.2357	847.4957	802.8023	723.6508	661.6059	636.1970 (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	82.8812	83.2021	83.5255	85.1808	85.5198	87.2560	87.2560	87.6117	86.5531	85.5198	84.8445	84.1798
alpha	6.5254	6.5468	6.5684	6.6787	6.7013	6.8171	6.8171	6.8408	6.7702	6.7013	6.6563	6.6120
util living area	0.9767	0.9462	0.8872	0.7474	0.5725	0.3948	0.2824	0.3106	0.4957	0.7852	0.9431	0.9812 (86)
MIT	20.4319	20.6133	20.7898	20.9421	20.9905	20.9994	20.9999	20.9999	20.9972	20.9342	20.6879	20.4059 (87)
Th 2	20.3569	20.3592	20.3616	20.3732	20.3756	20.3873	20.3873	20.3896	20.3826	20.3756	20.3709	20.3662 (88)
util rest of house	0.9718	0.9361	0.8686	0.7169	0.5360	0.3572	0.2431	0.2694	0.4522	0.7506	0.9308	0.9771 (89)
MIT 2	19.8449	20.0211	20.1874	20.3301	20.3696	20.3870	20.3873	20.3896	20.3811	20.3282	20.1047	19.8276 (90)
Living area fraction	20.0367	20.2146	20.3843	20.5302	20.5725	20.5871	20.5875	20.5891	20.5825	20.5263	20.2953	20.0166 (91)
MIT	20.0367	20.2146	20.3843	20.5302	20.5725	20.5871	20.5875	20.5891	20.5825	20.5263	20.2953	20.0166 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0367	20.2146	20.3843	20.5302	20.5725	20.5871	20.5875	20.5891	20.5825	20.5263	20.2953	20.0166 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9689	0.9335	0.8693	0.7247	0.5476	0.3695	0.2559	0.2829	0.4663	0.7593	0.9291	0.9745 (94)
Useful gains	644.2475	715.0639	722.2092	655.1983	515.8197	343.8129	229.1324	239.7227	374.3781	549.4621	614.7113	619.9768 (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	952.0648	922.9566	833.5130	684.6241	520.2225	344.0587	229.1481	239.7532	375.5480	582.0051	779.8357	942.1370 (97)
Space heating kWh	229.0161	139.7039	82.8100	21.1866	3.2757	0.0000	0.0000	0.0000	0.0000	24.2120	118.8896	239.6872 (98a)
Space heating requirement - total per year (kWh/year)												858.7810
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	229.0161	139.7039	82.8100	21.1866	3.2757	0.0000	0.0000	0.0000	0.0000	24.2120	118.8896	239.6872 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												858.7810
Space heating per m2										(98c) / (4) =		9.6786 (99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space and Water												1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500 (305)
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system												1.5000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	229.0161	139.7039	82.8100	21.1866	3.2757	0.0000	0.0000	0.0000	0.0000	24.2120	118.8896	239.6872 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	360.7004	220.0336	130.4258	33.3688	5.1592	0.0000	0.0000	0.0000	0.0000	38.1339	187.2511	377.5073
Space heating requirement	360.7004	220.0336	130.4258	33.3688	5.1592	0.0000	0.0000	0.0000	0.0000	38.1339	187.2511	377.5073 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating												
Annual water heating requirement	167.2170	147.8140	157.6760	141.0924	138.2551	126.2828	126.2563	130.5620	131.1400	144.1283	150.5642	165.7896 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	250.8254	221.7210	236.5140	211.6386	207.3826	189.4242	189.3844	195.8431	196.7100	216.1924	225.8464	248.6844
Water heating fuel	250.8254	221.7210	236.5140	211.6386	207.3826	189.4242	189.3844	195.8431	196.7100	216.1924	225.8464	248.6844 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	20.9161	18.8920	20.9161	20.2414	20.9161	20.2414	20.9161	20.9161	20.2414	20.9161	20.2414	20.9161 (311)
Lighting	28.4266	22.8048	20.5332	15.0435	11.6201	9.4937	10.6002	13.7785	17.8970	23.4818	26.5226	29.2166 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-13.1383	-22.4723	-39.7191	-53.3741	-64.4554	-62.8509	-61.7940	-54.4462	-42.4553	-28.7084	-15.5630	-10.8078 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												1352.5800 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2590.1664 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												13.5258 (313)
Space cooling fuel												0.0000 (321)

Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9100)												
mechanical ventilation fans (SFP = 0.9100)												246.2701 (330a)
Total electricity for the above, kWh/year												246.2701 (331)
Electricity for lighting (calculated in Appendix L)												229.4186 (332)

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

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PV generation	-469.7847	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4567.6023	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			280.0000 (367)
Space and Water heating from Heat pump	1408.1237	0.1585	76.5722 (367)
Electrical energy for heat distribution (space & water)	13.5258	0.0000	5.7831 (372)
Overall CO2 factor for heat network			0.0539 (386)
Total CO2 associated with community systems			212.3238 (373)
Energy for instantaneous electric shower(s)	618.9517	0.1391	86.1099 (264a)
Space and water heating			212.3238 (376)
Pumps, fans and electric keep-hot	246.2701	0.1387	34.1607 (378)
Energy for lighting	229.4186	0.1443	33.1122 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-469.7847	0.1312	-61.6495
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-61.6495 (380)
Total CO2, kg/year			304.0570 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.4300 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	1408.1237	1.5867	766.5005 (467)
Electrical energy for heat distribution (space & water)	13.5258	0.0000	60.8193 (472)
Overall CO2 factor for heat network			0.5663 (486)
Total CO2 associated with community systems			2232.9362 (473)
Energy for instantaneous electric shower(s)	618.9517	1.5143	937.2998 (278a)
Space and water heating			2232.9362 (476)
Pumps, fans and electric keep-hot	246.2701	1.5128	372.5574 (478)
Energy for lighting	229.4186	1.5338	351.8900 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-469.7847	1.4848	-697.5410
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-697.5410 (480)
Total Primary energy kWh/year			3197.1423 (483)
Dwelling Primary energy Rate (DPER)			36.0300 (484)

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

1. Overall dwelling characteristics

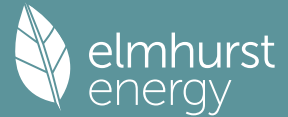
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	88.7300	2.5000	221.8250
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.7300		
Dwelling volume			

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	30.0000 / (5) = 0.1352 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3852 (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) = 0.3275 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000

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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 infiltr rate	0.4175	0.4093	0.4011	0.3602	0.3520	0.3111	0.3111	0.3029	0.3275	0.3520	0.3684	0.3848 (22b)
Effective ac	0.5872	0.5838	0.5805	0.5649	0.5620	0.5484	0.5484	0.5459	0.5536	0.5620	0.5679	0.5740 (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
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			20.3000	1.1450	23.2443		(27)
External Wall	80.4800	22.1900	58.2900	0.1800	10.4922		(29a)
Total net area of external elements Aum (A, m2)			80.4800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.6265		(33)
Main dwelling							
Party Wall			18.3300	0.0000	0.0000		(32)

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

203.4419 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.9100	0.0500	0.5455
E4 Jamb	28.6200	0.0500	1.4310
E7 Party floor between dwellings (in blocks of flats)	55.8700	0.0700	3.9109
E16 Corner (normal)	10.0000	0.0900	0.9000
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.5100	0.0200	0.1702
E18 Party wall between dwellings	2.5000	0.0600	0.1500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	14.6600	0.0000	0.0000
E3 Sill	2.7600	0.0500	0.1380
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500

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

7.1706 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 42.7971 (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	42.9811	42.7334	42.4905	41.3499	41.1365	40.1431	40.1431	39.9591	40.5258	41.1365	41.5682	42.0196 (38)
Heat transfer coeff	85.7782	85.5304	85.2876	84.1470	83.9336	82.9402	82.9402	82.7562	83.3228	83.9336	84.3653	84.8166 (39)
Average = Sum(39)m / 12 =												84.1460

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9667	0.9639	0.9612	0.9483	0.9459	0.9347	0.9347	0.9327	0.9391	0.9459	0.9508	0.9559 (40)
HLP (average)												0.9483
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

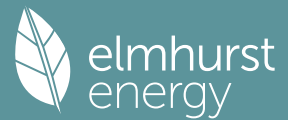
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6079 (42)
Hot water usage for mixer showers	67.9462	66.9251	65.4372	62.5903	60.4893	58.1464	56.8146	58.2913	59.9100	62.4257	65.3337	67.6859 (42a)
Hot water usage for baths	29.3423	28.9066	28.2929	27.1614	26.3142	25.3747	24.8673	25.4766	26.1401	27.1454	28.3002	29.2431 (42b)
Hot water usage for other uses	41.3379	39.8347	38.3315	36.8283	35.3251	33.8219	33.8219	35.3251	36.8283	38.3315	39.8347	41.3379 (42c)
Average daily hot water use (litres/day)												127.4290 (43)
Daily hot water use	138.6264	135.6664	132.0616	126.5800	122.1286	117.3430	115.5038	119.0931	122.8785	127.9025	133.4686	138.2669 (44)
Energy conte	219.5504	193.1871	202.9737	173.2817	164.4086	144.2869	139.6918	147.4621	151.5214	173.5625	190.1504	216.4926 (45)
Energy content (annual)										Total = Sum(45)m =		2116.5692
Distribution loss (46)m = 0.15 x (45)m	32.9326	28.9781	30.4461	25.9923	24.6613	21.6430	20.9538	22.1193	22.7282	26.0344	28.5226	32.4739 (46)
Water storage loss (or HIU loss):												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (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	266.1453	235.2728	249.5686	218.3735	211.0035	189.3787	186.2867	194.0570	196.6133	220.1574	235.2423	263.0875 (62)
WWHRS	-31.0622	-27.4717	-28.7667	-23.8200	-22.1994	-18.9962	-17.8059	-18.9348	-19.6542	-23.1701	-26.2489	-30.4870 (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	235.0831	207.8012	220.8019	194.5535	188.8041	170.3826	168.4809	175.1222	176.9591	196.9873	208.9934	232.6005 (64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2376.5698 (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	110.2764	97.9033	104.7647	93.6896	91.9418	84.0489	83.7235	86.3071	86.4543	94.9855	99.2985	109.2597 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.3989	132.1917	119.3989	123.3789	119.3989	123.3789	119.3989	119.3989	123.3789	119.3989	123.3789	119.3989 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.7218	239.1782	232.9881	219.8100	203.1751	187.5406	177.0958	174.6394	180.8295	194.0076	210.6425	226.2770 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												

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Pumps, fans	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174 (71)
Water heating gains (Table 5)	148.2210	145.6894	140.8127	130.1245	123.5776	116.7345	112.5315	116.0041	120.0755	127.6686	137.9146	146.8544 (72)
Total internal gains	569.4608	582.1783	558.3188	538.4324	511.2707	489.7731	471.1453	472.1615	486.4030	506.1942	537.0550	557.6494 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
Northeast					5.4800	11.2829	0.6300	0.7000			0.7700	18.8962 (75)
Southeast					6.4700	36.7938	0.6300	0.7000			0.7700	72.7530 (77)
Southwest					8.3500	36.7938	0.6300	0.7000			0.7700	93.8930 (79)
Solar gains	185.5423	322.3237	457.6890	595.0431	692.0041	698.2192	668.4888	594.4364	504.9862	360.7314	223.3799	158.0459 (83)
Total gains	755.0030	904.5020	1016.0078	1133.4755	1203.2748	1187.9923	1139.6342	1066.5979	991.3892	866.9256	760.4349	715.6953 (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	58.4563	58.6257	58.7926	59.5895	59.7410	60.4566	60.4566	60.5910	60.1789	59.7410	59.4353	59.1190
alpha	4.8971	4.9084	4.9195	4.9726	4.9827	5.0304	5.0304	5.0394	5.0119	4.9827	4.9624	4.9413
util living area	0.9790	0.9524	0.9013	0.7850	0.6202	0.4425	0.3195	0.3556	0.5634	0.8357	0.9557	0.9832 (86)
MIT	19.9777	20.2394	20.5262	20.8099	20.9492	20.9924	20.9988	20.9980	20.9757	20.7802	20.3402	19.9340 (87)
Th 2	20.1111	20.1135	20.1158	20.1266	20.1286	20.1381	20.1381	20.1398	20.1344	20.1286	20.1245	20.1202 (88)
util rest of house	0.9740	0.9421	0.8814	0.7488	0.5700	0.3846	0.2573	0.2898	0.4987	0.7976	0.9442	0.9791 (89)
MIT 2	18.9365	19.2633	19.6124	19.9444	20.0876	20.1335	20.1376	20.1390	20.1185	19.9227	19.4015	18.8884 (90)
Living area fraction	19.2768	19.5823	19.9111	20.2273	20.3692	20.4142	20.4191	20.4197	20.3986	20.2030	19.7083	19.2301 (92)
MIT	19.2768	19.5823	19.9111	20.2273	20.3692	20.4142	20.4191	20.4197	20.3986	20.2030	19.7083	19.2301 (93)
Temperature adjustment												0.0000
adjusted MIT	19.2768	19.5823	19.9111	20.2273	20.3692	20.4142	20.4191	20.4197	20.3986	20.2030	19.7083	19.2301 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9681	0.9347	0.8763	0.7532	0.5842	0.4033	0.2776	0.3113	0.5189	0.8011	0.9377	0.9738 (94)
Useful gains	730.9033	845.4617	890.2773	853.7902	702.9597	479.1484	316.3901	332.0125	514.4021	694.5108	713.0279	696.9785 (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	1284.6817	1255.7846	1143.7995	953.1578	727.6382	482.2337	316.7551	332.6583	524.8208	806.0110	1063.7029	1274.8026 (97)
Space heating kWh	412.0111	275.7370	188.6205	71.5447	18.3608	0.0000	0.0000	0.0000	0.0000	82.9562	252.4860	429.9011 (98a)
Space heating requirement - total per year (kWh/year)												1731.6174
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	412.0111	275.7370	188.6205	71.5447	18.3608	0.0000	0.0000	0.0000	0.0000	82.9562	252.4860	429.9011 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1731.6174
Space heating per m ²										(98c) / (4) =		19.5156 (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	412.0111	275.7370	188.6205	71.5447	18.3608	0.0000	0.0000	0.0000	0.0000	82.9562	252.4860	429.9011 (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)	446.3826	298.7400	204.3559	77.5132	19.8926	0.0000	0.0000	0.0000	0.0000	89.8767	273.5493	465.7650 (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	235.0831	207.8012	220.8019	194.5535	188.8041	170.3826	168.4809	175.1222	176.9591	196.9873	208.9934	232.6005 (64)
Efficiency of water heater (217)m	85.3048	84.6950	83.7086	82.0355	80.5233	79.8000	79.8000	79.8000	79.8000	82.2709	84.4848	79.8000 (216)
Fuel for water heating, kWh/month	275.5800	245.3524	263.7746	237.1578	234.4713	213.5120	211.1289	219.4514	221.7533	239.4375	247.3739	272.3095 (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	24.8087	19.9025	17.9200	13.1290	10.1412	8.2854	9.2511	12.0250	15.6192	20.4933	23.1471	25.4983 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-19.4814	-29.1176	-44.3383	-52.9019	-59.7334	-56.7296	-56.0244	-51.5408	-44.1309	-34.5982	-21.9917	-16.6547 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												

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(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	-6.5023	-14.0237	-28.5337	-43.8498	-58.9757	-59.6368	-58.9500	-49.4656	-35.6655	-20.3909	-8.7862	-5.1175	(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												1876.0752	(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												2881.3026	(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)												200.2208	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-877.1405	(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												4166.4580	(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	1876.0752	0.2100	393.9758	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2881.3026	0.2100	605.0735	(264)
Space and water heating			999.0493	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	200.2208	0.1443	28.8980	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-487.2428	0.1334	-64.9914	
PV Unit electricity exported	-389.8978	0.1252	-48.8246	
Total			-113.8160	(269)
Total CO2, kg/year			926.0606	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.4400	(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	1876.0752	1.1300	2119.9650	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2881.3026	1.1300	3255.8719	(278)
Space and water heating			5375.8369	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	200.2208	1.5338	307.1053	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-487.2428	1.4929	-727.4067	
PV Unit electricity exported	-389.8978	0.4596	-179.2071	
Total			-906.6138	(283)
Total Primary energy kWh/year			4906.4292	(286)
Target Primary Energy Rate (TPER)			55.3000	(287)

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Plot Reference	B2 3B5P Mid			Issued on Date	19/12/2025
Assessment Reference	3B5P	Plot Type Ref	3B5P		
Plot Address				SAP Version	10.2
SAP Rating	81 B	DER	3.43	TER	10.44
Environmental	97 A	% DER < TER			67.15
CO ₂ Emissions (t/year)	0.27	DFEE	25.06	TFEE	26.57
Compliance Check	See BREL	% DFEE < TFEE			5.70
% DPER < TPER	34.84	DPER	36.03	TPER	55.30
Assessor Details	Mr. Matthew Stainrod			Assessor ID	AU83-0001
Client	ROK, Wilf Foster				

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	88.7300 (1b)	2.5000 (2b)	221.8250 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.7300		221.8250 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 221.8250 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1352 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2852 (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) = 0.2425 (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)
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	0.3091	0.3031	0.2970	0.2667	0.2606	0.2303	0.2303	0.2243	0.2425	0.2606	0.2728	0.2849 (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	0.5478	0.5459	0.5441	0.5356	0.5340	0.5265	0.5265	0.5251	0.5294	0.5340	0.5372	0.5406 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			20.4900	0.9615	19.7019		(27)
External Wall	80.4800	22.3800	58.1000	0.1600	9.2960	14.0000	813.4000 (29a)
Total net area of external elements Aum(A, m ²)			80.4800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 30.8879		(33)
Main dwelling							
Party Wall			18.3300	0.0000	0.0000	20.0000	366.6000 (32)
Party Floor			88.7300			80.0000	7098.4000 (32d)
Party Ceiling			88.7300			100.0000	8873.0000 (32b)
Stud			100.0000			9.0000	900.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	18051.4000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							203.4419 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				10.9100	0.0500	0.5455	
E4 Jamb				28.6200	0.0500	1.4310	
E7 Party floor between dwellings (in blocks of flats)				55.8700	0.0700	3.9109	

elmhurst
energy

7. Mean internal temperature (heating season)

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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	64.1562	64.2679	64.3777	64.8988	64.9972	65.4593	65.4593	65.5456	65.2805	64.9972	64.7984	64.5919
alpha	5.2771	5.2845	5.2918	5.3266	5.3331	5.3640	5.3640	5.3697	5.3520	5.3331	5.3199	5.3061
util living area	0.9918	0.9807	0.9573	0.8875	0.7518	0.5583	0.4069	0.4500	0.6845	0.9162	0.9816	0.9936 (86)
MIT	19.9138	20.1273	20.3882	20.7013	20.9035	20.9839	20.9975	20.9958	20.9547	20.6882	20.2463	19.8729 (87)
Th 2	20.1838	20.1851	20.1864	20.1924	20.1935	20.1988	20.1988	20.1998	20.1968	20.1935	20.1913	20.1889 (88)
util rest of house	0.9898	0.9760	0.9470	0.8621	0.7045	0.4932	0.3338	0.3734	0.6185	0.8914	0.9763	0.9920 (89)
MIT 2	19.1917	19.4031	19.6582	19.9561	20.1289	20.1909	20.1980	20.1984	20.1718	19.9512	19.5272	19.1552 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.4277	19.6398	19.8968	20.1997	20.3821	20.4501	20.4593	20.4590	20.4277	20.1921	19.7623	19.3898 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.4277	19.6398	19.8968	20.1997	20.3821	20.4501	20.4593	20.4590	20.4277	20.1921	19.7623	19.3898 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9873	0.9721	0.9427	0.8624	0.7161	0.5139	0.3577	0.3984	0.6382	0.8913	0.9729	0.9899 (94)
Useful gains	579.9470	669.8509	711.5860	715.8381	622.4112	441.4837	294.8541	309.1489	466.1611	579.2539	570.0858	553.2865 (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	1182.3408	1150.0214	1043.4526	873.0473	669.7870	448.1237	295.6297	310.5156	486.0370	739.9903	979.8399	1179.1848 (97)
Space heating kWh	448.1810	322.6746	246.9087	113.1906	35.2475	0.0000	0.0000	0.0000	0.0000	119.5879	295.0230	465.6683 (98a)
Space heating requirement - total per year (kWh/year)	2046.4816											
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	448.1810	322.6746	246.9087	113.1906	35.2475	0.0000	0.0000	0.0000	0.0000	119.5879	295.0230	465.6683 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2046.4816											
Space heating per m2	(98c) / (4) = 23.0641 (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	720.0537	566.8508	581.4046	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9357	0.9699	0.9578	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	673.7658	549.8043	556.8537	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	957.3178	919.0908	864.8191	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	204.1574	274.7492	229.1262	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											
Intermittency factor (Table 10b)												1.0000 (105)
	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	51.0394	68.6873	57.2816	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	177.0082 (107)											
Energy for space heating	23.0641 (99)											
Energy for space cooling	1.9949 (108)											
Total	25.0591 (109)											
Fabric Energy Efficiency (DFEE)	25.1 (109)											

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

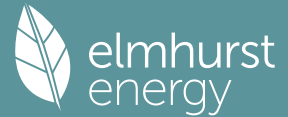
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	88.7300 (1b)	x 2.5000 (2b)	= 221.8250 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.7300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 221.8250 (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	30.0000 / (5) = 0.1352 (8)
Pressure test	Yes

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Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered

Blower Door
5.0000 (17)
0.3852 (18)
2 (19)

Shelter factor
Infiltration rate adjusted to include shelter factor

(20) = 1 - [0.075 x (19)] = 0.8500 (20)
(21) = (18) x (20) = 0.3275 (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	0.4175	0.4093	0.4011	0.3602	0.3520	0.3111	0.3111	0.3029	0.3275	0.3520	0.3684	0.3848	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													(23c)
Effective ac	0.5872	0.5838	0.5805	0.5649	0.5620	0.5484	0.5484	0.5459	0.5536	0.5620	0.5679	0.5740	(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	
Main dwelling								
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type			20.3000	1.1450	23.2443			(27)
External Wall	80.4800	22.1900	58.2900	0.1800	10.4922			(29a)
Total net area of external elements Aum(A, m2)			80.4800					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 35.6265			(33)
Main dwelling								
Party Wall			18.3300	0.0000	0.0000			(32)

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

203.4419 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element	10.9100	0.0500	0.5455	
E2 Other lintels (including other steel lintels)	28.6200	0.0500	1.4310	
E4 Jamb	55.8700	0.0700	3.9109	
E7 Party floor between dwellings (in blocks of flats)	10.0000	0.0900	0.9000	
E16 Corner (normal)	2.5000	-0.0900	-0.2250	
E17 Corner (inverted - internal area greater than external area)	8.5100	0.0200	0.1702	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	2.5000	0.0600	0.1500	
E18 Party wall between dwellings	14.6600	0.0000	0.0000	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	2.7600	0.0500	0.1380	
E3 Sill	2.5000	0.0600	0.1500	
E25 Staggered party wall between dwellings				7.1706 (36)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				0.0000
Point Thermal Bridges			(36a) =	
Total fabric heat loss			(33) + (36) + (36a) =	42.7971 (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	42.9811	42.7334	42.4905	41.3499	41.1365	40.1431	40.1431	39.9591	40.5258	41.1365	41.5682	42.0196	(38)
Heat transfer coeff	85.7782	85.5304	85.2876	84.1470	83.9336	82.9402	82.9402	82.7562	83.3228	83.9336	84.3653	84.8166	(39)
Average = Sum(39)m / 12 =												84.1460	

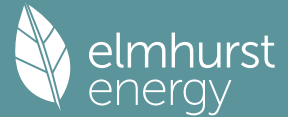
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9667	0.9639	0.9612	0.9483	0.9459	0.9347	0.9347	0.9327	0.9391	0.9459	0.9508	0.9559	(40)
HLP (average)												0.9483	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6079 (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	29.3423	28.9066	28.2929	27.1614	26.3142	25.3747	24.8673	25.4766	26.1401	27.1454	28.3002	29.2431	(42b)
Hot water usage for other uses	41.3379	39.8347	38.3315	36.8283	35.3251	33.8219	33.8219	35.3251	36.8283	38.3315	39.8347	41.3379	(42c)
Average daily hot water use (litres/day)													64.7848 (43)
Daily hot water use	70.6802	68.7412	66.6244	63.9897	61.6393	59.1966	58.6892	60.8017	62.9684	65.4769	68.1348	70.5810	(44)
Energy conte	111.9402	97.8866	102.3992	87.5987	82.9783	72.7891	70.9794	75.2852	77.6463	88.8515	97.0706	110.5128	(45)
Energy content (annual)										Total = Sum(45)m =		1075.9379	
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 (or HIU 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													
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	(57)
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	(59)
Total heat required for water heating calculated for each month	95.1491	83.2036	87.0393	74.4589	70.5315	61.8708	60.3325	63.9924	65.9994	75.5238	82.5100	93.9359	(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	95.1491	83.2036	87.0393	74.4589	70.5315	61.8708	60.3325	63.9924	65.9994	75.5238	82.5100	93.9359	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		914.5472	(64)
Electric shower(s)	54.4136	48.4830	52.9416	50.5215	51.4695	49.0969	50.7335	51.4695	50.5215	52.9416	51.9461	54.4136	(64a)
Heat gains from water heating, kWh/month	37.3907	32.9216	34.9952	31.2451	30.5003	27.7419	27.7665	28.8655	29.1302	32.1163	33.6140	37.0874	(65)

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

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Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	119.3989	132.1917	119.3989	123.3789	119.3989	123.3789	119.3989	119.3989	123.3789	119.3989	123.3789	119.3989 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	236.7218	239.1782	232.9881	219.8100	203.1751	187.5406	177.0958	174.6394	180.8295	194.0076	210.6425	226.2770 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397 (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)												
	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174 (71)
Water heating gains (Table 5)												
	50.2563	48.9905	47.0366	43.3960	40.9950	38.5304	37.3206	38.7977	40.4586	43.1671	46.6861	49.8486 (72)
Total internal gains												
	468.4960	482.4795	461.5426	448.7039	425.6881	411.5690	395.9344	394.9551	406.7861	418.6927	442.8266	457.6436 (73)

6. Solar gains

[Jan]		Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast		5.4800	11.2829	0.6300	0.7000	0.7700	18.8962 (75)
Southeast		6.4700	36.7938	0.6300	0.7000	0.7700	72.7530 (77)
Southwest		8.3500	36.7938	0.6300	0.7000	0.7700	93.8930 (79)
Solar gains							
	185.5423	322.3237	457.6890	595.0431	692.0041	698.2192	668.4888
Total gains							
	654.0383	804.8031	919.2316	1043.7470	1117.6921	1109.7882	1064.4232
							594.4364
							504.9862
							360.7314
							223.3799
							158.0459 (83)
							615.6895 (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	58.4563	58.6257	58.7926	59.5895	59.7410	60.4566	60.4566	60.5910	60.1789	59.7410	59.4353	59.1190
alpha	4.8971	4.9084	4.9195	4.9726	4.9827	5.0304	5.0304	5.0394	5.0119	4.9827	4.9624	4.9413
util living area												
	0.9882	0.9689	0.9279	0.8221	0.6585	0.4721	0.3418	0.3828	0.6059	0.8763	0.9730	0.9910 (86)
MIT												
	19.8409	20.1189	20.4335	20.7629	20.9340	20.9898	20.9984	20.9972	20.9667	20.7187	20.2239	19.7957 (87)
Th 2												
	20.1111	20.1135	20.1158	20.1266	20.1286	20.1381	20.1381	20.1398	20.1344	20.1286	20.1245	20.1202 (88)
util rest of house												
	0.9852	0.9617	0.9119	0.7885	0.6075	0.4110	0.2754	0.3122	0.5386	0.8434	0.9654	0.9887 (89)
MIT 2												
	19.0616	19.3356	19.6390	19.9465	20.0865	20.1333	20.1376	20.1389	20.1170	19.9177	19.4503	19.0242 (90)
Living area fraction												
	19.3163	19.5916	19.8987	20.2133	20.3635	20.4132	20.4189	20.4194	20.3947	20.1795	19.7031	19.2764 (92)
Temperature adjustment												
	19.3163	19.5916	19.8987	20.2133	20.3635	20.4132	20.4189	20.4194	20.3947	20.1795	19.7031	19.2764 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9819	0.9565	0.9074	0.7921	0.6217	0.4307	0.2971	0.3353	0.5594	0.8455	0.9609	0.9858 (94)
Useful gains	642.1686	769.8042	834.1445	826.7267	694.8559	478.0099	316.2408	331.7220	510.0314	659.0250	640.1509	606.9523 (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												
	1288.0678	1256.5799	1142.7395	951.9807	727.1584	482.1519	316.7415	332.6318	524.4923	804.0396	1063.2684	1278.7269 (97)
Space heating kWh												
	480.5491	327.1133	229.5947	90.1829	24.0331	0.0000	0.0000	0.0000	0.0000	107.8909	304.6446	499.8003 (98a)
Space heating requirement - total per year (kWh/year)												
												2063.8087
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												
	480.5491	327.1133	229.5947	90.1829	24.0331	0.0000	0.0000	0.0000	0.0000	107.8909	304.6446	499.8003 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												
												2063.8087
Space heating per m ²												
										(98c) / (4) =		23.2594 (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	779.6377	613.7574	628.9472	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.9629	0.9829	0.9748	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	750.6958	603.2802	613.1041	0.0000	0.0000	0.0000	0.0000 (102)
Total gains												
	0.0000	0.0000	0.0000	0.0000	0.0000	1250.4034	1199.6958	1114.3365	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	359.7895	443.7332	372.9169	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	89.9474	110.9333	93.2292	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												
												294.1099 (107)
Energy for space heating												
												23.2594 (99)
Energy for space cooling												
												3.3147 (108)
Total												
												26.5741 (109)
Fabric Energy Efficiency (TFEE)												
												26.6 (109)

Full SAP Calculation Printout



Plot Reference	B2 3B5P Mid				Issued on Date	19/12/2025	
Assessment Reference	3B5P		Plot Type Ref	3B5P			
Plot Address					SAP Version	10.2	
SAP Rating	81 B	DER	3.43	TER	10.44		
Environmental	97 A	% DER < TER				67.15	
CO ₂ Emissions (t/year)	0.27	DFEE	25.06	TFEE	26.57		
Compliance Check	See BREL	% DFEE < TFEE				5.70	
% DPER < TPER	34.84	DPER	36.03	TPER	55.30		
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	88.7300 (1b)	2.5000 (2b)	221.8250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.7300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	221.8250 (5)

2. Ventilation rate

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

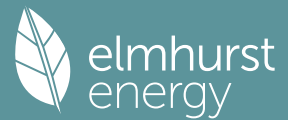
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												71.2000 (23c)
Effective ac	0.3066	0.3034	0.3002	0.2843	0.2811	0.2651	0.2651	0.2619	0.2715	0.2811	0.2874	0.2938 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			20.4900	0.9615	19.7019		(27)
External Wall	80.4800	22.3800	58.1000	0.1600	9.2960	14.0000	813.4000 (29a)
Total net area of external elements Aum(A, m ²)			80.4800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.8879		(33)
Main dwelling							
Party Wall			18.3300	0.0000	0.0000	20.0000	366.6000 (32)
Party Floor			88.7300			80.0000	7098.4000 (32d)
Party Ceiling			88.7300			100.0000	8873.0000 (32b)
Stud			100.0000			9.0000	900.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	18051.4000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							203.4419 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

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E2 Other lintels (including other steel lintels)									10.9100	0.0500	0.5455	
E4 Jamb									28.6200	0.0500	1.4310	
E7 Party floor between dwellings (in blocks of flats)									55.8700	0.0700	3.9109	
E16 Corner (normal)									10.0000	0.0900	0.9000	
E17 Corner (inverted - internal area greater than external area)									2.5000	-0.0900	-0.2250	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation									8.5100	0.0200	0.1702	
E18 Party wall between dwellings									2.5000	0.0600	0.1500	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)									14.6600	0.0000	0.0000	
E3 Sill									2.7600	0.0500	0.1380	
E25 Staggered party wall between dwellings									2.5000	0.0600	0.1500	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												7.1706 (36)
Point Thermal bridges												0.0000
Total fabric heat loss										(33) + (36) + (36a) =		38.0585 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	22.4411	22.2077	21.9744	20.8077	20.5744	19.4077	19.4077	19.1744	19.8744	20.5744	21.0411	21.5077 (38)
Heat transfer coeff	60.4996	60.2663	60.0329	58.8663	58.6329	57.4663	57.4663	57.2329	57.9329	58.6329	59.0996	59.5663 (39)
Average = Sum(39)m / 12 =												58.8079
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.6818	0.6792	0.6766	0.6634	0.6608	0.6477	0.6477	0.6450	0.6529	0.6608	0.6661	0.6713 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.6079 (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												
	29.3423	28.9066	28.2929	27.1614	26.3142	25.3747	24.8673	25.4766	26.1401	27.1454	28.3002	29.2431 (42b)
Hot water usage for other uses												
	41.3379	39.8347	38.3315	36.8283	35.3251	33.8219	33.8219	35.3251	36.8283	38.3315	39.8347	41.3379 (42c)
Average daily hot water use (litres/day)												64.7848 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	70.6802	68.7412	66.6244	63.9897	61.6393	59.1966	58.6892	60.8017	62.9684	65.4769	68.1348	70.5810 (44)
Energy conte	111.9402	97.8866	102.3992	87.5987	82.9783	72.7891	70.9794	75.2852	77.6463	88.8515	97.0706	110.5128 (45)
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m												1075.9379
	16.7910	14.6830	15.3599	13.1398	12.4467	10.9184	10.6469	11.2928	11.6470	13.3277	14.5606	16.5769 (46)
Water storage loss (or HIU loss):												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage												
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	167.2170	147.8140	157.6760	141.0924	138.2551	126.2828	126.2563	130.5620	131.1400	144.1283	150.5642	165.7896 (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												
	167.2170	147.8140	157.6760	141.0924	138.2551	126.2828	126.2563	130.5620	131.1400	144.1283	150.5642	165.7896 (64)
12Total per year (kWh/year)												1726.7776 (64)
Electric shower(s)												1727 (64)
	54.4136	48.4830	52.9416	50.5215	51.4695	49.0969	50.7335	51.4695	50.5215	52.9416	51.9461	54.4136 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												618.9517 (64a)
Heat gains from water heating, kWh/month												
	95.0449	84.6100	91.5046	84.5519	84.6791	79.2716	80.5055	82.1212	81.2427	86.9999	88.0574	94.5703 (65)

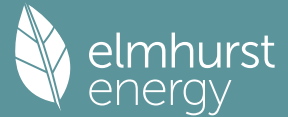
5. Internal gains (see Table 5 and 5a)												

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	119.3989	132.1917	119.3989	123.3789	119.3989	123.3789	119.3989	119.3989	123.3789	119.3989	123.3789	119.3989 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	236.7218	239.1782	232.9881	219.8100	203.1751	187.5406	177.0958	174.6394	180.8295	194.0076	210.6425	226.2770 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397 (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)												
	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174 (71)
Water heating gains (Table 5)												
	127.7486	125.9077	122.9900	117.4332	113.8160	110.0994	108.2063	110.3779	112.8371	116.9354	122.3020	127.1107 (72)
Total internal gains												
	545.9883	559.3966	537.4960	522.7411	498.5091	483.1380	466.8201	466.5353	479.1646	492.4610	518.4424	534.9056 (73)

6. Solar gains												

[Jan]												
	Area											
	m2											
	Solar flux											
	Table 6a											
	W/m2											
	Specific data											
	or Table 6b											
	Specific data											
	or Table 6c											
	Access											
	factor											
	Table 6d											
	Gains											
	W											
Northeast	5.5300				11.2829		0.4000		0.7000		0.7700	12.1071 (75)
Southeast	6.5300				36.7938		0.4000		0.7000		0.7700	46.6208 (77)
Southwest	8.4300				36.7938		0.4000		0.7000		0.7700	60.1858 (79)

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Solar gains	118.9136	206.5753	293.3272	381.3508	443.4869	447.4682	428.4156	380.9604	323.6377	231.1898	143.1634	101.2914 (83)
Total gains	664.9019	765.9720	830.8232	904.0920	941.9960	930.6062	895.2357	847.4957	802.8023	723.6508	661.6059	636.1970 (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	82.8812	83.2021	83.5255	85.1808	85.5198	87.2560	87.2560	87.6117	86.5531	85.5198	84.8445	84.1798
alpha	6.5254	6.5468	6.5684	6.6787	6.7013	6.8171	6.8171	6.8408	6.7702	6.7013	6.6563	6.6120
util living area	0.9767	0.9462	0.8872	0.7474	0.5725	0.3948	0.2824	0.3106	0.4957	0.7852	0.9431	0.9812 (86)
MIT	20.4319	20.6133	20.7898	20.9421	20.9905	20.9994	20.9999	20.9999	20.9972	20.9342	20.6879	20.4059 (87)
Th 2	20.3569	20.3592	20.3616	20.3732	20.3756	20.3873	20.3873	20.3896	20.3826	20.3756	20.3709	20.3662 (88)
util rest of house	0.9718	0.9361	0.8686	0.7169	0.5360	0.3572	0.2431	0.2694	0.4522	0.7506	0.9308	0.9771 (89)
MIT 2	19.8449	20.0211	20.1874	20.3301	20.3696	20.3870	20.3873	20.3896	20.3811	20.3282	20.1047	19.8276 (90)
Living area fraction	20.0367	20.2146	20.3843	20.5302	20.5725	20.5871	20.5875	20.5891	20.5825	20.5263	20.2953	20.0166 (91)
MIT	20.0367	20.2146	20.3843	20.5302	20.5725	20.5871	20.5875	20.5891	20.5825	20.5263	20.2953	20.0166 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0367	20.2146	20.3843	20.5302	20.5725	20.5871	20.5875	20.5891	20.5825	20.5263	20.2953	20.0166 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9689	0.9335	0.8693	0.7247	0.5476	0.3695	0.2559	0.2829	0.4663	0.7593	0.9291	0.9745 (94)
Useful gains	644.2475	715.0639	722.2092	655.1983	515.8197	343.8129	229.1324	239.7227	374.3781	549.4621	614.7113	619.9768 (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	952.0648	922.9566	833.5130	684.6241	520.2225	344.0587	229.1481	239.7532	375.5480	582.0051	779.8357	942.1370 (97)
Space heating kWh	229.0161	139.7039	82.8100	21.1866	3.2757	0.0000	0.0000	0.0000	0.0000	24.2120	118.8896	239.6872 (98a)
Space heating requirement - total per year (kWh/year)												858.7810
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	229.0161	139.7039	82.8100	21.1866	3.2757	0.0000	0.0000	0.0000	0.0000	24.2120	118.8896	239.6872 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												858.7810
Space heating per m2										(98c) / (4) =		9.6786 (99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space and Water												1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500 (305)
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system												1.5000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	229.0161	139.7039	82.8100	21.1866	3.2757	0.0000	0.0000	0.0000	0.0000	24.2120	118.8896	239.6872 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	360.7004	220.0336	130.4258	33.3688	5.1592	0.0000	0.0000	0.0000	0.0000	38.1339	187.2511	377.5073
Space heating requirement	360.7004	220.0336	130.4258	33.3688	5.1592	0.0000	0.0000	0.0000	0.0000	38.1339	187.2511	377.5073 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement	167.2170	147.8140	157.6760	141.0924	138.2551	126.2828	126.2563	130.5620	131.1400	144.1283	150.5642	165.7896 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	250.8254	221.7210	236.5140	211.6386	207.3826	189.4242	189.3844	195.8431	196.7100	216.1924	225.8464	248.6844
Water heating fuel	250.8254	221.7210	236.5140	211.6386	207.3826	189.4242	189.3844	195.8431	196.7100	216.1924	225.8464	248.6844 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	20.9161	18.8920	20.9161	20.2414	20.9161	20.2414	20.9161	20.9161	20.2414	20.9161	20.2414	20.9161 (311)
Lighting	28.4266	22.8048	20.5332	15.0435	11.6201	9.4937	10.6002	13.7785	17.8970	23.4818	26.5226	29.2166 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-13.1383	-22.4723	-39.7191	-53.3741	-64.4554	-62.8509	-61.7940	-54.4462	-42.4553	-28.7084	-15.5630	-10.8078 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												1352.5800 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2590.1664 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												13.5258 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9100)												
mechanical ventilation fans (SFP = 0.9100)												246.2701 (330a)
Total electricity for the above, kWh/year												246.2701 (331)
Electricity for lighting (calculated in Appendix L)												229.4186 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												

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PV generation	-469.7847	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4567.6023	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			280.0000 (367)
Space and Water heating from Heat pump	1408.1237	0.1585	76.5722 (367)
Electrical energy for heat distribution (space & water)	13.5258	0.0000	5.7831 (372)
Overall CO2 factor for heat network			0.0539 (386)
Total CO2 associated with community systems			212.3238 (373)
Energy for instantaneous electric shower(s)	618.9517	0.1391	86.1099 (264a)
Space and water heating			212.3238 (376)
Pumps, fans and electric keep-hot	246.2701	0.1387	34.1607 (378)
Energy for lighting	229.4186	0.1443	33.1122 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-469.7847	0.1312	-61.6495
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-61.6495 (380)
Total CO2, kg/year			304.0570 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.4300 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	1408.1237	1.5867	766.5005 (467)
Electrical energy for heat distribution (space & water)	13.5258	0.0000	60.8193 (472)
Overall CO2 factor for heat network			0.5663 (486)
Total CO2 associated with community systems			2232.9362 (473)
Energy for instantaneous electric shower(s)	618.9517	1.5143	937.2998 (278a)
Space and water heating			2232.9362 (476)
Pumps, fans and electric keep-hot	246.2701	1.5128	372.5574 (478)
Energy for lighting	229.4186	1.5338	351.8900 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-469.7847	1.4848	-697.5410
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-697.5410 (480)
Total Primary energy kWh/year			3197.1423 (483)
Dwelling Primary energy Rate (DPER)			36.0300 (484)

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

1. Overall dwelling characteristics

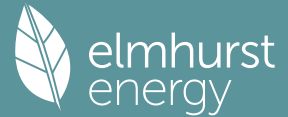
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	88.7300 (1b)	x 2.5000 (2b)	= 221.8250 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.7300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	221.8250 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 30.0000 / (5) = 0.1352 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3852 (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) = 0.3275 (21)

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

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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	0.4175	0.4093	0.4011	0.3602	0.3520	0.3111	0.3111	0.3029	0.3275	0.3520	0.3684	0.3848 (22b)
Effective ac	0.5872	0.5838	0.5805	0.5649	0.5620	0.5484	0.5484	0.5459	0.5536	0.5620	0.5679	0.5740 (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
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			20.3000	1.1450	23.2443		(27)
External Wall	80.4800	22.1900	58.2900	0.1800	10.4922		(29a)
Total net area of external elements Aum (A, m2)			80.4800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.6265		(33)
Main dwelling							
Party Wall			18.3300	0.0000	0.0000		(32)

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

203.4419 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.9100	0.0500	0.5455
E4 Jamb	28.6200	0.0500	1.4310
E7 Party floor between dwellings (in blocks of flats)	55.8700	0.0700	3.9109
E16 Corner (normal)	10.0000	0.0900	0.9000
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.5100	0.0200	0.1702
E18 Party wall between dwellings	2.5000	0.0600	0.1500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	14.6600	0.0000	0.0000
E3 Sill	2.7600	0.0500	0.1380
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500

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

7.1706 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 42.7971 (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	42.9811	42.7334	42.4905	41.3499	41.1365	40.1431	40.1431	39.9591	40.5258	41.1365	41.5682	42.0196 (38)
Heat transfer coeff	85.7782	85.5304	85.2876	84.1470	83.9336	82.9402	82.9402	82.7562	83.3228	83.9336	84.3653	84.8166 (39)
Average = Sum(39)m / 12 =												84.1460

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9667	0.9639	0.9612	0.9483	0.9459	0.9347	0.9347	0.9327	0.9391	0.9459	0.9508	0.9559 (40)
HLP (average)												0.9483
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

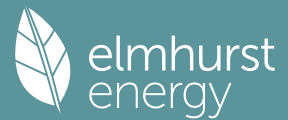
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6079 (42)
Hot water usage for mixer showers	67.9462	66.9251	65.4372	62.5903	60.4893	58.1464	56.8146	58.2913	59.9100	62.4257	65.3337	67.6859 (42a)
Hot water usage for baths	29.3423	28.9066	28.2929	27.1614	26.3142	25.3747	24.8673	25.4766	26.1401	27.1454	28.3002	29.2431 (42b)
Hot water usage for other uses	41.3379	39.8347	38.3315	36.8283	35.3251	33.8219	33.8219	35.3251	36.8283	38.3315	39.8347	41.3379 (42c)
Average daily hot water use (litres/day)												127.4290 (43)
Daily hot water use	138.6264	135.6664	132.0616	126.5800	122.1286	117.3430	115.5038	119.0931	122.8785	127.9025	133.4686	138.2669 (44)
Energy conte	219.5504	193.1871	202.9737	173.2817	164.4086	144.2869	139.6918	147.4621	151.5214	173.5625	190.1504	216.4926 (45)
Energy content (annual)										Total = Sum(45)m =		2116.5692
Distribution loss (46)m = 0.15 x (45)m	32.9326	28.9781	30.4461	25.9923	24.6613	21.6430	20.9538	22.1193	22.7282	26.0344	28.5226	32.4739 (46)
Water storage loss (or HIU loss):												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (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	266.1453	235.2728	249.5686	218.3735	211.0035	189.3787	186.2867	194.0570	196.6133	220.1574	235.2423	263.0875 (62)
WWHRS	-31.0622	-27.4717	-28.7667	-23.8200	-22.1994	-18.9962	-17.8059	-18.9348	-19.6542	-23.1701	-26.2489	-30.4870 (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	235.0831	207.8012	220.8019	194.5535	188.8041	170.3826	168.4809	175.1222	176.9591	196.9873	208.9934	232.6005 (64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2376.5698 (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	110.2764	97.9033	104.7647	93.6896	91.9418	84.0489	83.7235	86.3071	86.4543	94.9855	99.2985	109.2597 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.3989	132.1917	119.3989	123.3789	119.3989	123.3789	119.3989	119.3989	123.3789	119.3989	123.3789	119.3989 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.7218	239.1782	232.9881	219.8100	203.1751	187.5406	177.0958	174.6394	180.8295	194.0076	210.6425	226.2770 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												

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Pumps, fans	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174 (71)
Total internal gains	148.2210	145.6894	140.8127	130.1245	123.5776	116.7345	112.5315	116.0041	120.0755	127.6686	137.9146	146.8544 (72)
	569.4608	582.1783	558.3188	538.4324	511.2707	489.7731	471.1453	472.1615	486.4030	506.1942	537.0550	557.6494 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
Northeast					5.4800	11.2829	0.6300	0.7000			0.7700	18.8962 (75)
Southeast					6.4700	36.7938	0.6300	0.7000			0.7700	72.7530 (77)
Southwest					8.3500	36.7938	0.6300	0.7000			0.7700	93.8930 (79)
Solar gains	185.5423	322.3237	457.6890	595.0431	692.0041	698.2192	668.4888	594.4364	504.9862	360.7314	223.3799	158.0459 (83)
Total gains	755.0030	904.5020	1016.0078	1133.4755	1203.2748	1187.9923	1139.6342	1066.5979	991.3892	866.9256	760.4349	715.6953 (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)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	58.4563	58.6257	58.7926	59.5895	59.7410	60.4566	60.4566	60.5910	60.1789	59.7410	59.4353	59.1190
util living area	4.8971	4.9084	4.9195	4.9726	4.9827	5.0304	5.0304	5.0394	5.0119	4.9827	4.9624	4.9413
	0.9790	0.9524	0.9013	0.7850	0.6202	0.4425	0.3195	0.3556	0.5634	0.8357	0.9557	0.9832 (86)
MIT	19.9777	20.2394	20.5262	20.8099	20.9492	20.9924	20.9988	20.9980	20.9757	20.7802	20.3402	19.9340 (87)
Th 2	20.1111	20.1135	20.1158	20.1266	20.1286	20.1381	20.1381	20.1398	20.1344	20.1286	20.1245	20.1202 (88)
util rest of house	0.9740	0.9421	0.8814	0.7488	0.5700	0.3846	0.2573	0.2898	0.4987	0.7976	0.9442	0.9791 (89)
MIT 2	18.9365	19.2633	19.6124	19.9444	20.0876	20.1335	20.1376	20.1390	20.1185	19.9227	19.4015	18.8884 (90)
Living area fraction	19.2768	19.5823	19.9111	20.2273	20.3692	20.4142	20.4191	20.4197	20.3986	20.2030	19.7083	19.2301 (92)
MIT	19.2768	19.5823	19.9111	20.2273	20.3692	20.4142	20.4191	20.4197	20.3986	20.2030	19.7083	19.2301 (93)
Temperature adjustment												0.0000
adjusted MIT	19.2768	19.5823	19.9111	20.2273	20.3692	20.4142	20.4191	20.4197	20.3986	20.2030	19.7083	19.2301 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9681	0.9347	0.8763	0.7532	0.5842	0.4033	0.2776	0.3113	0.5189	0.8011	0.9377	0.9738 (94)
Ext temp.	730.9033	845.4617	890.2773	853.7902	702.9597	479.1484	316.3901	332.0125	514.4021	694.5108	713.0279	696.9785 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Space heating kWh	1284.6817	1255.7846	1143.7995	953.1578	727.6382	482.2337	316.7551	332.6583	524.8208	806.0110	1063.7029	1274.8026 (97)
Space heating requirement - total per year (kWh/year)	412.0111	275.7370	188.6205	71.5447	18.3608	0.0000	0.0000	0.0000	0.0000	82.9562	252.4860	429.9011 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	412.0111	275.7370	188.6205	71.5447	18.3608	0.0000	0.0000	0.0000	0.0000	82.9562	252.4860	429.9011 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (99)
Space heating per m ²												

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	412.0111	275.7370	188.6205	71.5447	18.3608	0.0000	0.0000	0.0000	0.0000	82.9562	252.4860	429.9011 (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)	446.3826	298.7400	204.3559	77.5132	19.8926	0.0000	0.0000	0.0000	0.0000	89.8767	273.5493	465.7650 (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	235.0831	207.8012	220.8019	194.5535	188.8041	170.3826	168.4809	175.1222	176.9591	196.9873	208.9934	232.6005 (64)
Efficiency of water heater (217)m	85.3048	84.6950	83.7086	82.0355	80.5233	79.8000	79.8000	79.8000	79.8000	82.2709	84.4848	79.8000 (216)
Fuel for water heating, kWh/month	275.5800	245.3524	263.7746	237.1578	234.4713	213.5120	211.1289	219.4514	221.7533	239.4375	247.3739	272.3095 (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	24.8087	19.9025	17.9200	13.1290	10.1412	8.2854	9.2511	12.0250	15.6192	20.4933	23.1471	25.4983 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-19.4814	-29.1176	-44.3383	-52.9019	-59.7334	-56.7296	-56.0244	-51.5408	-44.1309	-34.5982	-21.9917	-16.6547 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												

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(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	-6.5023	-14.0237	-28.5337	-43.8498	-58.9757	-59.6368	-58.9500	-49.4656	-35.6655	-20.3909	-8.7862	-5.1175	(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												1876.0752	(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												2881.3026	(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)												200.2208	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-877.1405	(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												4166.4580	(238)

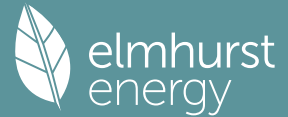
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1876.0752	0.2100	393.9758	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2881.3026	0.2100	605.0735	(264)
Space and water heating			999.0493	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	200.2208	0.1443	28.8980	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-487.2428	0.1334	-64.9914	
PV Unit electricity exported	-389.8978	0.1252	-48.8246	
Total			-113.8160	(269)
Total CO2, kg/year			926.0606	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.4400	(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	1876.0752	1.1300	2119.9650	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2881.3026	1.1300	3255.8719	(278)
Space and water heating			5375.8369	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	200.2208	1.5338	307.1053	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-487.2428	1.4929	-727.4067	
PV Unit electricity exported	-389.8978	0.4596	-179.2071	
Total			-906.6138	(283)
Total Primary energy kWh/year			4906.4292	(286)
Target Primary Energy Rate (TPER)			55.3000	(287)

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Plot Reference	B2 3B5P Top				Issued on Date	19/12/2025	
Assessment Reference	3B5P			Plot Type Ref	3B5P		
Plot Address					SAP Version	10.2	
SAP Rating	76 C		DER	4.98		TER	13.72
Environmental	96 A		% DER < TER				63.70
CO ₂ Emissions (t/year)	0.39		DFEE	41.40		TFEE	41.61
Compliance Check	See BREL		% DFEE < TFEE				0.50
% DPER < TPER	28.88		DPER	51.90		TPER	72.98
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	88.7300 (1b)	2.5000 (2b)	221.8250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.7300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	221.8250 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (21)

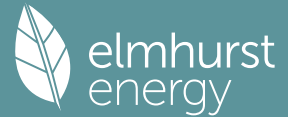
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												71.2000 (23c)
Effective ac	0.3066	0.3034	0.3002	0.2843	0.2811	0.2651	0.2651	0.2619	0.2715	0.2811	0.2874	0.2938 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			20.4900	0.9615	19.7019		(27)
External Wall	80.4800	22.3800	58.1000	0.1600	9.2960	14.0000	813.4000 (29a)
Roof	88.7300		88.7300	0.1300	11.5349	9.0000	798.5700 (30)
Total net area of external elements Aum(A, m ²)			169.2100				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	42.4228	(33)
Main dwelling							
Party Wall			18.3300	0.0000	0.0000	20.0000	366.6000 (32)
Party Floor			88.7300			80.0000	7098.4000 (32d)
Stud			100.0000			9.0000	900.0000 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 9976.9700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							112.4419 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value		Total

6. Solar gains						
[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	5.5300	11.2829	0.4000	0.7000	0.7700	12.1071 (75)

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Southeast			6.5300		36.7938		0.4000		0.7000		0.7700		46.6208 (77)
Southwest			8.4300		36.7938		0.4000		0.7000		0.7700		60.1858 (79)

Solar gains	118.9136	206.5753	293.3272	381.3508	443.4869	447.4682	428.4156	380.9604	323.6377	231.1898	143.1634	101.2914	(83)
Total gains	664.9019	765.9720	830.8232	904.0920	941.9960	930.6062	895.2357	847.4957	802.8023	723.6508	661.6059	636.1970	(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	31.2489	31.3314	31.4142	31.8352	31.9208	32.3556	32.3556	32.4440	32.1803	31.9208	31.7501	31.5813	
alpha	3.0833	3.0888	3.0943	3.1223	3.1281	3.1570	3.1570	3.1629	3.1454	3.1281	3.1167	3.1054	
util living area	0.9515	0.9261	0.8888	0.8118	0.6966	0.5379	0.4047	0.4408	0.6354	0.8341	0.9251	0.9568	(86)
MIT	19.0934	19.3924	19.7826	20.2778	20.6576	20.8917	20.9668	20.9560	20.8092	20.3225	19.6417	19.0480	(87)
Th 2	20.0837	20.0859	20.0881	20.0991	20.1013	20.1123	20.1123	20.1145	20.1079	20.1013	20.0969	20.0925	(88)
util rest of house	0.9445	0.9157	0.8730	0.7852	0.6539	0.4762	0.3288	0.3637	0.5758	0.8049	0.9129	0.9505	(89)
MIT 2	18.3492	18.6423	19.0223	19.4997	19.8446	20.0463	20.0976	20.0940	19.9828	19.5525	18.8984	18.3110	(90)
Living area fraction										fLA = Living area / (4) =		0.3268	(91)
MIT	18.5925	18.8874	19.2708	19.7540	20.1103	20.3226	20.3817	20.3757	20.2529	19.8042	19.1413	18.5519	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5925	18.8874	19.2708	19.7540	20.1103	20.3226	20.3817	20.3757	20.2529	19.8042	19.1413	18.5519	(93)

8. Space heating requirement													

Utilisation	0.9299	0.8992	0.8564	0.7739	0.6544	0.4913	0.3524	0.3871	0.5861	0.7939	0.8971	0.9368	(94)
Useful gains	618.3184	688.7544	711.5424	699.6447	616.4158	457.2174	315.4469	328.0700	470.5165	574.5240	593.5552	595.9998	(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	1267.5591	1237.2423	1126.6437	944.8864	730.1880	490.1625	323.9178	339.6094	529.8907	799.1124	1051.0542	1259.4346	(97)
Space heating kWh	483.0351	368.5839	308.8354	176.5740	84.6465	0.0000	0.0000	0.0000	0.0000	167.0937	329.3992	493.5955	(98a)
Space heating requirement - total per year (kWh/year)												2411.7634	
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	483.0351	368.5839	308.8354	176.5740	84.6465	0.0000	0.0000	0.0000	0.0000	167.0937	329.3992	493.5955	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2411.7634	
Space heating per m2										(98c) / (4) =		27.1809	(99)

9b. Energy requirements													

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	483.0351	368.5839	308.8354	176.5740	84.6465	0.0000	0.0000	0.0000	0.0000	167.0937	329.3992	493.5955	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	760.7803	580.5196	486.4158	278.1041	133.3182	0.0000	0.0000	0.0000	0.0000	263.1726	518.8038	777.4130	
Space heating requirement	760.7803	580.5196	486.4158	278.1041	133.3182	0.0000	0.0000	0.0000	0.0000	263.1726	518.8038	777.4130	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating													
Annual water heating requirement	167.2170	147.8140	157.6760	141.0924	138.2551	126.2828	126.2563	130.5620	131.1400	144.1283	150.5642	165.7896	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	250.8254	221.7210	236.5140	211.6386	207.3826	189.4242	189.3844	195.8431	196.7100	216.1924	225.8464	248.6844	
Water heating fuel	250.8254	221.7210	236.5140	211.6386	207.3826	189.4242	189.3844	195.8431	196.7100	216.1924	225.8464	248.6844	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	20.9161	18.8920	20.9161	20.2414	20.9161	20.2414	20.9161	20.9161	20.2414	20.9161	20.2414	20.9161	(316)
Lighting	28.4266	22.8048	20.5332	15.0435	11.6201	9.4937	10.6002	13.7785	17.8970	23.4818	26.5226	29.2166	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.1383	-22.4723	-39.7191	-53.3741	-64.4554	-62.8509	-61.7940	-54.4462	-42.4553	-28.7084	-15.5630	-10.8078	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												3798.5273	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2590.1664	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												37.9853	(313)
Space cooling fuel												0.0000	(321)

Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9100)													
mechanical ventilation fans (SFP = 0.9100)												246.2701	(330a)
Total electricity for the above, kWh/year												246.2701	(331)
Electricity for lighting (calculated in Appendix L)												229.4186	(332)

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

PV generation	-469.7847 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	7013.5496 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			280.0000 (367)
Space and Water heating from Heat pump	2281.6763	0.1552	210.5457 (367)
Electrical energy for heat distribution (space & water)	37.9853	0.0000	9.5344 (372)
Overall CO2 factor for heat network			0.0548 (386)
Total CO2 associated with community systems			350.0485 (373)
Energy for instantaneous electric shower(s)	618.9517	0.1391	86.1099 (264a)
Space and water heating			350.0485 (376)
Pumps, fans and electric keep-hot	246.2701	0.1387	34.1607 (378)
Energy for lighting	229.4186	0.1443	33.1122 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-469.7847	0.1312	-61.6495
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-61.6495 (380)
Total CO2, kg/year			441.7818 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.9800 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	2281.6763	1.5746	2136.0927 (467)
Electrical energy for heat distribution (space & water)	37.9853	0.0000	99.1679 (472)
Overall CO2 factor for heat network			0.5699 (486)
Total CO2 associated with community systems			3640.8769 (473)
Energy for instantaneous electric shower(s)	618.9517	1.5143	937.2998 (278a)
Space and water heating			3640.8769 (476)
Pumps, fans and electric keep-hot	246.2701	1.5128	372.5574 (478)
Energy for lighting	229.4186	1.5338	351.8900 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-469.7847	1.4848	-697.5410
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-697.5410 (480)
Total Primary energy kWh/year			4605.0831 (483)
Dwelling Primary energy Rate (DPER)			51.9000 (484)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	88.7300 (1b)	x 2.5000 (2b)	= 221.8250 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.7300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	221.8250 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1352 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3852 (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) = 0.3275 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
Effective ac	0.4175	0.4093	0.4011	0.3602	0.3520	0.3111	0.3111	0.3029	0.3275	0.3520	0.3684	0.3848	(22b)
	0.5872	0.5838	0.5805	0.5649	0.5620	0.5484	0.5484	0.5459	0.5536	0.5620	0.5679	0.5740	(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
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			20.3000	1.1450	23.2443		(27)
External Wall	80.4800	22.1900	58.2900	0.1800	10.4922		(29a)
Roof	88.7300		88.7300	0.1100	9.7603		(30)
Total net area of external elements Aum(A, m2)			169.2100				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	45.3868	(33)
Main dwelling							
Party Wall			18.3300	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 112.4419 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.9100	0.0500	0.5455
E4 Jamb	28.6200	0.0500	1.4310
E7 Party floor between dwellings (in blocks of flats)	23.6800	0.0700	1.6576
E16 Corner (normal)	10.0000	0.0900	0.9000
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.5100	0.0200	0.1702
E18 Party wall between dwellings	2.5000	0.0600	0.1500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.3300	0.0000	0.0000
E3 Sill	2.7600	0.0500	0.1380
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
E15 Flat roof with parapet	32.1900	0.5600	18.0264
P4 Party wall - Roof (insulation at ceiling level)	7.3300	0.1200	0.8796

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 23.8233 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 69.2101 (37)

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

(38)m	Jan 42.9811	Feb 42.7334	Mar 42.4905	Apr 41.3499	May 41.1365	Jun 40.1431	Jul 40.1431	Aug 39.9591	Sep 40.5258	Oct 41.1365	Nov 41.5682	Dec 42.0196	(38)
Heat transfer coeff	112.1912	111.9434	111.7006	110.5600	110.3466	109.3532	109.3532	109.1692	109.7358	110.3466	110.7783	111.2296	(39)
Average = Sum(39)m / 12 =												110.5590	

HLP	Jan 1.2644	Feb 1.2616	Mar 1.2589	Apr 1.2460	May 1.2436	Jun 1.2324	Jul 1.2324	Aug 1.2304	Sep 1.2367	Oct 1.2436	Nov 1.2485	Dec 1.2536	(40)
HLP (average)												1.2460	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

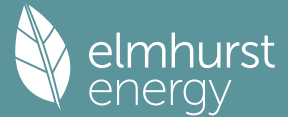
Assumed occupancy													2.6079 (42)	
Hot water usage for mixer showers														
67.9462	66.9251	65.4372	62.5903	60.4893	58.1464	56.8146	58.2913	59.9100	62.4257	65.3337	67.6859	(42a)		
Hot water usage for baths														
29.3423	28.9066	28.2929	27.1614	26.3142	25.3747	24.8673	25.4766	26.1401	27.1454	28.3002	29.2431	(42b)		
Hot water usage for other uses														
41.3379	39.8347	38.3315	36.8283	35.3251	33.8219	33.8219	35.3251	36.8283	38.3315	39.8347	41.3379	(42c)		
Average daily hot water use (litres/day)													127.4290 (43)	

Daily hot water use	Jan 138.6264	Feb 135.6664	Mar 132.0616	Apr 126.5800	May 122.1286	Jun 117.3430	Jul 115.5038	Aug 119.0931	Sep 122.8785	Oct 127.9025	Nov 133.4686	Dec 138.2669	(44)
Energy conte	219.5504	193.1871	202.9737	173.2817	164.4086	144.2869	139.6918	147.4621	151.5214	173.5625	190.1504	216.4926	(45)
Energy content (annual)										Total = Sum(45)m =		2116.5692	
Distribution loss (46)m = 0.15 x (45)m													
32.9326	28.9781	30.4461	25.9923	24.6613	21.6430	20.9538	22.1193	22.7282	26.0344	28.5226	32.4739	32.4739	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(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													
266.1453	235.2728	249.5686	218.3735	211.0035	189.3787	186.2867	194.0570	196.6133	220.1574	235.2423	263.0875	263.0875	(62)
WWHRS	-31.0622	-27.4717	-28.7667	-22.1994	-18.9962	-17.8059	-18.9348	-19.6542	-23.1701	-26.2489	-30.4870	-30.4870	(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	235.0831	207.8012	220.8019	194.5535	188.8041	170.3826	168.4809	175.1222	176.9591	196.9873	208.9934	232.6005	(64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2376.5698	(64)
Electric shower(s)												2377	(64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	110.2764	97.9033	104.7647	93.6896	91.9418	84.0489	83.7235	86.3071	86.4543	94.9855	99.2985	109.2597	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan 130.3968	Feb 130.3968	Mar 130.3968	Apr 130.3968	May 130.3968	Jun 130.3968	Jul 130.3968	Aug 130.3968	Sep 130.3968	Oct 130.3968	Nov 130.3968	Dec 130.3968	(66)

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Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.3989	132.1917	119.3989	123.3789	119.3989	123.3789	119.3989	123.3789	119.3989	123.3789	119.3989	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.7218	239.1782	232.9881	219.8100	203.1751	187.5406	177.0958	174.6394	180.8295	194.0076	210.6425	226.2770 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	(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)	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	(71)
Water heating gains (Table 5)	148.2210	145.6894	140.8127	130.1245	123.5776	116.7345	112.5315	116.0041	120.0755	127.6686	137.9146	146.8544 (72)
Total internal gains	569.4608	582.1783	558.3188	538.4324	511.2707	489.7731	471.1453	472.1615	486.4030	506.1942	537.0550	557.6494 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
Northeast					5.4800	11.2829	0.6300	0.7000	0.7700		18.8962 (75)	
Southeast					6.4700	36.7938	0.6300	0.7000	0.7700		72.7530 (77)	
Southwest					8.3500	36.7938	0.6300	0.7000	0.7700		93.8930 (79)	
Solar gains	185.5423	322.3237	457.6890	595.0431	692.0041	698.2192	668.4888	594.4364	504.9862	360.7314	223.3799	158.0459 (83)
Total gains	755.0030	904.5020	1016.0078	1133.4755	1203.2748	1187.9923	1139.6342	1066.5979	991.3892	866.9256	760.4349	715.6953 (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	24.7023	24.7570	24.8108	25.0668	25.1152	25.3434	25.3434	25.3861	25.2550	25.1152	25.0174	24.9158
alpha	2.6468	2.6505	2.6541	2.6711	2.6743	2.6896	2.6896	2.6924	2.6837	2.6743	2.6678	2.6611
util living area	0.9441	0.9128	0.8678	0.7848	0.6677	0.5211	0.3972	0.4359	0.6247	0.8204	0.9167	0.9505 (86)
MIT	18.6063	18.9843	19.4757	20.0703	20.5376	20.8318	20.9406	20.9223	20.7132	20.0943	19.2535	18.5411 (87)
Th 2	19.8688	19.8710	19.8732	19.8834	19.8853	19.8941	19.8941	19.8958	19.8907	19.8853	19.8814	19.8774 (88)
util rest of house	0.9353	0.8997	0.8478	0.7522	0.6172	0.4484	0.3062	0.3430	0.5544	0.7855	0.9018	0.9427 (89)
MIT 2	17.1155	17.5877	18.1968	18.9206	19.4577	19.7707	19.8640	19.8537	19.6616	18.9700	17.9397	17.0388 (90)
Living area fraction	fLA = Living area / (4) = 0.3268 (91)											
MIT	17.6027	18.0441	18.6148	19.2964	19.8106	20.1175	20.2159	20.2029	20.0053	19.3375	18.3691	17.5298 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.6027	18.0441	18.6148	19.2964	19.8106	20.1175	20.2159	20.2029	20.0053	19.3375	18.3691	17.5298 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9112	0.8723	0.8206	0.7327	0.6135	0.4639	0.3335	0.3699	0.5622	0.7653	0.8757	0.9200 (94)
Ext temp.	687.9788	788.9909	833.7200	830.4585	738.2597	551.0586	380.1165	394.5412	557.3918	663.4452	665.8829	658.4144 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Space heating kWh	1492.4471	1471.4007	1353.2289	1149.4211	894.9788	603.3557	395.4049	415.1629	648.0256	964.1481	1248.3735	1482.6706 (97)
Space heating requirement - total per year (kWh/year)	598.5244	458.5794	386.5146	229.6530	116.5990	0.0000	0.0000	0.0000	0.0000	223.7230	419.3932	613.2466 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98c)
Space heating kWh	598.5244	458.5794	386.5146	229.6530	116.5990	0.0000	0.0000	0.0000	0.0000	223.7230	419.3932	613.2466 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	3046.2334											
Space heating per m2	(98c) / (4) = 34.3315 (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)											
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating efficiency (main heating system 1)	598.5244	458.5794	386.5146	229.6530	116.5990	0.0000	0.0000	0.0000	0.0000	223.7230	419.3932	613.2466 (98)
Space heating fuel (main heating system)	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 efficiency (main heating system 2)	648.4555	496.8358	418.7591	248.8115	126.3261	0.0000	0.0000	0.0000	0.0000	242.3868	454.3805	664.4059 (211)
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 (212)
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 (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	235.0831	207.8012	220.8019	194.5535	188.8041	170.3826	168.4809	175.1222	176.9591	196.9873	208.9934	232.6005 (64)
Efficiency of water heater (217)m	86.0627	85.7831	85.3023	84.4327	83.0121	79.8000	79.8000	79.8000	79.8000	84.3459	85.5895	79.8000 (216)
Fuel for water heating, kWh/month	273.1532	242.2403	258.8465	230.4243	227.4416	213.5120	211.1289	219.4514	221.7533	233.5470	244.1810	270.0613 (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)

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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	24.8087	19.9025	17.9200	13.1290	10.1412	8.2854	9.2511	12.0250	15.6192	20.4933	23.1471	25.4983	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.4814	-29.1176	-44.3383	-52.9019	-59.7334	-56.7296	-56.0244	-51.5408	-44.1309	-34.5982	-21.9917	-16.6547	(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	-6.5023	-14.0237	-28.5337	-43.8498	-58.9757	-59.6368	-58.9500	-49.4656	-35.6655	-20.3909	-8.7862	-5.1175	(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												3300.3612	(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												2845.7407	(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)												200.2208	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-877.1405	(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												5555.1821	(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	3300.3612	0.2100	693.0758	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2845.7407	0.2100	597.6055	(264)
Space and water heating			1290.6814	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	200.2208	0.1443	28.8980	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-487.2428	0.1334	-64.9914	
PV Unit electricity exported	-389.8978	0.1252	-48.8246	
Total			-113.8160	(269)
Total CO2, kg/year			1217.6927	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.7200	(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	3300.3612	1.1300	3729.4081	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2845.7407	1.1300	3215.6870	(278)
Space and water heating			6945.0951	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	200.2208	1.5338	307.1053	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-487.2428	1.4929	-727.4067	
PV Unit electricity exported	-389.8978	0.4596	-179.2071	
Total			-906.6138	(283)
Total Primary energy kWh/year			6475.6874	(286)
Target Primary Energy Rate (TPER)			72.9800	(287)

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Plot Reference	B2 3B5P Top				Issued on Date	19/12/2025	
Assessment Reference	3B5P			Plot Type Ref	3B5P		
Plot Address					SAP Version	10.2	
SAP Rating	76 C		DER	4.98		TER	13.72
Environmental	96 A		% DER < TER				63.70
CO ₂ Emissions (t/year)	0.39		DFEE	41.40		TFEE	41.61
Compliance Check	See BREL		% DFEE < TFEE				0.50
% DPER < TPER	28.88		DPER	51.90		TPER	72.98
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	88.7300 (1b)	2.5000 (2b)	221.8250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.7300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	221.8250 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1352 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2852 (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) = 0.2425 (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)
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	0.3091	0.3031	0.2970	0.2667	0.2606	0.2303	0.2303	0.2243	0.2425	0.2606	0.2728	0.2849 (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	0.5478	0.5459	0.5441	0.5356	0.5340	0.5265	0.5265	0.5251	0.5294	0.5340	0.5372	0.5406 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			20.4900	0.9615	19.7019		(27)
External Wall	80.4800	22.3800	58.1000	0.1600	9.2960	14.0000	813.4000 (29a)
Roof	88.7300		88.7300	0.1300	11.5349	9.0000	798.5700 (30)
Total net area of external elements Aum(A, m ²)			169.2100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		42.4228		(33)
Main dwelling							
Party Wall			18.3300	0.0000	0.0000	20.0000	366.6000 (32)
Party Floor			88.7300			80.0000	7098.4000 (32d)
Stud			100.0000			9.0000	900.0000 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		9976.9700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							112.4419 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				10.9100	0.0500	0.5455	
E4 Jamb				28.6200	0.0500	1.4310	
E7 Party floor between dwellings (in blocks of flats)				23.6800	0.0700	1.6576	

Ventilation heat loss calculated monthly (39)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	40.0988	39.9630	39.8298	39.2045	39.0876	38.5429	38.5429	38.4421	38.7527	39.0876	39.3242	39.5717 (38)
Heat transfer coeff												
	106.3449	106.2091	106.0760	105.4507	105.3337	104.7891	104.7891	104.6882	104.9988	105.3337	105.5703	105.8178 (39)
Average = Sum(39)m / 12 =												105.4501
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1.1985	1.1970	1.1955	1.1884	1.1871	1.1810	1.1810	1.1799	1.1834	1.1871	1.1898	1.1926 (40)
HLP (average)												1.1884
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

Assumed occupancy												2.6079	(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	29.3423	28.9066	28.2929	27.1614	26.3142	25.3747	24.8673	25.4766	26.1401	27.1454	28.3002	29.2431	(42b)
Hot water usage for other uses	41.3379	39.8347	38.3315	36.8283	35.3251	33.8219	33.8219	35.3251	36.8283	38.3315	39.8347	41.3379	(42c)
Average daily hot water use (litres/day)												64.7848	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.6802	68.7412	66.6244	63.9897	61.6393	59.1966	58.6892	60.8017	62.9684	65.4769	68.1348	70.5810	(44)
Energy content (annual)	111.9402	97.8866	102.3992	87.5987	82.9783	72.7891	70.9794	75.2852	77.6463	88.8515	97.0706	110.5128	(45)
Distribution loss (46)m = 0.15 x (45)m												1075.9379	
Water storage loss (or HIU 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	(46)
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	95.1491	83.2036	87.0393	74.4589	70.5315	61.8708	60.3325	63.9924	65.9994	75.5238	82.5100	93.9359	(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	95.1491	83.2036	87.0393	74.4589	70.5315	61.8708	60.3325	63.9924	65.9994	75.5238	82.5100	93.9359	(64)
12Total per year (kWh/year)												914.5472	(64a)
Electric shower(s)	54.4136	48.4830	52.9416	50.5215	51.4695	49.0969	50.7335	51.4695	50.5215	52.9416	51.9461	54.4136	(64a)
												618.9517	(64a)
Heat gains from water heating, kWh/month	37.3907	32.9216	34.9952	31.2451	30.5003	27.7419	27.7665	28.8655	29.1302	32.1163	33.6140	37.0874	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.3989	132.1917	119.3989	123.3789	119.3989	123.3789	119.3989	119.3989	123.3789	119.3989	123.3789	119.3989 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.7218	239.1782	232.9881	219.8100	203.1751	187.5406	177.0958	174.6394	180.8295	194.0076	210.6425	226.2770 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397 (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)	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174 (71)
Water heating gains (Table 5)	50.2563	48.9905	47.0366	43.3960	40.9950	38.5304	37.3206	38.7977	40.4586	43.1671	46.6861	49.8486 (72)
Total internal gains	468.4960	482.4795	461.5426	448.7039	425.6881	411.5690	395.9344	394.9551	406.7861	418.6927	442.8266	457.6436 (73)

[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					5.5300	11.2829	0.4000	0.7000	0.7700			12.1071 (75)				
Southeast					6.5300	36.7938	0.4000	0.7000	0.7700			46.6208 (77)				
Southwest					8.4300	36.7938	0.4000	0.7000	0.7700			60.1858 (79)				
Solar gains					118.9136	206.5753	293.3272	381.3508	443.4869	447.4682	428.4156	380.9604	323.6377	231.1898	143.1634	101.2914 (83)
Total gains					587.4097	689.0548	754.8698	830.0548	869.1750	859.0372	824.3500	775.9154	730.4238	649.8825	585.9900	558.9350 (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	26.0603	26.0936	26.1264	26.2813	26.3105	26.4472	26.4472	26.4727	26.3944	26.3105	26.2515	26.1901
alpha	2.7374	2.7396	2.7418	2.7521	2.7540	2.7631	2.7631	2.7648	2.7596	2.7540	2.7501	2.7460
util living area	0.9671	0.9488	0.9222	0.8663	0.7758	0.6382	0.5036	0.5451	0.7310	0.8876	0.9503	0.9710 (86)
MIT	18.4571	18.7753	19.2258	19.8239	20.3550	20.7408	20.9027	20.8759	20.5969	19.9042	19.0777	18.3951 (87)
Th 2	19.9212	19.9224	19.9236	19.9293	19.9303	19.9352	19.9352	19.9362	19.9333	19.9303	19.9282	19.9259 (88)
util rest of house	0.9617	0.9405	0.9091	0.8424	0.7327	0.5643	0.4002	0.4427	0.6665	0.8625	0.9408	0.9662 (89)
MIT 2	17.6131	17.9267	18.3691	18.9497	19.4441	19.7779	19.8938	19.8797	19.6676	19.0380	18.2330	17.5551 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	17.8889	18.2041	18.6491	19.2354	19.7418	20.0926	20.2235	20.2053	19.9713	19.3211	18.5091	17.8296 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.8889	18.2041	18.6491	19.2354	19.7418	20.0926	20.2235	20.2053	19.9713	19.3211	18.5091	17.8296 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9477	0.9231	0.8895	0.8240	0.7241	0.5761	0.4298	0.4704	0.6691	0.8449	0.9241	0.9533 (94)
Useful gains	556.6867	636.0842	671.4404	683.9382	629.3715	494.8735	354.2834	364.9687	488.7395	549.0956	541.5207	532.8373 (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	1445.1136	1413.0156	1288.7247	1089.8748	847.0735	575.5616	379.7077	398.3693	616.4813	918.6266	1204.4579	1442.2576 (97)
Space heating kWh	660.9896	522.0979	459.2596	292.2744	161.9703	0.0000	0.0000	0.0000	0.0000	274.9311	477.3148	676.6088 (98a)
Space heating requirement - total per year (kWh/year)	3525.4463											
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	660.9896	522.0979	459.2596	292.2744	161.9703	0.0000	0.0000	0.0000	0.0000	274.9311	477.3148	676.6088 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	3525.4463											
Space heating per m2	(98c) / (4) = 39.7323 (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	985.0171	775.4390	795.6303	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7237	0.7932	0.7642	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	712.8642	615.0529	608.0251	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	957.3178	919.0908	864.8191	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	176.0066	226.2042	191.0547	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											
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 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	44.0017	56.5511	47.7637	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	148.3164 (107)											
Energy for space heating	39.7323 (99)											
Energy for space cooling	1.6715 (108)											
Total	41.4038 (109)											
Fabric Energy Efficiency (DFEE)	41.4 (109)											

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

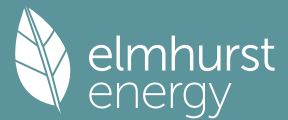
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	88.7300 (1b)	x 2.5000 (2b)	= 221.8250 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.7300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	221.8250 (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	

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Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 30.0000 / (5) = 0.1352 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 5.0000 (17)
Infiltration rate 0.3852 (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) = 0.3275 (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	0.4175	0.4093	0.4011	0.3602	0.3520	0.3111	0.3111	0.3029	0.3275	0.3520	0.3684	0.3848	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													(23c)
Effective ac	0.5872	0.5838	0.5805	0.5649	0.5620	0.5484	0.5484	0.5459	0.5536	0.5620	0.5679	0.5740	(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	
Main dwelling								
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type			20.3000	1.1450	23.2443			(27)
External Wall	80.4800	22.1900	58.2900	0.1800	10.4922			(29a)
Roof	88.7300		88.7300	0.1100	9.7603			(30)
Total net area of external elements Aum(A, m2)			169.2100					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	45.3868		(33)
Main dwelling								
Party Wall			18.3300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 112.4419 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	10.9100	0.0500	0.5455	
E4 Jamb	28.6200	0.0500	1.4310	
E7 Party floor between dwellings (in blocks of flats)	23.6800	0.0700	1.6576	
E16 Corner (normal)	10.0000	0.0900	0.9000	
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.5100	0.0200	0.1702	
E18 Party wall between dwellings	2.5000	0.0600	0.1500	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.3300	0.0000	0.0000	
E3 Sill	2.7600	0.0500	0.1380	
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500	
E15 Flat roof with parapet	32.1900	0.5600	18.0264	
P4 Party wall - Roof (insulation at ceiling level)	7.3300	0.1200	0.8796	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 23.8233 (36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 69.2101 (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	42.9811	42.7334	42.4905	41.3499	41.1365	40.1431	40.1431	39.9591	40.5258	41.1365	41.5682	42.0196	(38)
Heat transfer coeff	112.1912	111.9434	111.7006	110.5600	110.3466	109.3532	109.3532	109.1692	109.7358	110.3466	110.7783	111.2296	(39)
Average = Sum(39)m / 12 =												110.5590	

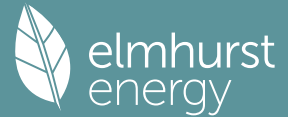
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2644	1.2616	1.2589	1.2460	1.2436	1.2324	1.2324	1.2304	1.2367	1.2436	1.2485	1.2536	(40)
HLP (average)												1.2460	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6079 (42)
Hot water usage for mixer showers													(42a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Hot water usage for baths													(42b)
29.3423	28.9066	28.2929	27.1614	26.3142	25.3747	24.8673	25.4766	26.1401	27.1454	28.3002	29.2431		
Hot water usage for other uses													(42c)
41.3379	39.8347	38.3315	36.8283	35.3251	33.8219	33.8219	35.3251	36.8283	38.3315	39.8347	41.3379		
Average daily hot water use (litres/day)													(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.6802	68.7412	66.6244	63.9897	61.6393	59.1966	58.6892	60.8017	62.9684	65.4769	68.1348	70.5810	(44)
Energy content (annual)	111.9402	97.8866	102.3992	87.5987	82.9783	72.7891	70.9794	75.2852	77.6463	88.8515	97.0706	110.5128	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =	1075.9379		
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU 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	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	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													
95.1491	83.2036	87.0393	74.4589	70.5315	61.8708	60.3325	63.9924	65.9994	75.5238	82.5100	93.9359	(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													
95.1491	83.2036	87.0393	74.4589	70.5315	61.8708	60.3325	63.9924	65.9994	75.5238	82.5100	93.9359	(64)	

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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	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968	130.3968 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.3989	132.1917	119.3989	123.3789	119.3989	123.3789	119.3989	119.3989	123.3789	119.3989	123.3789	119.3989 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.7218	239.1782	232.9881	219.8100	203.1751	187.5406	177.0958	174.6394	180.8295	194.0076	210.6425	226.2770 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397 (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)	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174 (71)
Water heating gains (Table 5)	50.2563	48.9905	47.0366	43.3960	40.9950	38.5304	37.3206	38.7977	40.4586	43.1671	46.6861	49.8486 (72)
Total internal gains	468.4960	482.4795	461.5426	448.7039	425.6881	411.5690	395.9344	394.9551	406.7861	418.6927	442.8266	457.6436 (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					5.4800	11.2829		0.6300	0.7000	0.7700		18.8962 (75)
Southeast					6.4700	36.7938		0.6300	0.7000	0.7700		72.7530 (77)
Southwest					8.3500	36.7938		0.6300	0.7000	0.7700		93.8930 (79)
Solar gains	185.5423	322.3237	457.6890	595.0431	692.0041	698.2192	668.4888	594.4364	504.9862	360.7314	223.3799	158.0459 (83)
Total gains	654.0383	804.8031	919.2316	1043.7470	1117.6921	1109.7882	1064.4232	989.3914	911.7723	779.4241	666.2065	615.6895 (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	24.7023	24.7570	24.8108	25.0668	25.1152	25.3434	25.3434	25.3861	25.2550	25.1152	25.0174	24.9158
alpha	2.6468	2.6505	2.6541	2.6711	2.6743	2.6896	2.6896	2.6924	2.6837	2.6743	2.6678	2.6611
util living area	0.9590	0.9310	0.8899	0.8106	0.6961	0.5482	0.4211	0.4637	0.6579	0.8497	0.9364	0.9644 (86)
MIT	18.4298	18.8267	19.3441	19.9801	20.4848	20.8094	20.9314	20.9096	20.6727	19.9927	19.1017	18.3622 (87)
Th 2	19.8688	19.8710	19.8732	19.8834	19.8853	19.8941	19.8941	19.8958	19.8907	19.8853	19.8814	19.8774 (88)
util rest of house	0.9522	0.9201	0.8723	0.7801	0.6465	0.4740	0.3260	0.3669	0.5880	0.8184	0.9244	0.9586 (89)
MIT 2	17.5512	17.9404	18.4439	19.0535	19.5105	19.7839	19.8667	19.8571	19.6841	19.0825	18.2233	17.4904 (90)
Living area fraction	17.8383	18.2301	18.7381	19.3564	19.8289	20.1191	20.2147	20.2011	20.0072	19.3800	18.5104	17.7753 (92)
MIT	17.8383	18.2301	18.7381	19.3564	19.8289	20.1191	20.2147	20.2011	20.0072	19.3800	18.5104	17.7753 (93)
Temperature adjustment												0.0000
adjusted MIT	17.8383	18.2301	18.7381	19.3564	19.8289	20.1191	20.2147	20.2011	20.0072	19.3800	18.5104	17.7753 (93)

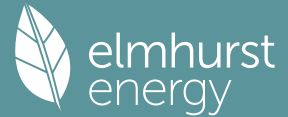
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9358	0.8998	0.8507	0.7636	0.6438	0.4899	0.3547	0.3950	0.5960	0.8015	0.9053	0.9435 (94)
Useful gains	612.0549	724.1638	782.0216	797.0499	719.5838	543.7125	377.5119	390.7605	543.3870	624.6810	603.1185	580.8814 (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	1518.8797	1492.2175	1367.0039	1156.0575	896.9975	603.5312	395.2789	414.9586	648.2303	968.8447	1264.0254	1509.9798 (97)
Space heating kWh	674.6777	516.1321	435.2268	258.4855	131.9958	0.0000	0.0000	0.0000	0.0000	256.0578	475.8529	691.2492 (98a)
Space heating requirement - total per year (kWh/year)												3439.6779
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	674.6777	516.1321	435.2268	258.4855	131.9958	0.0000	0.0000	0.0000	0.0000	256.0578	475.8529	691.2492 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3439.6779
Space heating per m ²												(98c) / (4) = 38.7657 (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	1027.9199	809.2136	829.6860	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7959	0.8527	0.8260	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	818.1055	689.9852	685.3189	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1250.4034	1199.6958	1114.3365	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	311.2545	379.2247	319.1891	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	77.8136	94.8062	79.7973	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												252.4170 (107)
Energy for space heating												38.7657 (99)
Energy for space cooling												2.8448 (108)
Total												41.6104 (109)
Fabric Energy Efficiency (TFEE)												41.6 (109)

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Plot Reference	B2 3B5P Top				Issued on Date	19/12/2025	
Assessment Reference	3B5P			Plot Type Ref	3B5P		
Plot Address					SAP Version	10.2	
SAP Rating	76 C		DER	4.98		TER	13.72
Environmental	96 A		% DER < TER				63.70
CO ₂ Emissions (t/year)	0.39		DFEE	41.40		TFEE	41.61
Compliance Check	See BREL		% DFEE < TFEE				0.50
% DPER < TPER	28.88		DPER	51.90		TPER	72.98
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	88.7300 (1b)	2.5000 (2b)	221.8250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.7300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	221.8250 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (21)

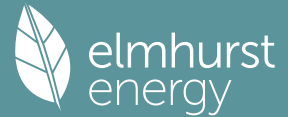
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												71.2000 (23c)
Effective ac	0.3066	0.3034	0.3002	0.2843	0.2811	0.2651	0.2651	0.2619	0.2715	0.2811	0.2874	0.2938 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			20.4900	0.9615	19.7019		(27)
External Wall	80.4800	22.3800	58.1000	0.1600	9.2960	14.0000	813.4000 (29a)
Roof	88.7300		88.7300	0.1300	11.5349	9.0000	798.5700 (30)
Total net area of external elements Aum(A, m ²)			169.2100				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	42.4228	(33)
Main dwelling							
Party Wall			18.3300	0.0000	0.0000	20.0000	366.6000 (32)
Party Floor			88.7300			80.0000	7098.4000 (32d)
Stud			100.0000			9.0000	900.0000 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 9976.9700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							112.4419 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value		Total

6. Solar gains						
[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	5.5300	11.2829	0.4000	0.7000	0.7700	12.1071 (75)

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Southeast			6.5300		36.7938		0.4000		0.7000		0.7700		46.6208 (77)
Southwest			8.4300		36.7938		0.4000		0.7000		0.7700		60.1858 (79)

Solar gains	118.9136	206.5753	293.3272	381.3508	443.4869	447.4682	428.4156	380.9604	323.6377	231.1898	143.1634	101.2914	(83)
Total gains	664.9019	765.9720	830.8232	904.0920	941.9960	930.6062	895.2357	847.4957	802.8023	723.6508	661.6059	636.1970	(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	31.2489	31.3314	31.4142	31.8352	31.9208	32.3556	32.3556	32.4440	32.1803	31.9208	31.7501	31.5813	
alpha	3.0833	3.0888	3.0943	3.1223	3.1281	3.1570	3.1570	3.1629	3.1454	3.1281	3.1167	3.1054	
util living area	0.9515	0.9261	0.8888	0.8118	0.6966	0.5379	0.4047	0.4408	0.6354	0.8341	0.9251	0.9568	(86)
MIT	19.0934	19.3924	19.7826	20.2778	20.6576	20.8917	20.9668	20.9560	20.8092	20.3225	19.6417	19.0480	(87)
Th 2	20.0837	20.0859	20.0881	20.0991	20.1013	20.1123	20.1123	20.1145	20.1079	20.1013	20.0969	20.0925	(88)
util rest of house	0.9445	0.9157	0.8730	0.7852	0.6539	0.4762	0.3288	0.3637	0.5758	0.8049	0.9129	0.9505	(89)
MIT 2	18.3492	18.6423	19.0223	19.4997	19.8446	20.0463	20.0976	20.0940	19.9828	19.5525	18.8984	18.3110	(90)
Living area fraction										fLA = Living area / (4) =		0.3268	(91)
MIT	18.5925	18.8874	19.2708	19.7540	20.1103	20.3226	20.3817	20.3757	20.2529	19.8042	19.1413	18.5519	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5925	18.8874	19.2708	19.7540	20.1103	20.3226	20.3817	20.3757	20.2529	19.8042	19.1413	18.5519	(93)

8. Space heating requirement													

Utilisation	0.9299	0.8992	0.8564	0.7739	0.6544	0.4913	0.3524	0.3871	0.5861	0.7939	0.8971	0.9368	(94)
Useful gains	618.3184	688.7544	711.5424	699.6447	616.4158	457.2174	315.4469	328.0700	470.5165	574.5240	593.5552	595.9998	(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	1267.5591	1237.2423	1126.6437	944.8864	730.1880	490.1625	323.9178	339.6094	529.8907	799.1124	1051.0542	1259.4346	(97)
Space heating kWh	483.0351	368.5839	308.8354	176.5740	84.6465	0.0000	0.0000	0.0000	0.0000	167.0937	329.3992	493.5955	(98a)
Space heating requirement - total per year (kWh/year)												2411.7634	
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	483.0351	368.5839	308.8354	176.5740	84.6465	0.0000	0.0000	0.0000	0.0000	167.0937	329.3992	493.5955	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2411.7634	
Space heating per m2										(98c) / (4) =		27.1809	(99)

9b. Energy requirements													

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	483.0351	368.5839	308.8354	176.5740	84.6465	0.0000	0.0000	0.0000	0.0000	167.0937	329.3992	493.5955	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	760.7803	580.5196	486.4158	278.1041	133.3182	0.0000	0.0000	0.0000	0.0000	263.1726	518.8038	777.4130	
Space heating requirement	760.7803	580.5196	486.4158	278.1041	133.3182	0.0000	0.0000	0.0000	0.0000	263.1726	518.8038	777.4130	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating													
Annual water heating requirement	167.2170	147.8140	157.6760	141.0924	138.2551	126.2828	126.2563	130.5620	131.1400	144.1283	150.5642	165.7896	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	250.8254	221.7210	236.5140	211.6386	207.3826	189.4242	189.3844	195.8431	196.7100	216.1924	225.8464	248.6844	
Water heating fuel	250.8254	221.7210	236.5140	211.6386	207.3826	189.4242	189.3844	195.8431	196.7100	216.1924	225.8464	248.6844	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	20.9161	18.8920	20.9161	20.2414	20.9161	20.2414	20.9161	20.9161	20.2414	20.9161	20.2414	20.9161	(316)
Lighting	28.4266	22.8048	20.5332	15.0435	11.6201	9.4937	10.6002	13.7785	17.8970	23.4818	26.5226	29.2166	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-13.1383	-22.4723	-39.7191	-53.3741	-64.4554	-62.8509	-61.7940	-54.4462	-42.4553	-28.7084	-15.5630	-10.8078	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												3798.5273	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2590.1664	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												37.9853	(313)
Space cooling fuel												0.0000	(321)

Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9100)													
mechanical ventilation fans (SFP = 0.9100)												246.2701	(330a)
Total electricity for the above, kWh/year												246.2701	(331)
Electricity for lighting (calculated in Appendix L)												229.4186	(332)

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

PV generation	-469.7847 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	7013.5496 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			280.0000 (367)
Space and Water heating from Heat pump	2281.6763	0.1552	210.5457 (367)
Electrical energy for heat distribution (space & water)	37.9853	0.0000	9.5344 (372)
Overall CO2 factor for heat network			0.0548 (386)
Total CO2 associated with community systems			350.0485 (373)
Energy for instantaneous electric shower(s)	618.9517	0.1391	86.1099 (264a)
Space and water heating			350.0485 (376)
Pumps, fans and electric keep-hot	246.2701	0.1387	34.1607 (378)
Energy for lighting	229.4186	0.1443	33.1122 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-469.7847	0.1312	-61.6495
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-61.6495 (380)
Total CO2, kg/year			441.7818 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.9800 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	2281.6763	1.5746	2136.0927 (467)
Electrical energy for heat distribution (space & water)	37.9853	0.0000	99.1679 (472)
Overall CO2 factor for heat network			0.5699 (486)
Total CO2 associated with community systems			3640.8769 (473)
Energy for instantaneous electric shower(s)	618.9517	1.5143	937.2998 (278a)
Space and water heating			3640.8769 (476)
Pumps, fans and electric keep-hot	246.2701	1.5128	372.5574 (478)
Energy for lighting	229.4186	1.5338	351.8900 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-469.7847	1.4848	-697.5410
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-697.5410 (480)
Total Primary energy kWh/year			4605.0831 (483)
Dwelling Primary energy Rate (DPER)			51.9000 (484)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	88.7300 (1b)	x 2.5000 (2b)	= 221.8250 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.7300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	221.8250 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1352 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3852 (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) = 0.3275 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
Effective ac	0.4175	0.4093	0.4011	0.3602	0.3520	0.3111	0.3111	0.3029	0.3275	0.3520	0.3684	0.3848	(22b)
	0.5872	0.5838	0.5805	0.5649	0.5620	0.5484	0.5484	0.5459	0.5536	0.5620	0.5679	0.5740	(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
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			20.3000	1.1450	23.2443		(27)
External Wall	80.4800	22.1900	58.2900	0.1800	10.4922		(29a)
Roof	88.7300		88.7300	0.1100	9.7603		(30)
Total net area of external elements Aum(A, m2)			169.2100				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	45.3868	(33)
Main dwelling							
Party Wall			18.3300	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 112.4419 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.9100	0.0500	0.5455
E4 Jamb	28.6200	0.0500	1.4310
E7 Party floor between dwellings (in blocks of flats)	23.6800	0.0700	1.6576
E16 Corner (normal)	10.0000	0.0900	0.9000
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.5100	0.0200	0.1702
E18 Party wall between dwellings	2.5000	0.0600	0.1500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.3300	0.0000	0.0000
E3 Sill	2.7600	0.0500	0.1380
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
E15 Flat roof with parapet	32.1900	0.5600	18.0264
P4 Party wall - Roof (insulation at ceiling level)	7.3300	0.1200	0.8796

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 23.8233 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 69.2101 (37)

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

(38)m	Jan 42.9811	Feb 42.7334	Mar 42.4905	Apr 41.3499	May 41.1365	Jun 40.1431	Jul 40.1431	Aug 39.9591	Sep 40.5258	Oct 41.1365	Nov 41.5682	Dec 42.0196	(38)
Heat transfer coeff	112.1912	111.9434	111.7006	110.5600	110.3466	109.3532	109.3532	109.1692	109.7358	110.3466	110.7783	111.2296	(39)
Average = Sum(39)m / 12 =												110.5590	

HLP	Jan 1.2644	Feb 1.2616	Mar 1.2589	Apr 1.2460	May 1.2436	Jun 1.2324	Jul 1.2324	Aug 1.2304	Sep 1.2367	Oct 1.2436	Nov 1.2485	Dec 1.2536	(40)
HLP (average)												1.2460	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

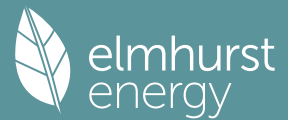
Assumed occupancy													2.6079 (42)	
Hot water usage for mixer showers														
67.9462	66.9251	65.4372	62.5903	60.4893	58.1464	56.8146	58.2913	59.9100	62.4257	65.3337	67.6859	(42a)		
Hot water usage for baths														
29.3423	28.9066	28.2929	27.1614	26.3142	25.3747	24.8673	25.4766	26.1401	27.1454	28.3002	29.2431	(42b)		
Hot water usage for other uses														
41.3379	39.8347	38.3315	36.8283	35.3251	33.8219	33.8219	35.3251	36.8283	38.3315	39.8347	41.3379	(42c)		
Average daily hot water use (litres/day)													127.4290 (43)	

Daily hot water use	Jan 138.6264	Feb 135.6664	Mar 132.0616	Apr 126.5800	May 122.1286	Jun 117.3430	Jul 115.5038	Aug 119.0931	Sep 122.8785	Oct 127.9025	Nov 133.4686	Dec 138.2669	(44)
Energy conte	219.5504	193.1871	202.9737	173.2817	164.4086	144.2869	139.6918	147.4621	151.5214	173.5625	190.1504	216.4926	(45)
Energy content (annual)										Total = Sum(45)m =		2116.5692	
Distribution loss (46)m = 0.15 x (45)m													
32.9326	28.9781	30.4461	25.9923	24.6613	21.6430	20.9538	22.1193	22.7282	26.0344	28.5226	32.4739	32.4739	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(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													
266.1453	235.2728	249.5686	218.3735	211.0035	189.3787	186.2867	194.0570	196.6133	220.1574	235.2423	263.0875	263.0875	(62)
WWHRS	-31.0622	-27.4717	-28.7667	-22.1994	-18.9962	-17.8059	-18.9348	-19.6542	-23.1701	-26.2489	-30.4870	-30.4870	(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	235.0831	207.8012	220.8019	194.5535	188.8041	170.3826	168.4809	175.1222	176.9591	196.9873	208.9934	232.6005	(64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2376.5698	(64)
Electric shower(s)												2377	(64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	110.2764	97.9033	104.7647	93.6896	91.9418	84.0489	83.7235	86.3071	86.4543	94.9855	99.2985	109.2597	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan 130.3968	Feb 130.3968	Mar 130.3968	Apr 130.3968	May 130.3968	Jun 130.3968	Jul 130.3968	Aug 130.3968	Sep 130.3968	Oct 130.3968	Nov 130.3968	Dec 130.3968	(66)

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Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.3989	132.1917	119.3989	123.3789	119.3989	123.3789	119.3989	123.3789	119.3989	123.3789	119.3989	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.7218	239.1782	232.9881	219.8100	203.1751	187.5406	177.0958	174.6394	180.8295	194.0076	210.6425	226.2770 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	36.0397	(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)	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	-104.3174	(71)
Water heating gains (Table 5)	148.2210	145.6894	140.8127	130.1245	123.5776	116.7345	112.5315	116.0041	120.0755	127.6686	137.9146	146.8544 (72)
Total internal gains	569.4608	582.1783	558.3188	538.4324	511.2707	489.7731	471.1453	472.1615	486.4030	506.1942	537.0550	557.6494 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W

Northeast					5.4800	11.2829	0.6300	0.7000			0.7700			18.8962 (75)
Southeast					6.4700	36.7938	0.6300	0.7000			0.7700			72.7530 (77)
Southwest					8.3500	36.7938	0.6300	0.7000			0.7700			93.8930 (79)

Solar gains	185.5423	322.3237	457.6890	595.0431	692.0041	698.2192	668.4888	594.4364	504.9862	360.7314	223.3799	158.0459	(83)	
Total gains	755.0030	904.5020	1016.0078	1133.4755	1203.2748	1187.9923	1139.6342	1066.5979	991.3892	866.9256	760.4349	715.6953	(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	24.7023	24.7570	24.8108	25.0668	25.1152	25.3434	25.3434	25.3861	25.2550	25.1152	25.0174	24.9158
alpha	2.6468	2.6505	2.6541	2.6711	2.6743	2.6896	2.6896	2.6924	2.6837	2.6743	2.6678	2.6611
util living area	0.9441	0.9128	0.8678	0.7848	0.6677	0.5211	0.3972	0.4359	0.6247	0.8204	0.9167	0.9505 (86)
MIT	18.6063	18.9843	19.4757	20.0703	20.5376	20.8318	20.9406	20.9223	20.7132	20.0943	19.2535	18.5411 (87)
Th 2	19.8688	19.8710	19.8732	19.8834	19.8853	19.8941	19.8941	19.8958	19.8907	19.8853	19.8814	19.8774 (88)
util rest of house	0.9353	0.8997	0.8478	0.7522	0.6172	0.4484	0.3062	0.3430	0.5544	0.7855	0.9018	0.9427 (89)
MIT 2	17.1155	17.5877	18.1968	18.9206	19.4577	19.7707	19.8640	19.8537	19.6616	18.9700	17.9397	17.0388 (90)
Living area fraction	fLA = Living area / (4) = 0.3268 (91)											
MIT	17.6027	18.0441	18.6148	19.2964	19.8106	20.1175	20.2159	20.2029	20.0053	19.3375	18.3691	17.5298 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.6027	18.0441	18.6148	19.2964	19.8106	20.1175	20.2159	20.2029	20.0053	19.3375	18.3691	17.5298 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9112	0.8723	0.8206	0.7327	0.6135	0.4639	0.3335	0.3699	0.5622	0.7653	0.8757	0.9200 (94)
Ext temp.	687.9788	788.9909	833.7200	830.4585	738.2597	551.0586	380.1165	394.5412	557.3918	663.4452	665.8829	658.4144 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Space heating kWh	1492.4471	1471.4007	1353.2289	1149.4211	894.9788	603.3557	395.4049	415.1629	648.0256	964.1481	1248.3735	1482.6706 (97)
Space heating requirement - total per year (kWh/year)	598.5244	458.5794	386.5146	229.6530	116.5990	0.0000	0.0000	0.0000	0.0000	223.7230	419.3932	613.2466 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	598.5244	458.5794	386.5146	229.6530	116.5990	0.0000	0.0000	0.0000	0.0000	223.7230	419.3932	613.2466 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	3046.2334											
Space heating per m2	(98c) / (4) = 34.3315 (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)											
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating efficiency (main heating system 1)	598.5244	458.5794	386.5146	229.6530	116.5990	0.0000	0.0000	0.0000	0.0000	223.7230	419.3932	613.2466 (98)
Space heating fuel (main heating system)	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 efficiency (main heating system 2)	648.4555	496.8358	418.7591	248.8115	126.3261	0.0000	0.0000	0.0000	0.0000	242.3868	454.3805	664.4059 (211)
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 (212)
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 (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	235.0831	207.8012	220.8019	194.5535	188.8041	170.3826	168.4809	175.1222	176.9591	196.9873	208.9934	232.6005 (64)
Efficiency of water heater (217)m	86.0627	85.7831	85.3023	84.4327	83.0121	79.8000	79.8000	79.8000	79.8000	84.3459	85.5895	79.8000 (216)
Fuel for water heating, kWh/month	273.1532	242.2403	258.8465	230.4243	227.4416	213.5120	211.1289	219.4514	221.7533	233.5470	244.1810	270.0613 (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)

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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	24.8087	19.9025	17.9200	13.1290	10.1412	8.2854	9.2511	12.0250	15.6192	20.4933	23.1471	25.4983	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.4814	-29.1176	-44.3383	-52.9019	-59.7334	-56.7296	-56.0244	-51.5408	-44.1309	-34.5982	-21.9917	-16.6547	(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	-6.5023	-14.0237	-28.5337	-43.8498	-58.9757	-59.6368	-58.9500	-49.4656	-35.6655	-20.3909	-8.7862	-5.1175	(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												3300.3612	(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												2845.7407	(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)												200.2208	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-877.1405	(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												5555.1821	(238)

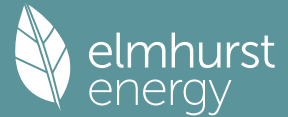
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3300.3612	0.2100	693.0758	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2845.7407	0.2100	597.6055	(264)
Space and water heating			1290.6814	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	200.2208	0.1443	28.8980	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-487.2428	0.1334	-64.9914	
PV Unit electricity exported	-389.8978	0.1252	-48.8246	
Total			-113.8160	(269)
Total CO2, kg/year			1217.6927	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.7200	(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	3300.3612	1.1300	3729.4081	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2845.7407	1.1300	3215.6870	(278)
Space and water heating			6945.0951	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	200.2208	1.5338	307.1053	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-487.2428	1.4929	-727.4067	
PV Unit electricity exported	-389.8978	0.4596	-179.2071	
Total			-906.6138	(283)
Total Primary energy kWh/year			6475.6874	(286)
Target Primary Energy Rate (TPER)			72.9800	(287)

Full SAP Calculation Printout



Plot Reference	B2 Maisonette				Issued on Date	19/12/2025	
Assessment Reference	Maisonette			Plot Type Ref	Maisonette		
Plot Address					SAP Version	10.2	
SAP Rating	78 C	DER	4.32	TER	12.39		
Environmental	96 A	% DER < TER				65.13	
CO ₂ Emissions (t/year)	0.39	DFEE	36.24	TFEE	38.33		
Compliance Check	See BREL	% DFEE < TFEE				5.46	
% DPER < TPER	31.41	DPER	45.10	TPER	65.75		
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	41.3200 (1b)	x 2.9300 (2b)	= 121.0676 (1b) - (3b)
First floor	61.9200 (1c)	x 2.5000 (2c)	= 154.8000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	103.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 275.8676 (5)

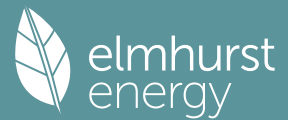
2. Ventilation rate

											m3 per hour		
Number of open chimneys											0 * 80 =	0.0000 (6a)	
Number of open flues											0 * 20 =	0.0000 (6b)	
Number of chimneys / flues attached to closed fire											0 * 10 =	0.0000 (6c)	
Number of flues attached to solid fuel boiler											0 * 20 =	0.0000 (6d)	
Number of flues attached to other heater											0 * 35 =	0.0000 (6e)	
Number of blocked chimneys											0 * 20 =	0.0000 (6f)	
Number of intermittent extract fans											0 * 10 =	0.0000 (7a)	
Number of passive vents											0 * 10 =	0.0000 (7b)	
Number of flueless gas fires											0 * 40 =	0.0000 (7c)	
											Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)	
Pressure test											Yes		
Pressure Test Method											Blower Door		
Measured/design AP50											3.0000 (17)		
Infiltration rate											0.1500 (18)		
Number of sides sheltered											2 (19)		
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.8500 (20)	
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1275 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)	
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)	
Adj infilt rate													
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)	
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation													
													0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													69.6000 (23c)
Effective ac	0.3146	0.3114	0.3082	0.2923	0.2891	0.2731	0.2731	0.2699	0.2795	0.2891	0.2954	0.3018 (25)	

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			18.9900	0.9615	18.2596		(27)
Ground Floor			41.3200	0.1300	5.3716	110.0000	4545.2000 (28a)
Exposed Floor			20.6000	0.1200	2.4720	0.0000	0.0000 (28b)
External Wall	109.8600	20.8800	88.9800	0.1600	14.2368	14.0000	1245.7200 (29a)
Total net area of external elements Aum (A, m ²)			171.7800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		42.2300		(33)
Main dwelling							
Party Wall			50.3400	0.0000	0.0000	20.0000	1006.8000 (32)
Party Ceiling			61.9200			100.0000	6192.0000 (32b)
Stud			190.0000			9.0000	1710.0000 (32c)
Internal Floor			41.3200			18.0000	743.7600 (32d)
Internal Ceiling			41.3200			9.0000	371.8800 (32e)

Full SAP Calculation Printout



Heat capacity $C_m = \text{Sum}(A \times k)$
Thermal mass parameter (TMP = C_m / TFA) in $\text{kJ/m}^2\text{K}$
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.8700	0.0500	0.5435
E4 Jamb	30.5200	0.0500	1.5260
E5 Ground floor (normal)	18.5000	0.1600	2.9600
E7 Party floor between dwellings (in blocks of flats)	22.2600	0.0700	1.5582
E18 Party wall between dwellings	10.8600	0.0600	0.6516
P1 Party wall - Ground floor	7.5400	0.0800	0.6032
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.3000	0.0000	0.0000
E3 Sill	1.8100	0.0500	0.0905
E20 Exposed floor (normal)	3.7600	0.3200	1.2032
E21 Exposed floor (inverted)	5.4800	0.3200	1.7536
E6 Intermediate floor within a dwelling	7.5400	0.0100	0.0754
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	10.9600	0.0200	0.2192
E16 Corner (normal)	10.8600	0.0900	0.9774
P2 Party wall - Intermediate floor within a dwelling	7.5400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	3.7600	0.1200	0.4512

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 54.8430 (37)

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	28.6366	28.3464	28.0563	26.6054	26.3152	24.8643	24.8643	24.5741	25.4446	26.3152	26.8955	27.4759
Heat transfer coeff	83.4796	83.1894	82.8993	81.4484	81.1582	79.7073	79.7073	79.4171	80.2877	81.1582	81.7386	82.3189
Average = Sum(39)m / 12 =												81.3758
HLP	0.8086	0.8058	0.8030	0.7889	0.7861	0.7721	0.7721	0.7692	0.7777	0.7861	0.7917	0.7974
HLP (average)												0.7882
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7676 (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	0.0000 (42a)
Hot water usage for baths												
30.4933	30.0404	29.4027	28.2268	27.3464	26.3701	25.8427	26.4760	27.1655	28.2102	29.4103	30.3902	30.3902 (42b)
Hot water usage for other uses												
42.9726	41.4100	39.8473	38.2847	36.7221	35.1594	35.1594	36.7221	38.2847	39.8473	41.4100	42.9726	42.9726 (42c)
Average daily hot water use (litres/day)												67.3381 (43)
Daily hot water use												
73.4659	71.4504	69.2500	66.5115	64.0684	61.5295	61.0021	63.1980	65.4502	68.0575	70.8202	73.3628	73.3628 (44)
Energy content (annual)	116.3521	101.7444	106.4347	91.0510	86.2484	75.6577	73.7768	78.2524	80.7066	92.3534	100.8964	114.8685 (45)
Distribution loss (46)m = $0.15 \times (45)\text{m}$												
17.4528	15.2617	15.9652	13.6576	12.9373	11.3486	11.0665	11.7379	12.1060	13.8530	15.1345	17.2303	17.2303 (46)
Water storage loss (or HIU loss):												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144 (56)
If cylinder contains dedicated solar storage												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
171.6289	151.6719	161.7115	144.5446	141.5252	129.1513	129.0536	133.5292	134.2003	147.6302	154.3901	170.1453	170.1453 (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												
171.6289	151.6719	161.7115	144.5446	141.5252	129.1513	129.0536	133.5292	134.2003	147.6302	154.3901	170.1453	170.1453 (64)
12Total per year (kWh/year)												1769.1820 (64)
Electric shower(s)												1769 (64)
56.5570	50.3928	55.0270	52.5116	53.4969	51.0309	52.7319	53.4969	52.5116	55.0270	53.9923	56.5570	56.5570 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												643.3330 (64a)
Heat gains from water heating, kWh/month												
97.0478	86.3702	93.3677	86.1973	86.2733	80.7088	81.9352	83.6146	82.7578	88.6857	89.8411	96.5545	96.5545 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
134.2425	148.6257	134.2425	138.7173	134.2425	138.7173	134.2425	134.2425	138.7173	134.2425	138.7173	134.2425	134.2425 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
261.4618	264.1749	257.3379	242.7826	224.4091	207.1407	195.6043	192.8911	199.7282	214.2835	232.6569	249.9254	249.9254 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378 (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)												
-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025 (71)
Water heating gains (Table 5)												
130.4405	128.5270	125.4943	119.7184	115.9587	112.0956	110.1280	112.3852	114.9414	119.2012	124.7793	129.7775	129.7775 (72)
Total internal gains												
590.6583	605.8411	581.5881	565.7317	539.1238	522.4670	504.4882	504.0323	517.9003	532.2407	560.6669	578.4589	578.4589 (73)

6. Solar gains

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Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1200)	
mechanical ventilation fans (SFP = 1.1200)	376.9455 (330a)
Total electricity for the above, kWh/year	376.9455 (331)
Electricity for lighting (calculated in Appendix L)	267.0211 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-483.5065 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	6804.4735 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			280.0000 (367)
Space and Water heating from Heat pump	2143.1002	0.1561	186.6175 (367)
Electrical energy for heat distribution (space & water)	33.4691	0.0000	8.9545 (372)
Overall CO2 factor for heat network			0.0548 (386)
Total CO2 associated with community systems			328.7566 (373)
Energy for instantaneous electric shower(s)	643.3330	0.1391	89.5018 (264a)
Space and water heating			328.7566 (376)
Pumps, fans and electric keep-hot	376.9455	0.1387	52.2870 (378)
Energy for lighting	267.0211	0.1443	38.5394 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-483.5065	0.1311	-63.3982
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-63.3982 (380)
Total CO2, kg/year			445.6865 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.3200 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	2143.1002	1.5780	1886.2097 (467)
Electrical energy for heat distribution (space & water)	33.4691	0.0000	93.1402 (472)
Overall CO2 factor for heat network			0.5699 (486)
Total CO2 associated with community systems			3419.5759 (473)
Energy for instantaneous electric shower(s)	643.3330	1.5143	974.2211 (278a)
Space and water heating			3419.5759 (476)
Pumps, fans and electric keep-hot	376.9455	1.5128	570.2431 (478)
Energy for lighting	267.0211	1.5338	409.5659 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-483.5065	1.4844	-717.7198
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-717.7198 (480)
Total Primary energy kWh/year			4655.8862 (483)
Dwelling Primary energy Rate (DPER)			45.1000 (484)

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

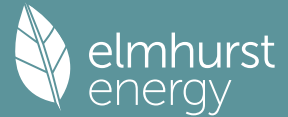
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	41.3200 (1b)	x 2.9300 (2b)	= 121.0676 (1b) - (3b)
First floor	61.9200 (1c)	x 2.5000 (2c)	= 154.8000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	103.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 275.8676 (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)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1450 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)

Full SAP Calculation Printout



Infiltration rate	0.3950 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = $1 - [0.075 \times (19)] = 0.8500$ (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3357 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	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)
Adj infilt rate	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)
Effective ac	0.4281	0.4197	0.4113	0.3693	0.3609	0.3190	0.3190	0.3106	0.3357	0.3609	0.3777	0.3945	(22b)
	0.5916	0.5881	0.5846	0.5682	0.5651	0.5509	0.5509	0.5482	0.5564	0.5651	0.5713	0.5778	(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	
Main dwelling								
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type			18.9900	1.1450	21.7443			(27)
Ground Floor			41.3200	0.1300	5.3716			(28a)
Exposed Floor			20.6000	0.1300	2.6780			(28b)
External Wall	109.8600	20.8800	88.9800	0.1800	16.0164			(29a)
Total net area of external elements Aum(A, m2)			171.7800					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 47.7003			(33)
Main dwelling								
Party Wall			50.3400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 153.1902 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	10.8700	0.0500	0.5435
E2 Other lintels (including other steel lintels)	30.5200	0.0500	1.5260
E4 Jamb	18.5000	0.1600	2.9600
E5 Ground floor (normal)	22.2600	0.0700	1.5582
E18 Party wall between dwellings (in blocks of flats)	10.8600	0.0600	0.6516
P1 Party wall - Ground floor	7.5400	0.0800	0.6032
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.3000	0.0000	0.0000
E3 Sill	1.8100	0.0500	0.0905
E20 Exposed floor (normal)	3.7600	0.3200	1.2032
E21 Exposed floor (inverted)	5.4800	0.3200	1.7536
E6 Intermediate floor within a dwelling	7.5400	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	10.9600	0.0200	0.2192
E16 Corner (normal)	10.8600	0.0900	0.9774
P2 Party wall - Intermediate floor within a dwelling	7.5400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	3.7600	0.1200	0.4512

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.5376 (36)

Point Thermal bridges

Total fabric heat loss (33) + (36) + (36a) = 60.2379 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	53.8594	53.5355	53.2180	51.7268	51.4478	50.1490	50.1490	49.9084	50.6493	51.4478	52.0122	52.6023	(38)
Average = Sum(39)m / 12 =	114.0973	113.7734	113.4559	111.9647	111.6857	110.3868	110.3868	110.1463	110.8871	111.6857	112.2501	112.8402	(39)
												111.9633	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1052	1.1020	1.0990	1.0845	1.0818	1.0692	1.0692	1.0669	1.0741	1.0818	1.0873	1.0930	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7676 (42)
Hot water usage for mixer showers													
Hot water usage for baths													
Hot water usage for other uses													
Average daily hot water use (litres/day)													132.4499 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	144.0886	141.0118	137.2649	131.5673	126.9405	121.9663	120.0548	123.7855	127.7202	132.9422	138.7275	143.7150	(44)
Energy content (annual)	228.2012	200.7989	210.9710	180.1091	170.8863	149.9718	145.1958	153.2723	157.4917	180.4013	197.6428	225.0229	(45)
Distribution loss (46)m = 0.15 x (45)m	34.2302	30.1198	31.6457	27.0164	25.6329	22.4958	21.7794	22.9908	23.6238	27.0602	29.6464	33.7534	(46)

Water storage loss (or HIU loss):

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss 23.3325 21.0745 23.3325 22.5798 23.3325 22.5798 23.3325 23.3325 22.5798 23.3325 22.5798 23.3325 23.3325 (56)

If cylinder contains dedicated solar storage 23.3325 21.0745 23.3325 22.5798 23.3325 22.5798 23.3325 23.3325 22.5798 23.3325 22.5798 23.3325 23.3325 (57)

Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 (59)

Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)

Total heat required for water heating calculated for each month 274.7961 242.8847 257.5659 225.2009 217.4812 195.0636 191.7907 199.8672 202.5836 226.9962 242.7346 271.6178 (62)

WWHRS -32.2858 -28.5538 -29.8999 -24.7583 -23.0738 -19.7444 -18.5073 -19.6806 -20.4284 -24.0828 -27.2829 -31.6879 (63a)

PV diverter -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 (63b)

Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63c)

FGHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63d)

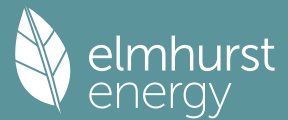
Output from w/h 242.5103 214.3309 227.6660 200.4426 194.4074 175.3192 173.2835 180.1866 182.1552 202.9134 215.4518 239.9299 (64)

12Total per year (kWh/year) Total per year (kWh/year) = Sum(64)m = 2448.5969 (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)

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Heat gains from water heating, kWh/month
113.1528 100.4342 107.4238 95.9597 94.0956 85.9391 85.5535 88.2390 88.4395 97.2594 101.7897 112.0960 (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	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	134.2425	148.6257	134.2425	138.7173	134.2425	138.7173	134.2425	134.2425	138.7173	134.2425	138.7173	134.2425	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	261.4618	264.1749	257.3379	242.7826	224.4091	207.1407	195.6043	192.8911	199.7282	214.2835	232.6569	249.9254	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	(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)	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	(71)
Water heating gains (Table 5)	152.0871	149.4557	144.3868	133.2774	126.4726	119.3599	114.9913	118.6008	122.8326	130.7249	141.3746	150.6667	(72)
Total internal gains	615.3049	629.7697	603.4806	582.2907	552.6377	529.7312	509.3516	510.2479	525.7915	546.7644	580.2622	602.3481	(73)

6. Solar gains

[Jan]			Area		Solar flux		g		FF		Access		Gains	
			m2		Table 6a		Specific data		Specific data		factor		W	
					W/m2		or Table 6b		or Table 6c		Table 6d			
East			6.3400		19.6403		0.6300		0.7000		0.7700		38.0547 (76)	
West			12.6500		19.6403		0.6300		0.7000		0.7700		75.9293 (80)	
Solar gains			113.9841	222.9770	367.2113	535.5559	656.3438	671.8847	639.6616	549.4599	427.0820	264.5810	142.1247	93.7349 (83)
Total gains			729.2889	852.7467	970.6920	1117.8466	1208.9815	1201.6159	1149.0132	1059.7077	952.8735	811.3454	722.3870	696.0830 (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)													
tau	38.5036	38.6132	38.7213	39.2370	39.3350	39.7978	39.7978	39.8847	39.6183	39.3350	39.1372	38.9326	
alpha	3.5669	3.5742	3.5814	3.6158	3.6223	3.6532	3.6532	3.6590	3.6412	3.6223	3.6091	3.5955	
util living area	0.9797	0.9642	0.9320	0.8516	0.7207	0.5499	0.4120	0.4608	0.6916	0.8985	0.9657	0.9826	(86)
MIT	19.1966	19.4700	19.8769	20.3867	20.7449	20.9302	20.9812	20.9719	20.8380	20.3409	19.6874	19.1591	(87)
Th 2	19.9966	19.9992	20.0017	20.0135	20.0157	20.0260	20.0260	20.0280	20.0221	20.0157	20.0112	20.0066	(88)
util rest of house	0.9755	0.9571	0.9184	0.8232	0.6710	0.4780	0.3253	0.3704	0.6220	0.8722	0.9576	0.9790	(89)
MIT 2	17.8991	18.2455	18.7554	19.3804	19.7858	19.9778	20.0174	20.0140	19.8967	19.3432	18.5324	17.8581	(90)
Living area fraction	18.3905	18.7093	19.1801	19.7615	20.1491	20.3385	20.3824	20.3768	20.2532	19.7211	18.9698	18.3508	(91)
MIT	18.3905	18.7093	19.1801	19.7615	20.1491	20.3385	20.3824	20.3768	20.2532	19.7211	18.9698	18.3508	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3905	18.7093	19.1801	19.7615	20.1491	20.3385	20.3824	20.3768	20.2532	19.7211	18.9698	18.3508	(93)

8. Space heating requirement

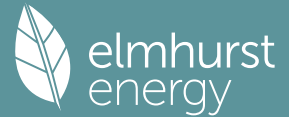
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9665	0.9452	0.9048	0.8151	0.6781	0.5018	0.3576	0.4036	0.6396	0.8628	0.9466	0.9709	(94)
Useful gains	704.8674	805.9971	878.3028	911.1267	819.8564	603.0253	410.8864	427.7236	609.4237	700.0626	683.7871	675.7976	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1607.6876	1571.1276	1438.6372	1216.1041	943.6410	633.4562	417.5302	438.0309	682.3076	1018.6916	1332.3880	1596.7836	(97)
Space heating kWh	671.6982	514.1677	416.8888	219.5837	92.0958	0.0000	0.0000	0.0000	0.0000	237.0599	466.9926	685.2135	(98a)
Space heating requirement - total per year (kWh/year)												3303.7004	
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	671.6982	514.1677	416.8888	219.5837	92.0958	0.0000	0.0000	0.0000	0.0000	237.0599	466.9926	685.2135	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3303.7004	
Space heating per m2										(98c) / (4) =		32.0002	(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)
Space heating requirement	671.6982	514.1677	416.8888	219.5837	92.0958	0.0000	0.0000	0.0000	0.0000	237.0599	466.9926	685.2135	(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)	727.7337	557.0615	451.6672	237.9022	99.7788	0.0000	0.0000	0.0000	0.0000	256.8363	505.9509	742.3765	(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)

13a. Primary energy - Individual heating systems including micro-CHP			
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year (275)
Space heating - main system 1	3579.3070	1.1300	4044.6170 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2931.4464	1.1300	3312.5344 (278)
Space and water heating			7357.1514 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	225.1121	1.5338	345.2844 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-556.9572	1.4932	-831.6289
PV Unit electricity exported	-463.6219	0.4597	-213.1397
Total			-1044.7687 (283)
Total Primary energy kWh/year			6787.7679 (286)
Target Primary Energy Rate (TPER)			65.7500 (287)

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Plot Reference	B2 Maisonette				Issued on Date	19/12/2025	
Assessment Reference	Maisonette			Plot Type Ref	Maisonette		
Plot Address					SAP Version	10.2	
SAP Rating	78 C	DER	4.32	TER	12.39		
Environmental	96 A	% DER < TER				65.13	
CO ₂ Emissions (t/year)	0.39	DFEE	36.24	TFEE	38.33		
Compliance Check	See BREL	% DFEE < TFEE				5.46	
% DPER < TPER	31.41	DPER	45.10	TPER	65.75		
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	41.3200 (1b)	x 2.9300 (2b)	= 121.0676 (1b) - (3b)
First floor	61.9200 (1c)	x 2.5000 (2c)	= 154.8000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	103.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 275.8676 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1450 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2950 (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) = 0.2507 (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	0.3197	0.3134	0.3072	0.2758	0.2696	0.2382	0.2382	0.2319	0.2507	0.2696	0.2821	0.2946 (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	0.5511	0.5491	0.5472	0.5380	0.5363	0.5284	0.5284	0.5269	0.5314	0.5363	0.5398	0.5434 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			18.9900	0.9615	18.2596		(27)
Ground Floor			41.3200	0.1300	5.3716	110.0000	4545.2000 (28a)
Exposed Floor			20.6000	0.1200	2.4720	0.0000	0.0000 (28b)
External Wall	109.8600	20.8800	88.9800	0.1600	14.2368	14.0000	1245.7200 (29a)
Total net area of external elements Aum(A, m ²)			171.7800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		42.2300		(33)
Main dwelling							
Party Wall			50.3400	0.0000	0.0000	20.0000	1006.8000 (32)
Party Ceiling			61.9200			100.0000	6192.0000 (32b)
Stud			190.0000			9.0000	1710.0000 (32c)
Internal Floor			41.3200			18.0000	743.7600 (32d)
Internal Ceiling			41.3200			9.0000	371.8800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	15815.3600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							153.1902 (35)
List of Thermal Bridges							

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K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.8700	0.0500	0.5435
E4 Jamb	30.5200	0.0500	1.5260
E5 Ground floor (normal)	18.5000	0.1600	2.9600
E7 Party floor between dwellings (in blocks of flats)	22.2600	0.0700	1.5582
E18 Party wall between dwellings	10.8600	0.0600	0.6516
P1 Party wall - Ground floor	7.5400	0.0800	0.6032
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.3000	0.0000	0.0000
E3 Sill	1.8100	0.0500	0.0905
E20 Exposed floor (normal)	3.7600	0.3200	1.2032
E21 Exposed floor (inverted)	5.4800	0.3200	1.7536
E6 Intermediate floor within a dwelling	7.5400	0.0100	0.0754
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	10.9600	0.0200	0.2192
E16 Corner (normal)	10.8600	0.0900	0.9774
P2 Party wall - Intermediate floor within a dwelling	7.5400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	3.7600	0.1200	0.4512
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			12.6130 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	54.8430 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	50.1706	49.9899	49.8128	48.9811	48.8255	48.1010	48.1010	47.9669	48.3801	48.8255	49.1403	49.4694 (38)
Average = Sum(39)m / 12 =	105.0136	104.8329	104.6558	103.8241	103.6685	102.9441	102.9441	102.8099	103.2231	103.6685	103.9833	104.3124 (39)
												103.8234
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0172	1.0154	1.0137	1.0057	1.0042	0.9971	0.9971	0.9958	0.9998	1.0042	1.0072	1.0104 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.7676 (42)
Hot water usage for mixer showers												
Hot water usage for baths	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 other uses	30.4933	30.0404	29.4027	28.2268	27.3464	26.3701	25.8427	26.4760	27.1655	28.2102	29.4103	30.3902 (42b)
Average daily hot water use (litres/day)	42.9726	41.4100	39.8473	38.2847	36.7221	35.1594	35.1594	36.7221	38.2847	39.8473	41.4100	42.9726 (42c)
												67.3381 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	73.4659	71.4504	69.2500	66.5115	64.0684	61.5295	61.0021	63.1980	65.4502	68.0575	70.8202	73.3628 (44)
Energy content (annual)	116.3521	101.7444	106.4347	91.0510	86.2484	75.6577	73.7768	78.2524	80.7066	92.3534	100.8964	114.8685 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss (or HIU 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 (46)
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	98.8992	86.4828	90.4695	77.3933	73.3111	64.3090	62.7103	66.5145	68.6006	78.5004	85.7619	97.6382 (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	98.8992	86.4828	90.4695	77.3933	73.3111	64.3090	62.7103	66.5145	68.6006	78.5004	85.7619	97.6382 (64)
12Total per year (kWh/year)												951 (64)
Electric shower(s)	56.5570	50.3928	55.0270	52.5116	53.4969	51.0309	52.7319	53.4969	52.5116	55.0270	53.9923	56.5570 (64a)
Heat gains from water heating, kWh/month	38.8641	34.2189	36.3741	32.4762	31.7020	28.8350	28.8605	30.0029	30.2781	33.3818	34.9386	38.5488 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	134.2425	148.6257	134.2425	138.7173	134.2425	138.7173	134.2425	134.2425	138.7173	134.2425	138.7173	134.2425 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	261.4618	264.1749	257.3379	242.7826	224.4091	207.1407	195.6043	192.8911	199.7282	214.2835	232.6569	249.9254 (68)
Pumps, fans	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025 (71)
Total internal gains	52.2367	50.9210	48.8900	45.1059	42.6102	40.0486	38.7911	40.3264	42.0529	44.8681	48.5258	51.8129 (72)
	512.4544	528.2350	504.9838	491.1192	465.7753	450.4200	433.1513	431.9735	445.0118	457.9075	484.4134	500.4943 (73)

6. Solar gains												
[Jan]												
	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
East	6.3400	19.6403	0.4000	0.7000	0.7700	24.1617 (76)						
West	12.6500	19.6403	0.4000	0.7000	0.7700	48.2091 (80)						

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Solar gains	72.3708	141.5727	233.1501	340.0355	416.7262	426.5934	406.1344	348.8634	271.1632	167.9879	90.2379	59.5142 (83)
Total gains	584.8252	669.8077	738.1339	831.1546	882.5016	877.0134	839.2857	780.8369	716.1749	625.8955	574.6513	560.0085 (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	41.8342	41.9063	41.9772	42.3134	42.3770	42.6752	42.6752	42.7309	42.5598	42.3770	42.2487	42.1154
alpha	3.7889	3.7938	3.7985	3.8209	3.8251	3.8450	3.8450	3.8487	3.8373	3.8251	3.8166	3.8077
util living area	0.9896	0.9817	0.9657	0.9191	0.8263	0.6683	0.5153	0.5677	0.7911	0.9435	0.9820	0.9911 (86)
MIT	19.1782	19.4018	19.7511	20.2343	20.6344	20.8866	20.9680	20.9537	20.7730	20.2413	19.6302	19.1400 (87)
Th 2	20.0690	20.0705	20.0719	20.0786	20.0799	20.0857	20.0857	20.0868	20.0835	20.0799	20.0773	20.0747 (88)
util rest of house	0.9874	0.9779	0.9582	0.9009	0.7865	0.5960	0.4181	0.4695	0.7309	0.9271	0.9775	0.9893 (89)
MIT 2	18.3968	18.6195	18.9653	19.4381	19.8081	20.0203	20.0733	20.0674	19.9368	19.4536	18.8527	18.3630 (90)
Living area fraction	18.6927	18.9158	19.2629	19.7396	20.1211	20.3484	20.4122	20.4031	20.2535	19.7519	19.1472	18.6573 (92)
MIT	18.6927	18.9158	19.2629	19.7396	20.1211	20.3484	20.4122	20.4031	20.2535	19.7519	19.1472	18.6573 (93)
Temperature adjustment												0.0000
adjusted MIT	18.6927	18.9158	19.2629	19.7396	20.1211	20.3484	20.4122	20.4031	20.2535	19.7519	19.1472	18.6573 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9830	0.9717	0.9501	0.8931	0.7884	0.6180	0.4539	0.5049	0.7432	0.9199	0.9717	0.9854 (94)
Useful gains	574.9000	650.8610	701.2870	742.2816	695.7982	541.9509	380.9141	394.2289	532.2691	575.7763	558.3802	551.8397 (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	1511.4326	1469.3173	1335.7107	1125.4167	872.9984	591.7591	392.4409	411.5541	635.1820	948.7639	1252.7049	1508.0737 (97)
Space heating kWh	696.7803	550.0026	472.0112	275.8573	131.8369	0.0000	0.0000	0.0000	0.0000	277.5028	499.9138	711.4381 (98a)
Space heating requirement - total per year (kWh/year)												3615.3431
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	696.7803	550.0026	472.0112	275.8573	131.8369	0.0000	0.0000	0.0000	0.0000	277.5028	499.9138	711.4381 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3615.3431
Space heating per m2												35.0188 (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	967.6741	761.7860	781.3553	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7943	0.8637	0.8309	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	768.5921	657.9885	649.2294	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	969.2993	927.8561	862.2073	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	144.5092	200.7815	158.4555	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	36.1273	50.1954	39.6139	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												125.9366 (107)
Energy for space heating												35.0188 (99)
Energy for space cooling												1.2198 (108)
Total												36.2387 (109)
Fabric Energy Efficiency (DFEE)												36.2 (109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

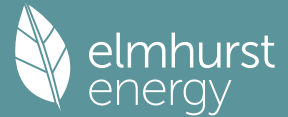
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	41.3200 (1b)	x 2.9300 (2b)	= 121.0676 (1b) - (3b)
First floor	61.9200 (1c)	x 2.5000 (2c)	= 154.8000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	103.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 275.8676 (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)

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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) =	0.1450 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3950	(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) =	0.3357 (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													
	0.4281	0.4197	0.4113	0.3693	0.3609	0.3190	0.3190	0.3106	0.3357	0.3609	0.3777	0.3945	(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	0.5916	0.5881	0.5846	0.5682	0.5651	0.5509	0.5509	0.5482	0.5564	0.5651	0.5713	0.5778	(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	
Main dwelling								
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type			18.9900	1.1450	21.7443			(27)
Ground Floor			41.3200	0.1300	5.3716			(28a)
Exposed Floor			20.6000	0.1300	2.6780			(28b)
External Wall	109.8600	20.8800	88.9800	0.1800	16.0164			(29a)
Total net area of external elements Aum(A, m2)			171.7800					(31)
Fabric heat loss, W/K = Sum (A x U)								(32)
Main dwelling								
Party Wall			50.3400	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								153.1902 (35)

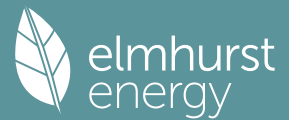
List of Thermal Bridges	Length	Psi-value	Total	
K1 Element	10.8700	0.0500	0.5435	
E2 Other lintels (including other steel lintels)	30.5200	0.0500	1.5260	
E4 Jamb	18.5000	0.1600	2.9600	
E5 Ground floor (normal)	22.2600	0.0700	1.5582	
E7 Party floor between dwellings (in blocks of flats)	10.8600	0.0600	0.6516	
E18 Party wall between dwellings	7.5400	0.0800	0.6032	
P1 Party wall - Ground floor	11.3000	0.0000	0.0000	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	1.8100	0.0500	0.0905	
E3 Sill	3.7600	0.3200	1.2032	
E20 Exposed floor (normal)	5.4800	0.3200	1.7536	
E21 Exposed floor (inverted)	7.5400	0.0000	0.0000	
E6 Intermediate floor within a dwelling	10.9600	0.0200	0.2192	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	10.8600	0.0900	0.9774	
E16 Corner (normal)	7.5400	0.0000	0.0000	
P2 Party wall - Intermediate floor within a dwelling	3.7600	0.1200	0.4512	
P4 Party wall - Roof (insulation at ceiling level)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				12.5376 (36)
Point Thermal bridges				0.0000 (36a)
Total fabric heat loss				60.2379 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	53.8594	53.5355	53.2180	51.7268	51.4478	50.1490	50.1490	49.9084	50.6493	51.4478	52.0122	52.6023	(38)
Heat transfer coeff	114.0973	113.7734	113.4559	111.9647	111.6857	110.3868	110.3868	110.1463	110.8871	111.6857	112.2501	112.8402	(39)
Average = Sum(39)m / 12 =												111.9633	
HLP	1.1052	1.1020	1.0990	1.0845	1.0818	1.0692	1.0692	1.0669	1.0741	1.0818	1.0873	1.0930	(40)
HLP (average)												1.0845	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7676 (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	0.0000	(42a)
Hot water usage for baths													
30.4933	30.0404	29.4027	28.2268	27.3464	26.3701	25.8427	26.4760	27.1655	28.2102	29.4103	30.3902		(42b)
Hot water usage for other uses													
42.9726	41.4100	39.8473	38.2847	36.7221	35.1594	35.1594	36.7221	38.2847	39.8473	41.4100	42.9726		(42c)
Average daily hot water use (litres/day)												67.3381	(43)
Daily hot water use													
73.4659	71.4504	69.2500	66.5115	64.0684	61.5295	61.0021	63.1980	65.4502	68.0575	70.8202	73.3628		(44)
Energy conte	116.3521	101.7444	106.4347	91.0510	86.2484	75.6577	73.7768	78.2524	80.7066	92.3534	100.8964	114.8685	(45)
Energy content (annual)												1118.3422	
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 (or HIU 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		(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		(61)
Total heat required for water heating calculated for each month													
98.8992	86.4828	90.4695	77.3933	73.3111	64.3090	62.7103	66.5145	68.6006	78.5004	85.7619	97.6382		(62)
WWHRS	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		(63b)

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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	98.8992	86.4828	90.4695	77.3933	73.3111	64.3090	62.7103	66.5145	68.6006	78.5004	85.7619	97.6382 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											950.5909 (64)
Electric shower(s)	56.5570	50.3928	55.0270	52.5116	53.4969	51.0309	52.7319	53.4969	52.5116	55.0270	53.9923	56.5570 (64a)
Heat gains from water heating, kWh/month	38.8641	34.2189	36.3741	32.4762	31.7020	28.8350	28.8605	30.0029	30.2781	33.3818	34.9386	38.5488 (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	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	134.2425	148.6257	134.2425	138.7173	134.2425	138.7173	134.2425	134.2425	138.7173	134.2425	138.7173	134.2425	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	261.4618	264.1749	257.3379	242.7826	224.4091	207.1407	195.6043	192.8911	199.7282	214.2835	232.6569	249.9254	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	(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)	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	(71)
Water heating gains (Table 5)	52.2367	50.9210	48.8900	45.1059	42.6102	40.0486	38.7911	40.3264	42.0529	44.8681	48.5258	51.8129	(72)
Total internal gains	512.4544	528.2350	504.9838	491.1192	465.7753	450.4200	433.1513	431.9735	445.0118	457.9075	484.4134	500.4943	(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					6.3400	19.6403		0.6300	0.7000	0.7700		38.0547 (76)
West					12.6500	19.6403		0.6300	0.7000	0.7700		75.9293 (80)
Solar gains	113.9841	222.9770	367.2113	535.5559	656.3438	671.8847	639.6616	549.4599	427.0820	264.5810	142.1247	93.7349 (83)
Total gains	626.4385	751.2120	872.1951	1026.6750	1122.1191	1122.3046	1072.8129	981.4334	872.0938	722.4885	626.5381	594.2292 (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	38.5036	38.6132	38.7213	39.2370	39.3350	39.7978	39.7978	39.8847	39.6183	39.3350	39.1372	38.9326
alpha	3.5669	3.5742	3.5814	3.6158	3.6223	3.6532	3.6532	3.6590	3.6412	3.6223	3.6091	3.5955
util living area	0.9872	0.9752	0.9488	0.8769	0.7524	0.5808	0.4387	0.4930	0.7305	0.9238	0.9774	0.9894 (86)
MIT	19.0512	19.3342	19.7599	20.3081	20.7038	20.9165	20.9769	20.9650	20.8045	20.2472	19.5578	19.0132 (87)
Th 2	19.9966	19.9992	20.0017	20.0135	20.0157	20.0260	20.0260	20.0280	20.0221	20.0157	20.0112	20.0066 (88)
util rest of house	0.9845	0.9701	0.9380	0.8516	0.7043	0.5072	0.3474	0.3980	0.6626	0.9024	0.9719	0.9871 (89)
MIT 2	18.2186	18.5001	18.9192	19.4502	19.8048	19.9805	20.0177	20.0142	19.9016	19.4069	18.7327	18.1881 (90)
Living area fraction	fLA = Living area / (4) = 0.3787 (91)											
MIT	18.5339	18.8160	19.2376	19.7751	20.1453	20.3350	20.3810	20.3743	20.2436	19.7251	19.0452	18.5006 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.5339	18.8160	19.2376	19.7751	20.1453	20.3350	20.3810	20.3743	20.2436	19.7251	19.0452	18.5006 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9792	0.9622	0.9279	0.8447	0.7111	0.5314	0.3814	0.4329	0.6792	0.8948	0.9648	0.9824	(94)
Useful gains	613.4016	722.7906	809.2947	867.2264	797.9789	596.4424	409.1650	424.8147	592.3299	646.5113	604.4529	583.7826	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
Space heating kWh	1624.0517	1583.2684	1445.1542	1217.6265	943.2193	633.0707	417.3708	437.7563	681.2448	1019.1433	1340.8462	1613.6782	(97)
Space heating requirement - total per year (kWh/year)	751.9237	578.2411	473.0795	252.2881	108.0589	0.0000	0.0000	0.0000	0.0000	277.2383	530.2032	766.2423	(98a)
Solar heating kWh	3737.2750												
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Space heating kWh	0.0000												
Space heating requirement after solar contribution - total per year (kWh/year)	751.9237	578.2411	473.0795	252.2881	108.0589	0.0000	0.0000	0.0000	0.0000	277.2383	530.2032	766.2423	(98c)
Space heating per m2	3737.2750												
	(98c) / (4) =											36.1999 (99)	

8c. Space cooling requirement

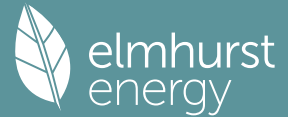
Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1037.6363	816.8626	837.1121	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8530	0.9061	0.8769	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	885.1442	740.1674	734.0866	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1256.0034	1200.8100	1096.6707	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	267.0186	342.7181	269.7626	0.0000	0.0000	0.0000	0.0000	(104)

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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 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	66.7546	85.6795	67.4406	0.0000	0.0000	0.0000 (107)
Space cooling requirement											219.8748 (107)
Energy for space heating											36.1999 (99)
Energy for space cooling											2.1297 (108)
Total											38.3296 (109)
Fabric Energy Efficiency (TFEE)											38.3 (109)

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Plot Reference	B2 Maisonette				Issued on Date	19/12/2025	
Assessment Reference	Maisonette			Plot Type Ref	Maisonette		
Plot Address					SAP Version	10.2	
SAP Rating	78 C	DER	4.32	TER	12.39		
Environmental	96 A	% DER < TER				65.13	
CO ₂ Emissions (t/year)	0.39	DFEE	36.24	TFEE	38.33		
Compliance Check	See BREL	% DFEE < TFEE				5.46	
% DPER < TPER	31.41	DPER	45.10	TPER	65.75		
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	41.3200 (1b)	x 2.9300 (2b)	= 121.0676 (1b) - (3b)
First floor	61.9200 (1c)	x 2.5000 (2c)	= 154.8000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	103.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 275.8676 (5)

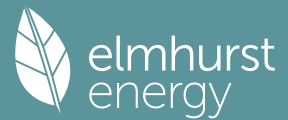
2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000 (22)
Wind factor	1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1250 1.1750 (22a)
Adj infilt rate	0.1626 0.1594 0.1562 0.1403 0.1371 0.1211 0.1211 0.1179 0.1275 0.1371 0.1434 0.1498 (22b)
Balanced mechanical ventilation with heat recovery	
If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	69.6000 (23c)
Effective ac	0.3146 0.3114 0.3082 0.2923 0.2891 0.2731 0.2731 0.2699 0.2795 0.2891 0.2954 0.3018 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			18.9900	0.9615	18.2596		(27)
Ground Floor			41.3200	0.1300	5.3716	110.0000	4545.2000 (28a)
Exposed Floor			20.6000	0.1200	2.4720	0.0000	0.0000 (28b)
External Wall	109.8600	20.8800	88.9800	0.1600	14.2368	14.0000	1245.7200 (29a)
Total net area of external elements Aum (A, m ²)			171.7800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		42.2300		(33)
Main dwelling							
Party Wall			50.3400	0.0000	0.0000	20.0000	1006.8000 (32)
Party Ceiling			61.9200			100.0000	6192.0000 (32b)
Stud			190.0000			9.0000	1710.0000 (32c)
Internal Floor			41.3200			18.0000	743.7600 (32d)
Internal Ceiling			41.3200			9.0000	371.8800 (32e)

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Heat capacity $C_m = \text{Sum}(A \times k)$
 Thermal mass parameter (TMP = C_m / TFA) in $\text{kJ/m}^2\text{K}$
 List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.8700	0.0500	0.5435
E4 Jamb	30.5200	0.0500	1.5260
E5 Ground floor (normal)	18.5000	0.1600	2.9600
E7 Party floor between dwellings (in blocks of flats)	22.2600	0.0700	1.5582
E18 Party wall between dwellings	10.8600	0.0600	0.6516
P1 Party wall - Ground floor	7.5400	0.0800	0.6032
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.3000	0.0000	0.0000
E3 Sill	1.8100	0.0500	0.0905
E20 Exposed floor (normal)	3.7600	0.3200	1.2032
E21 Exposed floor (inverted)	5.4800	0.3200	1.7536
E6 Intermediate floor within a dwelling	7.5400	0.0100	0.0754
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	10.9600	0.0200	0.2192
E16 Corner (normal)	10.8600	0.0900	0.9774
P2 Party wall - Intermediate floor within a dwelling	7.5400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	3.7600	0.1200	0.4512

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 54.8430 (37)

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	28.6366	28.3464	28.0563	26.6054	26.3152	24.8643	24.8643	24.5741	25.4446	26.3152	26.8955	27.4759
Heat transfer coeff	83.4796	83.1894	82.8993	81.4484	81.1582	79.7073	79.7073	79.4171	80.2877	81.1582	81.7386	82.3189
Average = Sum(39)m / 12 =												81.3758

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8086	0.8058	0.8030	0.7889	0.7861	0.7721	0.7721	0.7692	0.7777	0.7861	0.7917	0.7974
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

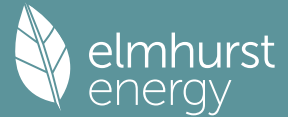
Assumed occupancy												2.7676
Hot water usage for mixer showers												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths												
30.4933	30.0404	29.4027	28.2268	27.3464	26.3701	25.8427	26.4760	27.1655	28.2102	29.4103	30.3902	(42b)
Hot water usage for other uses												
42.9726	41.4100	39.8473	38.2847	36.7221	35.1594	35.1594	36.7221	38.2847	39.8473	41.4100	42.9726	(42c)
Average daily hot water use (litres/day)												67.3381
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	73.4659	71.4504	69.2500	66.5115	64.0684	61.5295	61.0021	63.1980	65.4502	68.0575	70.8202	73.3628
Energy content (annual)	116.3521	101.7444	106.4347	91.0510	86.2484	75.6577	73.7768	78.2524	80.7066	92.3534	100.8964	114.8685
Distribution loss (46)m = $0.15 \times (45)\text{m}$												
17.4528	15.2617	15.9652	13.6576	12.9373	11.3486	11.0665	11.7379	12.1060	13.8530	15.1345	17.2303	(46)
Water storage loss (or HIU loss):												
Store volume												110.0000
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152
Volume factor from Table 2a												1.0294
Temperature factor from Table 2b												0.6000
Enter (49) or (54) in (55)												1.0327
Total storage loss												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	(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	(61)
Total heat required for water heating calculated for each month												
171.6289	151.6719	161.7115	144.5446	141.5252	129.1513	129.0536	133.5292	134.2003	147.6302	154.3901	170.1453	(62)
WWHRS	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	(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	(63c)
FGHRS	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												
171.6289	151.6719	161.7115	144.5446	141.5252	129.1513	129.0536	133.5292	134.2003	147.6302	154.3901	170.1453	(64)
12Total per year (kWh/year)												1769.1820
Electric shower(s)												1769
56.5570	50.3928	55.0270	52.5116	53.4969	51.0309	52.7319	53.4969	52.5116	55.0270	53.9923	56.5570	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												643.3330
Heat gains from water heating, kWh/month												
97.0478	86.3702	93.3677	86.1973	86.2733	80.7088	81.9352	83.6146	82.7578	88.6857	89.8411	96.5545	(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	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
134.2425	148.6257	134.2425	138.7173	134.2425	138.7173	134.2425	134.2425	138.7173	134.2425	138.7173	134.2425	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
261.4618	264.1749	257.3379	242.7826	224.4091	207.1407	195.6043	192.8911	199.7282	214.2835	232.6569	249.9254	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	(71)
Water heating gains (Table 5)												
130.4405	128.5270	125.4943	119.7184	115.9587	112.0956	110.1280	112.3852	114.9414	119.2012	124.7793	129.7775	(72)
Total internal gains												
590.6583	605.8411	581.5881	565.7317	539.1238	522.4670	504.4882	504.0323	517.9003	532.2407	560.6669	578.4589	(73)

6. Solar gains

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[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	6.3400				19.6403	0.4000	0.7000	0.7700			24.1617 (76)	
West	12.6500				19.6403	0.4000	0.7000	0.7700			48.2091 (80)	
Solar gains	72.3708	141.5727	233.1501	340.0355	416.7262	426.5934	406.1344	348.8634	271.1632	167.9879	90.2379	59.5142 (83)
Total gains	663.0291	747.4138	814.7382	905.7672	955.8500	949.0604	910.6226	852.8957	789.0635	700.2286	650.9048	637.9731 (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	52.6255	52.8090	52.9939	53.9379	54.1308	55.1161	55.1161	55.3175	54.7177	54.1308	53.7464	53.3675
alpha	4.5084	4.5206	4.5329	4.5959	4.6087	4.6744	4.6744	4.6878	4.6478	4.6087	4.5831	4.5578
util living area	0.9813	0.9670	0.9375	0.8541	0.7134	0.5234	0.3824	0.4237	0.6553	0.8890	0.9652	0.9839 (86)
MIT	19.7779	19.9857	20.2784	20.6497	20.8795	20.9778	20.9958	20.9934	20.9388	20.6335	20.1610	19.7546 (87)
Th 2	20.2459	20.2483	20.2508	20.2629	20.2654	20.2776	20.2776	20.2801	20.2727	20.2654	20.2605	20.2556 (88)
util rest of house	0.9778	0.9611	0.9263	0.8300	0.6723	0.4689	0.3208	0.3593	0.5991	0.8650	0.9580	0.9810 (89)
MIT 2	19.1235	19.3296	19.6164	19.9758	20.1785	20.2651	20.2760	20.2773	20.2348	19.9697	19.5136	19.1081 (90)
Living area fraction	fLA = Living area / (4) = 0.3787 (91)											
MIT	19.3714	19.5781	19.8672	20.2310	20.4440	20.5350	20.5486	20.5485	20.5014	20.2211	19.7588	19.3529 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.3714	19.5781	19.8672	20.2310	20.4440	20.5350	20.5486	20.5485	20.5014	20.2211	19.7588	19.3529 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9729	0.9548	0.9197	0.8289	0.6827	0.4886	0.3440	0.3835	0.6174	0.8634	0.9521	0.9764 (94)
Useful gains	645.0357	713.6463	749.2978	750.7923	652.5860	463.7266	313.2933	327.1119	487.1423	604.5487	619.7039	622.9390 (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	1258.1516	1221.0638	1108.1282	922.8955	709.6491	473.0645	314.7323	329.4627	513.9549	780.8296	1034.7130	1247.3734 (97)
Space heating kWh	456.1582	340.9846	266.9698	123.9143	42.4549	0.0000	0.0000	0.0000	0.0000	131.1530	298.8066	464.5792 (98a)
Space heating requirement - total per year (kWh/year)												2125.0206
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	456.1582	340.9846	266.9698	123.9143	42.4549	0.0000	0.0000	0.0000	0.0000	131.1530	298.8066	464.5792 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2125.0206
Space heating per m2	(98c) / (4) =											20.5833 (99)
9b. Energy requirements												
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space and Water												1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500 (305)
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system												1.5000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement												
	456.1582	340.9846	266.9698	123.9143	42.4549	0.0000	0.0000	0.0000	0.0000	131.1530	298.8066	464.5792 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	718.4492	537.0507	420.4774	195.1650	66.8665	0.0000	0.0000	0.0000	0.0000	206.5660	470.6203	731.7123
Space heating requirement	718.4492	537.0507	420.4774	195.1650	66.8665	0.0000	0.0000	0.0000	0.0000	206.5660	470.6203	731.7123 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement												
	171.6289	151.6719	161.7115	144.5446	141.5252	129.1513	129.0536	133.5292	134.2003	147.6302	154.3901	170.1453 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	257.4433	227.5078	242.5673	216.8170	212.2878	193.7270	193.5804	200.2937	201.3005	221.4453	231.5851	255.2179
Water heating fuel	257.4433	227.5078	242.5673	216.8170	212.2878	193.7270	193.5804	200.2937	201.3005	221.4453	231.5851	255.2179 (310)
Cooling System Energy Efficiency Ratio												
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (314)
Pumps and Fa	32.0145	28.9164	32.0145	30.9818	32.0145	30.9818	32.0145	32.0145	30.9818	32.0145	30.9818	32.0145 (315)
Lighting	33.0858	26.5426	23.8987	17.5092	13.5246	11.0497	12.3376	16.0369	20.8303	27.3305	30.8698	34.0053 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-13.2879	-22.8449	-40.6192	-54.9443	-66.6962	-65.1702	-64.0624	-56.2631	-43.6366	-29.2873	-15.7742	-10.9202 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												3346.9074 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2653.7730 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												33.4691 (313)
Space cooling fuel												0.0000 (321)

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Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1200)	
mechanical ventilation fans (SFP = 1.1200)	376.9455 (330a)
Total electricity for the above, kWh/year	376.9455 (331)
Electricity for lighting (calculated in Appendix L)	267.0211 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-483.5065 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	6804.4735 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			280.0000 (367)
Space and Water heating from Heat pump	2143.1002	0.1561	186.6175 (367)
Electrical energy for heat distribution (space & water)	33.4691	0.0000	8.9545 (372)
Overall CO2 factor for heat network			0.0548 (386)
Total CO2 associated with community systems			328.7566 (373)
Energy for instantaneous electric shower(s)	643.3330	0.1391	89.5018 (264a)
Space and water heating			328.7566 (376)
Pumps, fans and electric keep-hot	376.9455	0.1387	52.2870 (378)
Energy for lighting	267.0211	0.1443	38.5394 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-483.5065	0.1311	-63.3982
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-63.3982 (380)
Total CO2, kg/year			445.6865 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.3200 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	2143.1002	1.5780	1886.2097 (467)
Electrical energy for heat distribution (space & water)	33.4691	0.0000	93.1402 (472)
Overall CO2 factor for heat network			0.5699 (486)
Total CO2 associated with community systems			3419.5759 (473)
Energy for instantaneous electric shower(s)	643.3330	1.5143	974.2211 (278a)
Space and water heating			3419.5759 (476)
Pumps, fans and electric keep-hot	376.9455	1.5128	570.2431 (478)
Energy for lighting	267.0211	1.5338	409.5659 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-483.5065	1.4844	-717.7198
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-717.7198 (480)
Total Primary energy kWh/year			4655.8862 (483)
Dwelling Primary energy Rate (DPER)			45.1000 (484)

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

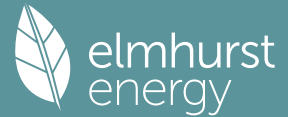
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	41.3200 (1b)	x 2.9300 (2b)	= 121.0676 (1b) - (3b)
First floor	61.9200 (1c)	x 2.5000 (2c)	= 154.8000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	103.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 275.8676 (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)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1450 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)

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Infiltration rate	0.3950	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = $1 - [0.075 \times (19)]$	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20)	0.3357 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	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)
Adj infilt rate	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)
Effective ac	0.4281	0.4197	0.4113	0.3693	0.3609	0.3190	0.3190	0.3106	0.3357	0.3609	0.3777	0.3945	(22b)
	0.5916	0.5881	0.5846	0.5682	0.5651	0.5509	0.5509	0.5482	0.5564	0.5651	0.5713	0.5778	(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	
Main dwelling								
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type			18.9900	1.1450	21.7443			(27)
Ground Floor			41.3200	0.1300	5.3716			(28a)
Exposed Floor			20.6000	0.1300	2.6780			(28b)
External Wall	109.8600	20.8800	88.9800	0.1800	16.0164			(29a)
Total net area of external elements Aum(A, m2)			171.7800					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	47.7003		(33)
Main dwelling								
Party Wall			50.3400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 153.1902 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	10.8700	0.0500	0.5435
E2 Other lintels (including other steel lintels)	30.5200	0.0500	1.5260
E4 Jamb	18.5000	0.1600	2.9600
E5 Ground floor (normal)	22.2600	0.0700	1.5582
E18 Party floor between dwellings (in blocks of flats)	10.8600	0.0600	0.6516
P1 Party wall - Ground floor	7.5400	0.0800	0.6032
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.3000	0.0000	0.0000
E3 Sill	1.8100	0.0500	0.0905
E20 Exposed floor (normal)	3.7600	0.3200	1.2032
E21 Exposed floor (inverted)	5.4800	0.3200	1.7536
E6 Intermediate floor within a dwelling	7.5400	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	10.9600	0.0200	0.2192
E16 Corner (normal)	10.8600	0.0900	0.9774
P2 Party wall - Intermediate floor within a dwelling	7.5400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	3.7600	0.1200	0.4512

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.5376 (36)

Point Thermal bridges

Total fabric heat loss (33) + (36) + (36a) = 60.2379 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	53.8594	53.5355	53.2180	51.7268	51.4478	50.1490	50.1490	49.9084	50.6493	51.4478	52.0122	52.6023	(38)
Average = Sum(39)m / 12 =	114.0973	113.7734	113.4559	111.9647	111.6857	110.3868	110.3868	110.1463	110.8871	111.6857	112.2501	112.8402	(39)
												111.9633	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1052	1.1020	1.0990	1.0845	1.0818	1.0692	1.0692	1.0669	1.0741	1.0818	1.0873	1.0930	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7676 (42)
Hot water usage for mixer showers													
Hot water usage for baths	70.6227	69.5614	68.0148	65.0558	62.8721	60.4368	59.0526	60.5875	62.2700	64.8847	67.9073	70.3521	(42a)
Hot water usage for other uses	30.4933	30.0404	29.4027	28.2268	27.3464	26.3701	25.8427	26.4760	27.1655	28.2102	29.4103	30.3902	(42b)
Average daily hot water use (litres/day)	42.9726	41.4100	39.8473	38.2847	36.7221	35.1594	35.1594	36.7221	38.2847	39.8473	41.4100	42.9726	(42c)
												132.4499	(43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	144.0886	141.0118	137.2649	131.5673	126.9405	121.9663	120.0548	123.7855	127.7202	132.9422	138.7275	143.7150	(44)
Energy content (annual)	228.2012	200.7989	210.9710	180.1091	170.8863	149.9718	145.1958	153.2723	157.4917	180.4013	197.6428	225.0229	(45)
Distribution loss (46)m = 0.15 x (45)m	34.2302	30.1198	31.6457	27.0164	25.6329	22.4958	21.7794	22.9908	23.6238	27.0602	29.6464	33.7534	(46)

Water storage loss (or HIU loss): 150.0000 (47)

Store volume 1.3938 (48)

a) If manufacturer declared loss factor is known (kWh/day): 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss 23.3325 21.0745 23.3325 22.5798 23.3325 22.5798 23.3325 23.3325 22.5798 23.3325 22.5798 23.3325 23.3325 (56)

If cylinder contains dedicated solar storage 23.3325 21.0745 23.3325 22.5798 23.3325 22.5798 23.3325 23.3325 22.5798 23.3325 22.5798 23.3325 23.3325 (57)

Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 (59)

Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)

Total heat required for water heating calculated for each month 274.7961 242.8847 257.5659 225.2009 217.4812 195.0636 191.7907 199.8672 202.5836 226.9962 242.7346 271.6178 (62)

WWHRS -32.2858 -28.5538 -29.8999 -24.7583 -23.0738 -19.7444 -18.5073 -19.6806 -20.4284 -24.0828 -27.2829 -31.6879 (63a)

PV diverter -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 (63b)

Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63c)

FGHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63d)

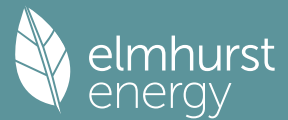
Output from w/h 242.5103 214.3309 227.6660 200.4426 194.4074 175.3192 173.2835 180.1866 182.1552 202.9134 215.4518 239.9299 (64)

12Total per year (kWh/year) Total per year (kWh/year) = Sum(64)m = 2448.5969 (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)

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Heat gains from water heating, kWh/month
113.1528 100.4342 107.4238 95.9597 94.0956 85.9391 85.5535 88.2390 88.4395 97.2594 101.7897 112.0960 (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	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	138.3781	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	134.2425	148.6257	134.2425	138.7173	134.2425	138.7173	134.2425	134.2425	138.7173	134.2425	138.7173	134.2425	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	261.4618	264.1749	257.3379	242.7826	224.4091	207.1407	195.6043	192.8911	199.7282	214.2835	232.6569	249.9254	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	36.8378	(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)	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	-110.7025	(71)
Water heating gains (Table 5)	152.0871	149.4557	144.3868	133.2774	126.4726	119.3599	114.9913	118.6008	122.8326	130.7249	141.3746	150.6667	(72)
Total internal gains	615.3049	629.7697	603.4806	582.2907	552.6377	529.7312	509.3516	510.2479	525.7915	546.7644	580.2622	602.3481	(73)

6. Solar gains

[Jan]			Area		Solar flux		g		FF		Access		Gains	
			m2		Table 6a		Specific data		Specific data		factor		W	
					W/m2		or Table 6b		or Table 6c		Table 6d			
East			6.3400		19.6403		0.6300		0.7000		0.7700		38.0547 (76)	
West			12.6500		19.6403		0.6300		0.7000		0.7700		75.9293 (80)	
Solar gains			113.9841	222.9770	367.2113	535.5559	656.3438	671.8847	639.6616	549.4599	427.0820	264.5810	142.1247	93.7349 (83)
Total gains			729.2889	852.7467	970.6920	1117.8466	1208.9815	1201.6159	1149.0132	1059.7077	952.8735	811.3454	722.3870	696.0830 (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	38.5036	38.6132	38.7213	39.2370	39.3350	39.7978	39.7978	39.8847	39.6183	39.3350	39.1372	38.9326	
alpha	3.5669	3.5742	3.5814	3.6158	3.6223	3.6532	3.6532	3.6590	3.6412	3.6223	3.6091	3.5955	
util living area	0.9797	0.9642	0.9320	0.8516	0.7207	0.5499	0.4120	0.4608	0.6916	0.8985	0.9657	0.9826	(86)
MIT	19.1966	19.4700	19.8769	20.3867	20.7449	20.9302	20.9812	20.9719	20.8380	20.3409	19.6874	19.1591	(87)
Th 2	19.9966	19.9992	20.0017	20.0135	20.0157	20.0260	20.0260	20.0280	20.0221	20.0157	20.0112	20.0066	(88)
util rest of house	0.9755	0.9571	0.9184	0.8232	0.6710	0.4780	0.3253	0.3704	0.6220	0.8722	0.9576	0.9790	(89)
MIT 2	17.8991	18.2455	18.7554	19.3804	19.7858	19.9778	20.0174	20.0140	19.8967	19.3432	18.5324	17.8581	(90)
Living area fraction	18.3905	18.7093	19.1801	19.7615	20.1491	20.3385	20.3824	20.3768	20.2532	19.7211	18.9698	18.3508	(91)
MIT	18.3905	18.7093	19.1801	19.7615	20.1491	20.3385	20.3824	20.3768	20.2532	19.7211	18.9698	18.3508	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3905	18.7093	19.1801	19.7615	20.1491	20.3385	20.3824	20.3768	20.2532	19.7211	18.9698	18.3508	(93)

8. Space heating requirement

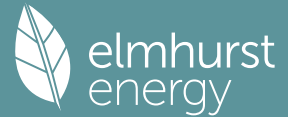
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9665	0.9452	0.9048	0.8151	0.6781	0.5018	0.3576	0.4036	0.6396	0.8628	0.9466	0.9709	(94)
Useful gains	704.8674	805.9971	878.3028	911.1267	819.8564	603.0253	410.8864	427.7236	609.4237	700.0626	683.7871	675.7976	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1607.6876	1571.1276	1438.6372	1216.1041	943.6410	633.4562	417.5302	438.0309	682.3076	1018.6916	1332.3880	1596.7836	(97)
Space heating kWh	671.6982	514.1677	416.8888	219.5837	92.0958	0.0000	0.0000	0.0000	0.0000	237.0599	466.9926	685.2135	(98a)
Space heating requirement - total per year (kWh/year)												3303.7004	
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	671.6982	514.1677	416.8888	219.5837	92.0958	0.0000	0.0000	0.0000	0.0000	237.0599	466.9926	685.2135	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3303.7004	
Space heating per m2										(98c) / (4) =		32.0002	(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	671.6982	514.1677	416.8888	219.5837	92.0958	0.0000	0.0000	0.0000	0.0000	237.0599	466.9926	685.2135	(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)	727.7337	557.0615	451.6672	237.9022	99.7788	0.0000	0.0000	0.0000	0.0000	256.8363	505.9509	742.3765	(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)

13a. Primary energy - Individual heating systems including micro-CHP			
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year (275)
Space heating - main system 1	3579.3070	1.1300	4044.6170 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2931.4464	1.1300	3312.5344 (278)
Space and water heating			7357.1514 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	225.1121	1.5338	345.2844 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-556.9572	1.4932	-831.6289
PV Unit electricity exported	-463.6219	0.4597	-213.1397
Total			-1044.7687 (283)
Total Primary energy kWh/year			6787.7679 (286)
Target Primary Energy Rate (TPER)			65.7500 (287)

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Plot Reference	B3.1-3.3 1B2P Ground				Issued on Date	19/12/2025
Assessment Reference	1B2P	Plot Type Ref		1B2P		
Plot Address					SAP Version	10.2
SAP Rating	79 C	DER	4.40	TER	14.70	
Environmental	97 A	% DER < TER				70.07
CO ₂ Emissions (t/year)	0.19	DFEE	31.90	TFEE	33.83	
Compliance Check	See BREL	% DFEE < TFEE				5.70
% DPER < TPER	40.93	DPER	46.29	TPER	78.36	
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001
Client	ROK, Wilf Foster					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	50.0200 (1b)	2.5000 (2b)	125.0500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0200		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.0500 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000 (23c)
Effective ac	0.3026	0.2994	0.2962	0.2802	0.2771	0.2611	0.2611	0.2579	0.2675	0.2771	0.2834	0.2898 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			8.4300	0.9615	8.1058		(27)
Ground Floor			50.0200	0.1300	6.5026	110.0000	5502.2000 (28a)
External Wall	18.5300	8.4300	10.1000	0.1600	1.6160	14.0000	141.4000 (29a)
Communal Wall	11.2000	1.8900	9.3100	0.2100	1.9551	14.0000	130.3400 (29a)
Total net area of external elements Aum(A, m ²)			79.7500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.0695		(33)
Main dwelling							
Party Wall			41.0700	0.0000	0.0000	20.0000	821.4000 (32)
Party Ceiling			50.0200			100.0000	5002.0000 (32b)
Stud			85.0000			9.0000	765.0000 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12362.3400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							247.1479 (35)
List of Thermal Bridges							

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K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	4.5200	0.0500	0.2260
E4 Jamb	13.5200	0.0500	0.6760
E5 Ground floor (normal)	11.8900	0.1600	1.9024
E7 Party floor between dwellings (in blocks of flats)	11.8900	0.0700	0.8323
E18 Party wall between dwellings	7.5000	0.0600	0.4500
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
P1 Party wall - Ground floor	16.4300	0.0800	1.3144
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.4300	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.5511 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	25.6206 (37)

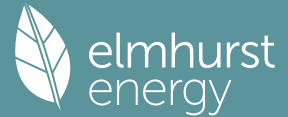
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	12.4857	12.3542	12.2226	11.5649	11.4334	10.7757	10.7757	10.6442	11.0388	11.4334	11.6965	11.9595 (38)
Heat transfer coeff	38.1063	37.9747	37.8432	37.1855	37.0540	36.3963	36.3963	36.2647	36.6594	37.0540	37.3170	37.5801 (39)
Average = Sum(39)m / 12 =												37.1526
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7618	0.7592	0.7566	0.7434	0.7408	0.7276	0.7276	0.7250	0.7329	0.7408	0.7460	0.7513 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												1.6907 (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	22.7287	22.3911	21.9158	21.0393	20.3830	19.6553	19.2623	19.7343	20.2482	21.0269	21.9214	22.6518 (42b)
Hot water usage for other uses	31.9444	30.7827	29.6211	28.4595	27.2979	26.1363	26.1363	27.2979	28.4595	29.6211	30.7827	31.9444 (42c)
Average daily hot water use (litres/day)												50.1134 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	54.6730	53.1739	51.5369	49.4988	47.6810	45.7916	45.3986	47.0322	48.7078	50.6480	52.7041	54.5962 (44)
Energy conte	86.5887	75.7189	79.2103	67.7614	64.1877	56.3062	54.9056	58.2357	60.0615	68.7289	75.0867	85.4844 (45)
Energy content (annual)										Total = Sum(45)m =		832.2761
Distribution loss (46)m = 0.15 x (45)m	12.9883	11.3578	11.8815	10.1642	9.6282	8.4459	8.2358	8.7354	9.0092	10.3093	11.2630	12.8227 (46)
Water storage loss (or HIU loss):												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	141.8655	125.6463	134.4871	121.2551	119.4645	109.7998	110.1824	113.5125	113.5552	124.0057	128.5804	140.7612 (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	141.8655	125.6463	134.4871	121.2551	119.4645	109.7998	110.1824	113.5125	113.5552	124.0057	128.5804	140.7612 (64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1483.1159 (64)
Electric shower(s)	42.0972	37.5090	40.9584	39.0861	39.8195	37.9840	39.2501	39.8195	39.0861	40.9584	40.1882	42.0972 (64a)
Heat gains from water heating, kWh/month	83.5365	74.4957	80.7985	75.0971	75.5187	71.0127	72.2901	73.5397	72.5369	77.3134	77.8083	83.1693 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												478.8537 (64a)

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	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.7400	84.9622	76.7400	79.2980	76.7400	79.2980	76.7400	76.7400	79.2980	76.7400	79.2980	76.7400 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.2859	148.8143	144.9628	136.7636	126.4135	116.6859	110.1872	108.6589	112.5103	120.7096	131.0596	140.7872 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534 (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)	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276 (71)
Water heating gains (Table 5)	112.2802	110.8567	108.6001	104.3016	101.5037	98.6288	97.1641	98.8437	100.7457	103.9159	108.0671	111.7867 (72)
Total internal gains	384.6665	392.9935	378.6633	368.7235	353.0175	342.9730	332.4517	332.6029	340.9144	349.7258	366.7851	377.6743 (73)

6. Solar gains												
[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
Northwest	8.4300	11.2829	0.4000	0.7000	0.7700	18.4562 (81)						
Solar gains	18.4562	37.5680	67.6856	111.1593	149.4199	159.2974	149.0195	118.8000	82.4760	45.9111	23.2226	15.0722 (83)

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Total gains 403.1226 430.5615 446.3489 479.8828 502.4374 502.2704 481.4711 451.4029 423.3904 395.6369 390.0077 392.7466 (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	90.1160	90.4281	90.7424	92.3474	92.6752	94.3498	94.3498	94.6921	93.6728	92.6752	92.0219	91.3777
alpha	7.0077	7.0285	7.0495	7.1565	7.1783	7.2900	7.2900	7.3128	7.2449	7.1783	7.1348	7.0918
util living area	0.9847	0.9732	0.9463	0.8474	0.6708	0.4628	0.3325	0.3694	0.5916	0.8659	0.9640	0.9867 (86)
MIT	20.4424	20.5518	20.7055	20.8988	20.9823	20.9989	20.9999	20.9998	20.9942	20.8999	20.6666	20.4310 (87)
Th 2	20.2865	20.2888	20.2911	20.3026	20.3049	20.3165	20.3165	20.3188	20.3119	20.3049	20.3003	20.2957 (88)
util rest of house	0.9806	0.9664	0.9329	0.8168	0.6255	0.4138	0.2809	0.3148	0.5351	0.8320	0.9537	0.9831 (89)
MIT 2	19.7884	19.8967	20.0452	20.2278	20.2943	20.3160	20.3165	20.3187	20.3091	20.2338	20.0185	19.7852 (90)
Living area fraction	fLA = Living area / (4) = 0.4658 (91)											
MIT	20.0931	20.2019	20.3527	20.5403	20.6148	20.6341	20.6348	20.6360	20.6282	20.5441	20.3204	20.0860 (92)
Temperature adjustment	0.0000											
adjusted MIT	20.0931	20.2019	20.3527	20.5403	20.6148	20.6341	20.6348	20.6360	20.6282	20.5441	20.3204	20.0860 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9792	0.9654	0.9341	0.8277	0.6460	0.4367	0.3050	0.3402	0.5613	0.8443	0.9541	0.9818 (94)
Useful gains	394.7561	415.6591	416.9549	397.2064	324.5660	219.3223	146.8349	153.5794	237.6372	334.0467	372.0884	385.6099 (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	601.8144	581.0839	524.2316	432.8518	330.3273	219.6197	146.8527	153.6177	239.3206	368.4672	493.3461	596.9985 (97)
Space heating kWh	154.0513	111.1654	79.8139	25.6647	4.2864	0.0000	0.0000	0.0000	0.0000	25.6089	87.3056	157.2731 (98a)
Space heating requirement - total per year (kWh/year)	645.1693											
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	154.0513	111.1654	79.8139	25.6647	4.2864	0.0000	0.0000	0.0000	0.0000	25.6089	87.3056	157.2731 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	645.1693											
Space heating per m2	(98c) / (4) = 12.8982 (99)											

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)
Fraction of space heat from community system
Fraction of heat from community Heat pump-Space and Water
Factor for control and charging method (Table 4c(3)) for space heating
Factor for charging method (Table 4c(3)) for water heating
Distribution loss factor (Table 12c) for community heating system
Efficiency of secondary/supplementary heating system, %

0.0000 (301)
1.0000 (302)
1.0000 (303a)
1.0000 (305)
1.0000 (305a)
1.5000 (306)
0.0000 (208)

Space heating:

Space heating requirement	154.0513	111.1654	79.8139	25.6647	4.2864	0.0000	0.0000	0.0000	0.0000	25.6089	87.3056	157.2731 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	242.6308	175.0855	125.7068	40.4219	6.7511	0.0000	0.0000	0.0000	0.0000	40.3340	137.5063	247.7051
Space heating requirement	242.6308	175.0855	125.7068	40.4219	6.7511	0.0000	0.0000	0.0000	0.0000	40.3340	137.5063	247.7051 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)											
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating

Annual water heating requirement	141.8655	125.6463	134.4871	121.2551	119.4645	109.7998	110.1824	113.5125	113.5552	124.0057	128.5804	140.7612 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	212.7983	188.4695	201.7307	181.8827	179.1968	164.6997	165.2736	170.2687	170.3328	186.0086	192.8706	211.1419
Water heating fuel	212.7983	188.4695	201.7307	181.8827	179.1968	164.6997	165.2736	170.2687	170.3328	186.0086	192.8706	211.1419 (310)
Cooling System Energy Efficiency Ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	9.9771	9.0115	9.9771	9.6552	9.9771	9.6552	9.9771	9.9771	9.6552	9.9771	9.6552	9.9771 (331)
Lighting	15.9106	12.7641	11.4927	8.4200	6.5039	5.3137	5.9330	7.7120	10.0171	13.1430	14.8450	16.3529 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-12.4805	-20.8558	-35.8898	-46.8625	-55.3907	-53.6269	-52.8419	-47.2251	-37.6661	-26.2893	-14.6546	-10.3152 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												
Space heating fuel - secondary												
Water heating fuel - community heating												
Efficiency of water heater												
Electricity used for heat distribution												
Space cooling fuel												

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7700)
mechanical ventilation fans (SFP = 0.7700)

117.4720 (330a)
117.4720 (331)
128.4080 (332)

Total electricity for the above, kWh/year

Electricity for lighting (calculated in Appendix L)

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

PV generation

-414.0986 (333)

Wind generation

0.0000 (334)

Hydro-electric generation (Appendix N)

0.0000 (335a)

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Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	3551.4505 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			280.0000 (367)
Space and Water heating from Heat pump	1157.4341	0.1575	57.1757 (367)
Electrical energy for heat distribution (space & water)	10.1614	0.0000	4.7226 (372)
Overall CO2 factor for heat network			0.0535 (386)
Total CO2 associated with community systems			173.3861 (373)
Energy for instantaneous electric shower(s)	478.8537	0.1391	66.6191 (264a)
Space and water heating			173.3861 (376)
Pumps, fans and electric keep-hot	117.4720	0.1387	16.2948 (378)
Energy for lighting	128.4080	0.1443	18.5332 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-414.0986	0.1317	-54.5300
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-54.5300 (380)
Total CO2, kg/year			220.3033 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.4000 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	1157.4341	1.5833	574.5767 (467)
Electrical energy for heat distribution (space & water)	10.1614	0.0000	49.8770 (472)
Overall CO2 factor for heat network			0.5650 (486)
Total CO2 associated with community systems			1831.1985 (473)
Energy for instantaneous electric shower(s)	478.8537	1.5143	725.1445 (278a)
Space and water heating			1831.1985 (476)
Pumps, fans and electric keep-hot	117.4720	1.5128	177.7116 (478)
Energy for lighting	128.4080	1.5338	196.9565 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-414.0986	1.4865	-615.5654
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-615.5654 (480)
Total Primary energy kWh/year			2315.4457 (483)
Dwelling Primary energy Rate (DPER)			46.2900 (484)

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

1. Overall dwelling characteristics

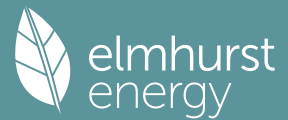
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	50.0200 (1b)	x 2.5000 (2b)	= 125.0500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	125.0500 (5)

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	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1599 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4099 (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) = 0.3484 (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	0.4443	0.4356	0.4268	0.3833	0.3746	0.3310	0.3310	0.3223	0.3484	0.3746	0.3920	0.4094 (22b)

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Effective ac 0.5987 0.5949 0.5911 0.5735 0.5702 0.5548 0.5548 0.5519 0.5607 0.5702 0.5768 0.5838 (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
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			8.4300	1.1450	9.6527		(27)
Ground Floor			50.0200	0.1300	6.5026		(28a)
External Wall	18.5300	8.4300	10.1000	0.1800	1.8180		(29a)
Communal Wall	11.2000	1.8900	9.3100	0.1800	1.6758		(29a)
Total net area of external elements Aum(A, m2)			79.7500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	21.5391		(33)
Main dwelling							
Party Wall			41.0700	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 247.1479 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	4.5200	0.0500	0.2260
E4 Jamb	13.5200	0.0500	0.6760
E5 Ground floor (normal)	11.8900	0.1600	1.9024
E7 Party floor between dwellings (in blocks of flats)	11.8900	0.0700	0.8323
E18 Party wall between dwellings	7.5000	0.0600	0.4500
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
P1 Party wall - Ground floor	16.4300	0.0800	1.3144
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.4300	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.5511 (36)

Point Thermal Bridges

Total fabric heat loss (33) + (36) + (36a) = 27.0902 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	24.7057	24.5476	24.3926	23.6645	23.5283	22.8942	22.8942	22.7767	23.1384	23.5283	23.8039	24.0920
Average = Sum(39)m / 12 =	51.7959	51.6378	51.4827	50.7547	50.6185	49.9843	49.9843	49.8669	50.2286	50.6185	50.8940	51.1821

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0355	1.0323	1.0292	1.0147	1.0120	0.9993	0.9993	0.9969	1.0042	1.0120	1.0175	1.0232
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6907 (42)

Hot water usage for mixer showers	52.5668	51.7768	50.6257	48.4231	46.7977	44.9851	43.9548	45.0972	46.3496	48.2958	50.5456	52.3654
Hot water usage for baths	22.7287	22.3911	21.9158	21.0393	20.3830	19.6553	19.2623	19.7343	20.2482	21.0269	21.9214	22.6518
Hot water usage for other uses	31.9444	30.7827	29.6211	28.4595	27.2979	26.1363	26.1363	27.2979	28.4595	29.6211	30.7827	31.9444
Average daily hot water use (litres/day)												98.5782

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	107.2398	104.9507	102.1626	97.9220	94.4787	90.7767	89.3534	92.1294	95.0573	98.9438	103.2498	106.9616
Energy content (annual)	169.8417	149.4484	157.0201	134.0503	127.1865	111.6206	108.0652	114.0755	117.2152	134.2658	147.0982	167.4760
Distribution loss (46)m = 0.15 x (45)m	25.4762	22.4173	23.5530	20.1075	19.0780	16.7431	16.2098	17.1113	17.5823	20.1399	22.0647	25.1214

Water storage loss (or HIU loss): 150.0000 (47)

Store volume 1.3938 (48)

a) If manufacturer declared loss factor is known (kWh/day): 0.5400 (49)

Temperature factor from Table 2b 0.7527 (55)

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

Total storage loss

23.3325 21.0745 23.3325 22.5798 23.3325 22.5798 23.3325 23.3325 22.5798 23.3325 22.5798 23.3325 (56)

If cylinder contains dedicated solar storage

23.3325 21.0745 23.3325 22.5798 23.3325 22.5798 23.3325 23.3325 22.5798 23.3325 22.5798 23.3325 (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

216.4366 191.5341 203.6150 179.1421 173.7814 156.7124 154.6601 160.6704 162.3070 180.8607 192.1901 214.0709 (62)

WWHRS -24.0313 -21.2535 -22.2555 -18.4284 -17.1746 -14.6964 -13.7756 -14.6489 -15.2055 -17.9256 -20.3075 -23.5863 (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 192.4052 170.2806 181.3595 160.7137 156.6068 142.0160 140.8845 146.0215 147.1015 162.9351 171.8825 190.4846 (64)

12Total per year (kWh/year) Total per year (kWh/year) = Sum(64)m = 1962.6915 (64)

Electric shower(s) 1963 (64)

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)

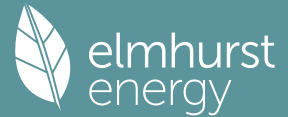
Heat gains from water heating, kWh/month Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

93.7483 83.3602 89.4851 80.6452 79.5654 73.1873 73.2076 75.2060 75.0475 81.9193 84.9836 92.9617 (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	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.7400	84.9622	76.7400	79.2980	76.7400	79.2980	76.7400	76.7400	79.2980	76.7400	79.2980	76.7400
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.2859	148.8143	144.9628	136.7636	126.4135	116.6859	110.1872	108.6589	112.5103	120.7096	131.0596	140.7872
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534
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
Losses e.g. evaporation (negative values) (Table 5)												

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Water heating gains (Table 5)	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276 (71)
Total internal gains	126.0057	124.0479	120.2757	112.0072	106.9428	101.6491	98.3973	101.0834	104.2327	110.1066	118.0328	124.9485 (72)
	401.3920	409.1846	393.3388	379.4291	361.4566	345.9933	333.6849	334.8426	344.4013	358.9165	379.7508	393.8361 (73)

6. Solar gains

[Jan]	Area			Solar flux		g	Specific data	FF	Access		Gains	
	m2			Table 6a		or Table 6b	or Table 6c		factor		W	
				W/m2					Table 6d			
Northwest	8.4300			11.2829		0.6300		0.7000	0.7700		29.0684 (81)	
Solar gains	29.0684	59.1697	106.6049	175.0759	235.3363	250.8934	234.7056	187.1101	129.8997	72.3100	36.5756	23.7388 (83)
Total gains	430.4604	468.3543	499.9437	554.5050	596.7929	596.8867	568.3905	521.9526	474.3011	431.2265	416.3264	417.5749 (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	66.2984	66.5014	66.7016	67.6585	67.8405	68.7012	68.7012	68.8630	68.3671	67.8405	67.4732	67.0934
alpha	5.4199	5.4334	5.4468	5.5106	5.5227	5.5801	5.5801	5.5909	5.5578	5.5227	5.4982	5.4729
util living area	0.9884	0.9802	0.9598	0.8861	0.7317	0.5282	0.3857	0.4370	0.6913	0.9174	0.9770	0.9900 (86)
MIT	20.0291	20.1771	20.4102	20.7277	20.9244	20.9897	20.9985	20.9971	20.9584	20.7097	20.3335	20.0115 (87)
Th 2	20.0539	20.0565	20.0590	20.0711	20.0734	20.0839	20.0839	20.0859	20.0799	20.0734	20.0688	20.0640 (88)
util rest of house	0.9850	0.9744	0.9479	0.8557	0.6754	0.4560	0.3061	0.3515	0.6140	0.8878	0.9692	0.9871 (89)
MIT 2	18.9427	19.1310	19.4228	19.8078	20.0142	20.0784	20.0835	20.0849	20.0538	19.7981	19.3391	18.9282 (90)
Living area fraction	19.4488	19.6183	19.8828	20.2363	20.4382	20.5029	20.5097	20.5098	20.4752	20.2228	19.8023	19.4328 (91)
MIT	19.4488	19.6183	19.8828	20.2363	20.4382	20.5029	20.5097	20.5098	20.4752	20.2228	19.8023	19.4328 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4488	19.6183	19.8828	20.2363	20.4382	20.5029	20.5097	20.5098	20.4752	20.2228	19.8023	19.4328 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9822	0.9711	0.9452	0.8616	0.6984	0.4894	0.3432	0.3914	0.6484	0.8932	0.9664	0.9845 (94)
Useful gains	422.7937	454.8030	472.5701	477.7580	416.8048	292.0964	195.0916	204.2735	307.5308	385.1908	402.3397	411.0992 (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	784.6436	760.0192	688.9815	575.3722	442.3130	295.0513	195.4236	204.9436	320.2155	487.0903	646.4711	779.6466 (97)
Space heating kWh	269.2164	205.1053	161.0100	70.2822	18.9781	0.0000	0.0000	0.0000	0.0000	75.8132	175.7746	274.1992 (98a)
Space heating requirement - total per year (kWh/year)												1250.3791
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	269.2164	205.1053	161.0100	70.2822	18.9781	0.0000	0.0000	0.0000	0.0000	75.8132	175.7746	274.1992 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1250.3791
Space heating per m2										(98c) / (4) =		24.9976 (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	269.2164	205.1053	161.0100	70.2822	18.9781	0.0000	0.0000	0.0000	0.0000	75.8132	175.7746	274.1992 (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)	291.6754	222.2159	174.4421	76.1454	20.5613	0.0000	0.0000	0.0000	0.0000	82.1379	190.4384	297.0739 (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	192.4052	170.2806	181.3595	160.7137	156.6068	142.0160	140.8845	146.0215	147.1015	162.9351	171.8825	190.4846 (64)
Efficiency of water heater	84.8131	84.4781	83.7939	82.3391	80.6839	79.8000	79.8000	79.8000	79.8000	82.4537	84.1101	84.8760 (216)
Fuel for water heating, kWh/month	226.8579	201.5676	216.4352	195.1853	194.0993	177.9649	176.5470	182.9843	184.3378	197.6081	204.3543	224.4268 (217)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and 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	15.9451	12.7917	11.5175	8.4382	6.5179	5.3252	5.9459	7.7287	10.0388	13.1714	14.8771	16.3882 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-13.5536	-20.1624	-30.5685	-36.3268	-40.9181	-38.8583	-38.4088	-35.4019	-30.3885	-23.9265	-15.2784	-11.5999 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

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Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-4.7561	-10.2378	-20.7819	-31.8508	-42.7322	-43.1411	-42.6097	-35.7738	-25.8413	-14.8225	-6.4097	-3.7423 (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	(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	(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	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1354.6902 (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												2382.3684 (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)												128.6858 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-618.0910 (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												3333.6534 (238)

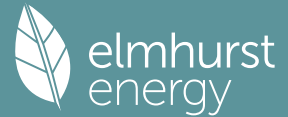
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1354.6902	0.2100	284.4849 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2382.3684	0.2100	500.2974 (264)
Space and water heating			784.7823 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	128.6858	0.1443	18.5733 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-335.3918	0.1335	-44.7587
PV Unit electricity exported	-282.6992	0.1253	-35.4284
Total			-80.1871 (269)
Total CO2, kg/year			735.0978 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.7000 (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	1354.6902	1.1300	1530.8000 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2382.3684	1.1300	2692.0763 (278)
Space and water heating			4222.8762 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	128.6858	1.5338	197.3825 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-335.3918	1.4932	-500.7908
PV Unit electricity exported	-282.6992	0.4600	-130.0390
Total			-630.8298 (283)
Total Primary energy kWh/year			3919.5297 (286)
Target Primary Energy Rate (TPER)			78.3600 (287)

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Plot Reference	B3.1-3.3 1B2P Ground				Issued on Date	19/12/2025	
Assessment Reference	1B2P			Plot Type Ref	1B2P		
Plot Address					SAP Version	10.2	
SAP Rating	79 C		DER	4.40		TER	14.70
Environmental	97 A		% DER < TER				70.07
CO ₂ Emissions (t/year)	0.19		DFEE	31.90		TFEE	33.83
Compliance Check	See BREL		% DFEE < TFEE				5.70
% DPER < TPER	40.93		DPER	46.29		TPER	78.36
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	50.0200 (1b)	2.5000 (2b)	125.0500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.0500 (5)

2. Ventilation rate

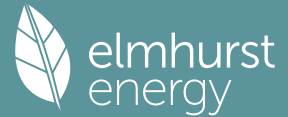
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1599 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.3099 (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) = 0.2634 (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	0.3359	0.3293	0.3227	0.2898	0.2832	0.2503	0.2503	0.2437	0.2634	0.2832	0.2964	0.3095 (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	0.5564	0.5542	0.5521	0.5420	0.5401	0.5313	0.5313	0.5297	0.5347	0.5401	0.5439	0.5479 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			8.4300	0.9615	8.1058		(27)
Ground Floor			50.0200	0.1300	6.5026	110.0000	5502.2000 (28a)
External Wall	18.5300	8.4300	10.1000	0.1600	1.6160	14.0000	141.4000 (29a)
Communal Wall	11.2000	1.8900	9.3100	0.2100	1.9551	14.0000	130.3400 (29a)
Total net area of external elements Aum(A, m ²)			79.7500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	20.0695	(33)
Main dwelling							
Party Wall			41.0700	0.0000	0.0000	20.0000	821.4000 (32)
Party Ceiling			50.0200			100.0000	5002.0000 (32b)
Stud			85.0000			9.0000	765.0000 (32c)
Heat capacity Cm = Sum (A x k)							(28)...(30) + (32) + (32a)...(32e) =
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							12362.3400 (34)
List of Thermal Bridges							247.1479 (35)
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				4.5200	0.0500	0.2260	
E4 Jamb				13.5200	0.0500	0.6760	

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E5 Ground floor (normal)	11.8900	0.1600	1.9024
E7 Party floor between dwellings (in blocks of flats)	11.8900	0.0700	0.8323
E18 Party wall between dwellings	7.5000	0.0600	0.4500
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
P1 Party wall - Ground floor	16.4300	0.0800	1.3144
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.4300	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.5511 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	25.6206 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	22.9612	22.8708	22.7822	22.3660	22.2881	21.9256	21.9256	21.8585	22.0653	22.2881	22.4457	22.6103 (38)
Average = Sum(39)m / 12 =	48.5817	48.4914	48.4027	47.9866	47.9087	47.5462	47.5462	47.4791	47.6858	47.9087	48.0662	48.2309 (39)
												47.9862
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9712	0.9694	0.9677	0.9593	0.9578	0.9505	0.9505	0.9492	0.9533	0.9578	0.9609	0.9642 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												1.6907 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths												22.7287 (42b)
Hot water usage for other uses												31.9444 (42c)
Average daily hot water use (litres/day)												50.1134 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	54.6730	53.1739	51.5369	49.4988	47.6810	45.7916	45.3986	47.0322	48.7078	50.6480	52.7041	54.5962 (44)
Energy content (annual)	86.5887	75.7189	79.2103	67.7614	64.1877	56.3062	54.9056	58.2357	60.0615	68.7289	75.0867	85.4844 (45)
Distribution loss												832.2761
Water storage loss (or HIU loss):												0.0000 (46)
Total storage loss												0.0000 (56)
If cylinder contains dedicated solar storage												0.0000 (57)
Primary loss												0.0000 (59)
Combi loss												0.0000 (61)
Total heat required for water heating calculated for each month												
WWHRS	73.6004	64.3610	67.3288	57.5972	54.5596	47.8602	46.6698	49.5003	51.0523	58.4196	63.8237	72.6618 (62)
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 (63a)
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 (63b)
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 (63c)
Output from w/h	73.6004	64.3610	67.3288	57.5972	54.5596	47.8602	46.6698	49.5003	51.0523	58.4196	63.8237	72.6618 (64)
12Total per year (kWh/year)												707.4347 (64)
Electric shower(s)	42.0972	37.5090	40.9584	39.0861	39.8195	37.9840	39.2501	39.8195	39.0861	40.9584	40.1882	42.0972 (64a)
Heat gains from water heating, kWh/month	28.9244	25.4675	27.0718	24.1708	23.5948	21.4610	21.4800	22.3300	22.5346	24.8445	26.0030	28.6898 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	76.7400	84.9622	76.7400	79.2980	76.7400	79.2980	76.7400	76.7400	79.2980	76.7400	79.2980	76.7400 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	147.2859	148.8143	144.9628	136.7636	126.4135	116.6859	110.1872	108.6589	112.5103	120.7096	131.0596	140.7872 (68)
Pumps, fans	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276 (71)
Total internal gains	38.8769	37.8981	36.3868	33.5706	31.7134	29.8070	28.8709	30.0134	31.2980	33.3931	36.1152	38.5615 (72)
	311.2631	320.0348	306.4500	297.9925	283.2273	274.1512	264.1585	263.7726	271.4667	279.2030	294.8332	304.4491 (73)

6. Solar gains												
[Jan]												
	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
Northwest	8.4300	11.2829	0.4000	0.7000	0.7700	18.4562 (81)						
Solar gains	18.4562	37.5680	67.6856	111.1593	149.4199	159.2974	149.0195	118.8000	82.4760	45.9111	23.2226	15.0722 (83)
Total gains	329.7193	357.6029	374.1356	409.1518	432.6471	433.4486	413.1780	382.5726	353.9427	325.1141	318.0559	319.5213 (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)												

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	70.6846	70.8164	70.9460	71.5613	71.6777	72.2241	72.2241	72.3262	72.0126	71.6777	71.4428	71.1988
alpha	5.7123	5.7211	5.7297	5.7708	5.7785	5.8149	5.8149	5.8217	5.8008	5.7785	5.7629	5.7466
util living area	0.9965	0.9937	0.9871	0.9568	0.8647	0.6727	0.5015	0.5613	0.8201	0.9688	0.9927	0.9971 (86)
MIT	19.9206	20.0486	20.2559	20.5761	20.8398	20.9714	20.9955	20.9918	20.9130	20.5891	20.2105	19.8991 (87)
Th 2	20.1074	20.1089	20.1104	20.1173	20.1187	20.1248	20.1248	20.1259	20.1224	20.1187	20.1160	20.1132 (88)
util rest of house	0.9954	0.9917	0.9827	0.9416	0.8210	0.5926	0.4043	0.4596	0.7514	0.9548	0.9899	0.9962 (89)
MIT 2	19.1241	19.2525	19.4590	19.7744	20.0107	20.1117	20.1236	20.1235	20.0747	19.7922	19.4197	19.1075 (90)
Living area fraction	19.4951	19.6233	19.8302	20.1478	20.3970	20.5122	20.5297	20.5279	20.4652	20.1634	19.7881	19.4762 (91)
MIT	19.4951	19.6233	19.8302	20.1478	20.3970	20.5122	20.5297	20.5279	20.4652	20.1634	19.7881	19.4762 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4951	19.6233	19.8302	20.1478	20.3970	20.5122	20.5297	20.5279	20.4652	20.1634	19.7881	19.4762 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9944	0.9904	0.9810	0.9422	0.8360	0.6291	0.4497	0.5072	0.7803	0.9557	0.9886	0.9953 (94)
Useful gains	327.8845	354.1520	367.0308	385.5130	361.6741	272.6982	185.8259	194.0235	276.1824	310.7010	314.4386	318.0285 (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	738.2044	713.9543	645.2195	539.7447	416.6597	281.1011	186.8443	195.9907	303.5314	458.1720	609.8679	736.7860 (97)
Space heating kWh	305.2780	241.7871	206.9724	111.0468	40.9093	0.0000	0.0000	0.0000	0.0000	109.7184	212.7091	311.5556 (98a)
Space heating requirement - total per year (kWh/year)												1539.9767
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	305.2780	241.7871	206.9724	111.0468	40.9093	0.0000	0.0000	0.0000	0.0000	109.7184	212.7091	311.5556 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1539.9767
Space heating per m2												30.7872 (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	446.9345	351.8420	360.8411	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8800	0.9387	0.9106	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	393.2805	330.2789	328.5842	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	477.5199	455.4119	421.1272	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	60.6524	93.0990	68.8520	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			0.0000 (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	15.1631	23.2747	17.2130	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												55.6508 (107)
Energy for space heating												30.7872 (99)
Energy for space cooling												1.1126 (108)
Total												31.8998 (109)
Fabric Energy Efficiency (DFEE)												31.9 (109)

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

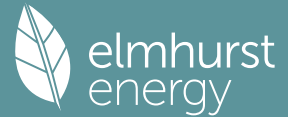
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	50.0200	2.5000	125.0500
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0200		
Dwelling volume			125.0500

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	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	20.0000 / (5) = 0.1599 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4099 (18)

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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) = 0.3484 (21)

Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.4443	0.4356	0.4268	0.3833	0.3746	0.3310	0.3310	0.3223	0.3484	0.3746	0.3920	0.4094 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.5987	0.5949	0.5911	0.5735	0.5702	0.5548	0.5548	0.5519	0.5607	0.5702	0.5768	0.5838 (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
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			8.4300	1.1450	9.6527		(27)
Ground Floor			50.0200	0.1300	6.5026		(28a)
External Wall	18.5300	8.4300	10.1000	0.1800	1.8180		(29a)
Communal Wall	11.2000	1.8900	9.3100	0.1800	1.6758		(29a)
Total net area of external elements Aum(A, m2)							
Fabric heat loss, W/K = Sum (A x U)							
(26)...(30) + (32) =							
21.5391							
Main dwelling							
Party Wall			41.0700	0.0000	0.0000		(32)

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

247.1479 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	4.5200	0.0500	0.2260
E2 Other lintels (including other steel lintels)	13.5200	0.0500	0.6760
E4 Jamb	11.8900	0.1600	1.9024
E5 Ground floor (normal)	11.8900	0.0700	0.8323
E7 Party floor between dwellings (in blocks of flats)	7.5000	0.0600	0.4500
E18 Party wall between dwellings	2.5000	0.0600	0.1500
E25 Staggered party wall between dwellings	16.4300	0.0800	1.3144
P1 Party wall - Ground floor	16.4300	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			
(36a) =			
0.0000			
Point Thermal bridges			
(33) + (36) + (36a) =			
27.0902 (37)			
Total fabric heat loss			

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

(38)m	Jan 24.7057	Feb 24.5476	Mar 24.3926	Apr 23.6645	May 23.5283	Jun 22.8942	Jul 22.8942	Aug 22.7767	Sep 23.1384	Oct 23.5283	Nov 23.8039	Dec 24.0920 (38)
Heat transfer coeff	51.7959	51.6378	51.4827	50.7547	50.6185	49.9843	49.9843	49.8669	50.2286	50.6185	50.8940	51.1821 (39)
Average = Sum(39)m / 12 =												
50.7540												
HLP	Jan 1.0355	Feb 1.0323	Mar 1.0292	Apr 1.0147	May 1.0120	Jun 0.9993	Jul 0.9993	Aug 0.9969	Sep 1.0042	Oct 1.0120	Nov 1.0175	Dec 1.0232 (40)
HLP (average)												1.0147
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

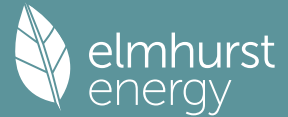
4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6907 (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	0.0000 (42a)
Hot water usage for baths	22.7287	22.3911	21.9158	21.0393	20.3830	19.6553	19.2623	19.7343	20.2482	21.0269	21.9214	22.6518 (42b)
Hot water usage for other uses	31.9444	30.7827	29.6211	28.4595	27.2979	26.1363	26.1363	27.2979	28.4595	29.6211	30.7827	31.9444 (42c)
Average daily hot water use (litres/day)												
50.1134 (43)												
Daily hot water use	Jan 54.6730	Feb 53.1739	Mar 51.5369	Apr 49.4988	May 47.6810	Jun 45.7916	Jul 45.3986	Aug 47.0322	Sep 48.7078	Oct 50.6480	Nov 52.7041	Dec 54.5962 (44)
Energy conte	86.5887	75.7189	79.2103	67.7614	64.1877	56.3062	54.9056	58.2357	60.0615	68.7289	75.0867	85.4844 (45)
Energy content (annual)												
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 (or HIU 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	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												
73.6004	64.3610	67.3288	57.5972	54.5596	47.8602	46.6698	49.5003	51.0523	58.4196	63.8237	72.6618	(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	73.6004	64.3610	67.3288	57.5972	54.5596	47.8602	46.6698	49.5003	51.0523	58.4196	63.8237	72.6618 (64)
Total per year (kWh/year) = Sum(64)m =												
707.4347 (64)												
12Total per year (kWh/year)												
Electric shower(s)	42.0972	37.5090	40.9584	39.0861	39.8195	37.9840	39.2501	39.8195	39.0861	40.9584	40.1882	42.0972 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												
478.8537 (64a)												
Heat gains from water heating, kWh/month	28.9244	25.4675	27.0718	24.1708	23.5948	21.4610	21.4800	22.3300	22.5346	24.8445	26.0030	28.6898 (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
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(66)m	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.7400	84.9622	76.7400	79.2980	76.7400	79.2980	76.7400	76.7400	79.2980	76.7400	79.2980	76.7400	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.2859	148.8143	144.9628	136.7636	126.4135	116.6859	110.1872	108.6589	112.5103	120.7096	131.0596	140.7872	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	(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)	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	(71)
Water heating gains (Table 5)	38.8769	37.8981	36.3868	33.5706	31.7134	29.8070	28.8709	30.0134	31.2980	33.3931	36.1152	38.5615	(72)
Total internal gains	311.2631	320.0348	306.4500	297.9925	283.2273	274.1512	264.1585	263.7726	271.4667	279.2030	294.8332	304.4491	(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
Northwest				8.4300	11.2829	0.6300	0.7000			0.7700			29.0684 (81)
Solar gains	29.0684	59.1697	106.6049	175.0759	235.3363	250.8934	234.7056	187.1101	129.8997	72.3100	36.5756	23.7388	(83)
Total gains	340.3316	379.2045	413.0549	473.0684	518.5636	525.0446	498.8642	450.8827	401.3664	351.5130	331.4089	328.1878	(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	66.2984	66.5014	66.7016	67.6585	67.8405	68.7012	68.7012	68.8630	68.3671	67.8405	67.4732	67.0934		
alpha	5.4199	5.4334	5.4468	5.5106	5.5227	5.5801	5.5801	5.5909	5.5578	5.5227	5.4982	5.4729		
util living area	0.9961	0.9923	0.9818	0.9333	0.8030	0.5937	0.4383	0.5030	0.7791	0.9615	0.9917	0.9968	(86)	
MIT	19.8381	19.9941	20.2459	20.6172	20.8794	20.9818	20.9972	20.9942	20.9248	20.5819	20.1604	19.8205	(87)	
Th 2	20.0539	20.0565	20.0590	20.0711	20.0734	20.0839	20.0839	20.0859	20.0799	20.0734	20.0688	20.0640	(88)	
util rest of house	0.9949	0.9898	0.9757	0.9118	0.7504	0.5153	0.3484	0.4060	0.7041	0.9447	0.9886	0.9958	(89)	
MIT 2	18.9993	19.1562	19.4065	19.7703	19.9963	20.0761	20.0832	20.0843	20.0404	19.7462	19.3320	18.9898	(90)	
Living area fraction									fLA = Living area / (4) =			0.4658	(91)	
MIT	19.3900	19.5465	19.7975	20.1648	20.4076	20.4980	20.5089	20.5081	20.4524	20.1354	19.7179	19.3767	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.3900	19.5465	19.7975	20.1648	20.4076	20.4980	20.5089	20.5081	20.4524	20.1354	19.7179	19.3767	(93)	

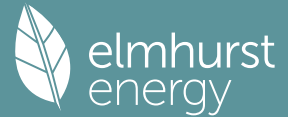
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	338.2001	374.7099	402.1832	432.5103	399.5411	289.5255	194.7485	203.4942	295.5783	332.5351	327.1282	326.4837	(94)	
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	(95)	
Heat loss rate W	781.5993	756.3125	684.5938	571.7402	440.7675	294.8059	195.3859	204.8598	319.0704	482.6696	642.1757	776.7783	(97)	
Space heating kWh	329.8891	256.4370	210.1134	100.2455	30.6725	0.0000	0.0000	0.0000	0.0000	111.7001	226.8342	335.0192	(98a)	
Space heating requirement - total per year (kWh/year)												1600.9109		
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	329.8891	256.4370	210.1134	100.2455	30.6725	0.0000	0.0000	0.0000	0.0000	111.7001	226.8342	335.0192	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1600.9109		
Space heating per m2										(98c) / (4) =		32.0054	(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	469.8528	369.8841	378.9885	0.0000	0.0000	0.0000	0.0000	(100)	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9239	0.9629	0.9392	0.0000	0.0000	0.0000	0.0000	(101)	
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	434.1176	356.1683	355.9339	0.0000	0.0000	0.0000	0.0000	(102)	
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	584.5801	555.5646	500.9701	0.0000	0.0000	0.0000	0.0000	(103)	
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	108.3330	148.3508	107.9069	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	27.0832	37.0877	26.9767	0.0000	0.0000	0.0000	0.0000	(107)	
Space cooling requirement												91.1477	(107)	
Energy for space heating												32.0054	(99)	
Energy for space cooling												1.8222	(108)	
Total												33.8276	(109)	
Fabric Energy Efficiency (TFEE)												33.8	(109)	

Full SAP Calculation Printout



Plot Reference	B3.1-3.3 1B2P Ground				Issued on Date	19/12/2025	
Assessment Reference	1B2P			Plot Type Ref	1B2P		
Plot Address					SAP Version	10.2	
SAP Rating	79 C		DER	4.40		TER	14.70
Environmental	97 A		% DER < TER				70.07
CO ₂ Emissions (t/year)	0.19		DFEE	31.90		TFEE	33.83
Compliance Check	See BREL		% DFEE < TFEE				5.70
% DPER < TPER	40.93		DPER	46.29		TPER	78.36
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	50.0200 (1b)	2.5000 (2b)	125.0500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0200		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.0500 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000 (23c)
Effective ac	0.3026	0.2994	0.2962	0.2802	0.2771	0.2611	0.2611	0.2579	0.2675	0.2771	0.2834	0.2898 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			8.4300	0.9615	8.1058		(27)
Ground Floor			50.0200	0.1300	6.5026	110.0000	5502.2000 (28a)
External Wall	18.5300	8.4300	10.1000	0.1600	1.6160	14.0000	141.4000 (29a)
Communal Wall	11.2000	1.8900	9.3100	0.2100	1.9551	14.0000	130.3400 (29a)
Total net area of external elements Aum(A, m ²)			79.7500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.0695		(33)
Main dwelling							
Party Wall			41.0700	0.0000	0.0000	20.0000	821.4000 (32)
Party Ceiling			50.0200			100.0000	5002.0000 (32b)
Stud			85.0000			9.0000	765.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	12362.3400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							247.1479 (35)
List of Thermal Bridges							

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K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	4.5200	0.0500	0.2260
E4 Jamb	13.5200	0.0500	0.6760
E5 Ground floor (normal)	11.8900	0.1600	1.9024
E7 Party floor between dwellings (in blocks of flats)	11.8900	0.0700	0.8323
E18 Party wall between dwellings	7.5000	0.0600	0.4500
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
P1 Party wall - Ground floor	16.4300	0.0800	1.3144
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.4300	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.5511 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	25.6206 (37)

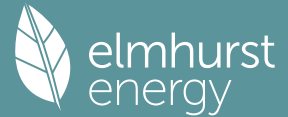
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	12.4857	12.3542	12.2226	11.5649	11.4334	10.7757	10.7757	10.6442	11.0388	11.4334	11.6965	11.9595 (38)
Heat transfer coeff	38.1063	37.9747	37.8432	37.1855	37.0540	36.3963	36.3963	36.2647	36.6594	37.0540	37.3170	37.5801 (39)
Average = Sum(39)m / 12 =												37.1526
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7618	0.7592	0.7566	0.7434	0.7408	0.7276	0.7276	0.7250	0.7329	0.7408	0.7460	0.7513 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												1.6907 (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	22.7287	22.3911	21.9158	21.0393	20.3830	19.6553	19.2623	19.7343	20.2482	21.0269	21.9214	22.6518 (42b)
Hot water usage for other uses	31.9444	30.7827	29.6211	28.4595	27.2979	26.1363	26.1363	27.2979	28.4595	29.6211	30.7827	31.9444 (42c)
Average daily hot water use (litres/day)												50.1134 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	54.6730	53.1739	51.5369	49.4988	47.6810	45.7916	45.3986	47.0322	48.7078	50.6480	52.7041	54.5962 (44)
Energy conte	86.5887	75.7189	79.2103	67.7614	64.1877	56.3062	54.9056	58.2357	60.0615	68.7289	75.0867	85.4844 (45)
Energy content (annual)										Total = Sum(45)m =		832.2761
Distribution loss (46)m = 0.15 x (45)m	12.9883	11.3578	11.8815	10.1642	9.6282	8.4459	8.2358	8.7354	9.0092	10.3093	11.2630	12.8227 (46)
Water storage loss (or HIU loss):												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	141.8655	125.6463	134.4871	121.2551	119.4645	109.7998	110.1824	113.5125	113.5552	124.0057	128.5804	140.7612 (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	141.8655	125.6463	134.4871	121.2551	119.4645	109.7998	110.1824	113.5125	113.5552	124.0057	128.5804	140.7612 (64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1483.1159 (64)
Electric shower(s)	42.0972	37.5090	40.9584	39.0861	39.8195	37.9840	39.2501	39.8195	39.0861	40.9584	40.1882	42.0972 (64a)
Heat gains from water heating, kWh/month	83.5365	74.4957	80.7985	75.0971	75.5187	71.0127	72.2901	73.5397	72.5369	77.3134	77.8083	83.1693 (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	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.7400	84.9622	76.7400	79.2980	76.7400	79.2980	76.7400	76.7400	79.2980	76.7400	79.2980	76.7400 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.2859	148.8143	144.9628	136.7636	126.4135	116.6859	110.1872	108.6589	112.5103	120.7096	131.0596	140.7872 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534 (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)	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276 (71)
Water heating gains (Table 5)	112.2802	110.8567	108.6001	104.3016	101.5037	98.6288	97.1641	98.8437	100.7457	103.9159	108.0671	111.7867 (72)
Total internal gains	384.6665	392.9935	378.6633	368.7235	353.0175	342.9730	332.4517	332.6029	340.9144	349.7258	366.7851	377.6743 (73)

6. Solar gains												
[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
Northwest	8.4300	11.2829	0.4000	0.7000	0.7700	18.4562 (81)						
Solar gains	18.4562	37.5680	67.6856	111.1593	149.4199	159.2974	149.0195	118.8000	82.4760	45.9111	23.2226	15.0722 (83)

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Total gains 403.1226 430.5615 446.3489 479.8828 502.4374 502.2704 481.4711 451.4029 423.3904 395.6369 390.0077 392.7466 (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	90.1160	90.4281	90.7424	92.3474	92.6752	94.3498	94.3498	94.6921	93.6728	92.6752	92.0219	91.3777
alpha	7.0077	7.0285	7.0495	7.1565	7.1783	7.2900	7.2900	7.3128	7.2449	7.1783	7.1348	7.0918
util living area	0.9847	0.9732	0.9463	0.8474	0.6708	0.4628	0.3325	0.3694	0.5916	0.8659	0.9640	0.9867 (86)
MIT	20.4424	20.5518	20.7055	20.8988	20.9823	20.9989	20.9999	20.9998	20.9942	20.8999	20.6666	20.4310 (87)
Th 2	20.2865	20.2888	20.2911	20.3026	20.3049	20.3165	20.3165	20.3188	20.3119	20.3049	20.3003	20.2957 (88)
util rest of house	0.9806	0.9664	0.9329	0.8168	0.6255	0.4138	0.2809	0.3148	0.5351	0.8320	0.9537	0.9831 (89)
MIT 2	19.7884	19.8967	20.0452	20.2278	20.2943	20.3160	20.3165	20.3187	20.3091	20.2338	20.0185	19.7852 (90)
Living area fraction	fLA = Living area / (4) = 0.4658 (91)											
MIT	20.0931	20.2019	20.3527	20.5403	20.6148	20.6341	20.6348	20.6360	20.6282	20.5441	20.3204	20.0860 (92)
Temperature adjustment	0.0000											
adjusted MIT	20.0931	20.2019	20.3527	20.5403	20.6148	20.6341	20.6348	20.6360	20.6282	20.5441	20.3204	20.0860 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9792	0.9654	0.9341	0.8277	0.6460	0.4367	0.3050	0.3402	0.5613	0.8443	0.9541	0.9818 (94)
Useful gains	394.7561	415.6591	416.9549	397.2064	324.5660	219.3223	146.8349	153.5794	237.6372	334.0467	372.0884	385.6099 (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	601.8144	581.0839	524.2316	432.8518	330.3273	219.6197	146.8527	153.6177	239.3206	368.4672	493.3461	596.9985 (97)
Space heating kWh	154.0513	111.1654	79.8139	25.6647	4.2864	0.0000	0.0000	0.0000	0.0000	25.6089	87.3056	157.2731 (98a)
Space heating requirement - total per year (kWh/year)	645.1693											
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	154.0513	111.1654	79.8139	25.6647	4.2864	0.0000	0.0000	0.0000	0.0000	25.6089	87.3056	157.2731 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	645.1693											
Space heating per m2	(98c) / (4) = 12.8982 (99)											

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)
Fraction of space heat from community system
Fraction of heat from community Heat pump-Space and Water
Factor for control and charging method (Table 4c(3)) for space heating
Factor for charging method (Table 4c(3)) for water heating
Distribution loss factor (Table 12c) for community heating system
Efficiency of secondary/supplementary heating system, %

0.0000 (301)
1.0000 (302)
1.0000 (303a)
1.0000 (305)
1.0000 (305a)
1.5000 (306)
0.0000 (208)

Space heating:

Space heating requirement	154.0513	111.1654	79.8139	25.6647	4.2864	0.0000	0.0000	0.0000	0.0000	25.6089	87.3056	157.2731 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	242.6308	175.0855	125.7068	40.4219	6.7511	0.0000	0.0000	0.0000	0.0000	40.3340	137.5063	247.7051
Space heating requirement	242.6308	175.0855	125.7068	40.4219	6.7511	0.0000	0.0000	0.0000	0.0000	40.3340	137.5063	247.7051 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)											
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating

Annual water heating requirement	141.8655	125.6463	134.4871	121.2551	119.4645	109.7998	110.1824	113.5125	113.5552	124.0057	128.5804	140.7612 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	212.7983	188.4695	201.7307	181.8827	179.1968	164.6997	165.2736	170.2687	170.3328	186.0086	192.8706	211.1419
Water heating fuel	212.7983	188.4695	201.7307	181.8827	179.1968	164.6997	165.2736	170.2687	170.3328	186.0086	192.8706	211.1419 (310)

Cooling System Energy Efficiency Ratio

Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (314)
Pumps and Fa	9.9771	9.0115	9.9771	9.6552	9.9771	9.6552	9.9771	9.9771	9.6552	9.9771	9.6552	9.9771 (315)
Lighting	15.9106	12.7641	11.4927	8.4200	6.5039	5.3137	5.9330	7.7120	10.0171	13.1430	14.8450	16.3529 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-12.4805	-20.8558	-35.8898	-46.8625	-55.3907	-53.6269	-52.8419	-47.2251	-37.6661	-26.2893	-14.6546	-10.3152 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												
Space heating fuel - secondary												
Water heating fuel - community heating												
Efficiency of water heater												
Electricity used for heat distribution												
Space cooling fuel												

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7700)
mechanical ventilation fans (SFP = 0.7700)

117.4720 (330a)
117.4720 (331)
128.4080 (332)

Total electricity for the above, kWh/year

Electricity for lighting (calculated in Appendix L)

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

PV generation	-414.0986 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)

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Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	3551.4505 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			280.0000 (367)
Space and Water heating from Heat pump	1157.4341	0.1575	57.1757 (367)
Electrical energy for heat distribution (space & water)	10.1614	0.0000	4.7226 (372)
Overall CO2 factor for heat network			0.0535 (386)
Total CO2 associated with community systems			173.3861 (373)
Energy for instantaneous electric shower(s)	478.8537	0.1391	66.6191 (264a)
Space and water heating			173.3861 (376)
Pumps, fans and electric keep-hot	117.4720	0.1387	16.2948 (378)
Energy for lighting	128.4080	0.1443	18.5332 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-414.0986	0.1317	-54.5300
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-54.5300 (380)
Total CO2, kg/year			220.3033 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.4000 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	1157.4341	1.5833	574.5767 (467)
Electrical energy for heat distribution (space & water)	10.1614	0.0000	49.8770 (472)
Overall CO2 factor for heat network			0.5650 (486)
Total CO2 associated with community systems			1831.1985 (473)
Energy for instantaneous electric shower(s)	478.8537	1.5143	725.1445 (278a)
Space and water heating			1831.1985 (476)
Pumps, fans and electric keep-hot	117.4720	1.5128	177.7116 (478)
Energy for lighting	128.4080	1.5338	196.9565 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-414.0986	1.4865	-615.5654
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-615.5654 (480)
Total Primary energy kWh/year			2315.4457 (483)
Dwelling Primary energy Rate (DPER)			46.2900 (484)

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

1. Overall dwelling characteristics

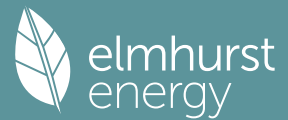
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	50.0200 (1b)	2.5000 (2b)	125.0500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	125.0500 (5)

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	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1599 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4099 (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) = 0.3484 (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	0.4443	0.4356	0.4268	0.3833	0.3746	0.3310	0.3310	0.3223	0.3484	0.3746	0.3920	0.4094 (22b)

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Effective ac 0.5987 0.5949 0.5911 0.5735 0.5702 0.5548 0.5548 0.5519 0.5607 0.5702 0.5768 0.5838 (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	
Main dwelling								
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type			8.4300	1.1450	9.6527			(27)
Ground Floor			50.0200	0.1300	6.5026			(28a)
External Wall	18.5300	8.4300	10.1000	0.1800	1.8180			(29a)
Communal Wall	11.2000	1.8900	9.3100	0.1800	1.6758			(29a)
Total net area of external elements Aum(A, m2)			79.7500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	21.5391			(33)
Main dwelling								
Party Wall			41.0700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 247.1479 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	4.5200	0.0500	0.2260	
E4 Jamb	13.5200	0.0500	0.6760	
E5 Ground floor (normal)	11.8900	0.1600	1.9024	
E7 Party floor between dwellings (in blocks of flats)	11.8900	0.0700	0.8323	
E18 Party wall between dwellings	7.5000	0.0600	0.4500	
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500	
P1 Party wall - Ground floor	16.4300	0.0800	1.3144	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.4300	0.0000	0.0000	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.5511 (36)

Point Thermal Bridges

Total fabric heat loss (33) + (36) + (36a) = 27.0902 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	24.7057	24.5476	24.3926	23.6645	23.5283	22.8942	22.8942	22.7767	23.1384	23.5283	23.8039	24.0920	(38)
Average = Sum(39)m / 12 =	51.7959	51.6378	51.4827	50.7547	50.6185	49.9843	49.9843	49.8669	50.2286	50.6185	50.8940	51.1821	(39)
												50.7540	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0355	1.0323	1.0292	1.0147	1.0120	0.9993	0.9993	0.9969	1.0042	1.0120	1.0175	1.0232	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6907 (42)

Hot water usage for mixer showers 52.5668 51.7768 50.6257 48.4231 46.7977 44.9851 43.9548 45.0972 46.3496 48.2958 50.5456 52.3654 (42a)

Hot water usage for baths 22.7287 22.3911 21.9158 21.0393 20.3830 19.6553 19.2623 19.7343 20.2482 21.0269 21.9214 22.6518 (42b)

Hot water usage for other uses 31.9444 30.7827 29.6211 28.4595 27.2979 26.1363 26.1363 27.2979 28.4595 29.6211 30.7827 31.9444 (42c)

Average daily hot water use (litres/day) 98.5782 (43)

Daily hot water use 107.2398 104.9507 102.1626 97.9220 94.4787 90.7767 89.3534 92.1294 95.0573 98.9438 103.2498 106.9616 (44)

Energy conte 169.8417 149.4484 157.0201 134.0503 127.1865 111.6206 108.0652 114.0755 117.2152 134.2658 147.0982 167.4760 (45)

Energy content (annual) 1637.3633

Distribution loss (46)m = 0.15 x (45)m 25.4762 22.4173 23.5530 20.1075 19.0780 16.7431 16.2098 17.1113 17.5823 20.1399 22.0647 25.1214 (46)

Water storage loss (or HIU loss): 150.0000 (47)

Store volume 1.3938 (48)

a) If manufacturer declared loss factor is known (kWh/day): 0.5400 (49)

Temperature factor from Table 2b 0.7527 (55)

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

Total storage loss 23.3325 21.0745 23.3325 22.5798 23.3325 22.5798 23.3325 23.3325 22.5798 23.3325 22.5798 23.3325 (56)

If cylinder contains dedicated solar storage 23.3325 21.0745 23.3325 22.5798 23.3325 22.5798 23.3325 23.3325 22.5798 23.3325 22.5798 23.3325 (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 216.4366 191.5341 203.6150 179.1421 173.7814 156.7124 154.6601 160.6704 162.3070 180.8607 192.1901 214.0709 (62)

WWHRS -24.0313 -21.2535 -22.2555 -18.4284 -17.1746 -14.6964 -13.7756 -14.6489 -15.2055 -17.9256 -20.3075 -23.5863 (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 192.4052 170.2806 181.3595 160.7137 156.6068 142.0160 140.8845 146.0215 147.1015 162.9351 171.8825 190.4846 (64)

Total per year (kWh/year) = Sum(64)m = 1962.6915 (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)

Heat gains from water heating, kWh/month 93.7483 83.3602 89.4851 80.6452 79.5654 73.1873 73.2076 75.2060 75.0475 81.9193 84.9836 92.9617 (65)

12Total per year (kWh/year) 1963 (64)

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

Metabolic gains (Table 5), Watts

(66)m 84.5345 84.5345 84.5345 84.5345 84.5345 84.5345 84.5345 84.5345 84.5345 84.5345 84.5345 84.5345 (66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 76.7400 84.9622 76.7400 79.2980 76.7400 79.2980 76.7400 76.7400 79.2980 76.7400 79.2980 76.7400 (67)

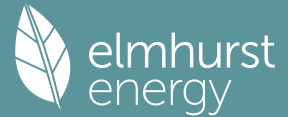
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 147.2859 148.8143 144.9628 136.7636 126.4135 116.6859 110.1872 108.6589 112.5103 120.7096 131.0596 140.7872 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 31.4534 31.4534 31.4534 31.4534 31.4534 31.4534 31.4534 31.4534 31.4534 31.4534 31.4534 31.4534 (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)

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Water heating gains (Table 5)	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276 (71)
Total internal gains	126.0057	124.0479	120.2757	112.0072	106.9428	101.6491	98.3973	101.0834	104.2327	110.1066	118.0328	124.9485 (72)
	401.3920	409.1846	393.3388	379.4291	361.4566	345.9933	333.6849	334.8426	344.4013	358.9165	379.7508	393.8361 (73)

6. Solar gains

[Jan]	Area m2			Solar flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		FF Access factor Table 6d		Gains W
Northwest	8.4300			11.2829		0.6300		0.7000		0.7700		29.0684 (81)
Solar gains	29.0684	59.1697	106.6049	175.0759	235.3363	250.8934	234.7056	187.1101	129.8997	72.3100	36.5756	23.7388 (83)
Total gains	430.4604	468.3543	499.9437	554.5050	596.7929	596.8867	568.3905	521.9526	474.3011	431.2265	416.3264	417.5749 (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	66.2984	66.5014	66.7016	67.6585	67.8405	68.7012	68.7012	68.8630	68.3671	67.8405	67.4732	67.0934
alpha	5.4199	5.4334	5.4468	5.5106	5.5227	5.5801	5.5801	5.5909	5.5578	5.5227	5.4982	5.4729
util living area	0.9884	0.9802	0.9598	0.8861	0.7317	0.5282	0.3857	0.4370	0.6913	0.9174	0.9770	0.9900 (86)
MIT	20.0291	20.1771	20.4102	20.7277	20.9244	20.9897	20.9985	20.9971	20.9584	20.7097	20.3335	20.0115 (87)
Th 2	20.0539	20.0565	20.0590	20.0711	20.0734	20.0839	20.0839	20.0859	20.0799	20.0734	20.0688	20.0640 (88)
util rest of house	0.9850	0.9744	0.9479	0.8557	0.6754	0.4560	0.3061	0.3515	0.6140	0.8878	0.9692	0.9871 (89)
MIT 2	18.9427	19.1310	19.4228	19.8078	20.0142	20.0784	20.0835	20.0849	20.0538	19.7981	19.3391	18.9282 (90)
Living area fraction	19.4488	19.6183	19.8828	20.2363	20.4382	20.5029	20.5097	20.5098	20.4752	20.2228	19.8023	19.4328 (91)
MIT	19.4488	19.6183	19.8828	20.2363	20.4382	20.5029	20.5097	20.5098	20.4752	20.2228	19.8023	19.4328 (92)
Temperature adjustment	19.4488	19.6183	19.8828	20.2363	20.4382	20.5029	20.5097	20.5098	20.4752	20.2228	19.8023	19.4328 (93)
adjusted MIT	19.4488	19.6183	19.8828	20.2363	20.4382	20.5029	20.5097	20.5098	20.4752	20.2228	19.8023	19.4328 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9822	0.9711	0.9452	0.8616	0.6984	0.4894	0.3432	0.3914	0.6484	0.8932	0.9664	0.9845 (94)
Useful gains	422.7937	454.8030	472.5701	477.7580	416.8048	292.0964	195.0916	204.2735	307.5308	385.1908	402.3397	411.0992 (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	784.6436	760.0192	688.9815	575.3722	442.3130	295.0513	195.4236	204.9436	320.2155	487.0903	646.4711	779.6466 (97)
Space heating kWh	269.2164	205.1053	161.0100	70.2822	18.9781	0.0000	0.0000	0.0000	0.0000	75.8132	175.7746	274.1992 (98a)
Space heating requirement - total per year (kWh/year)												1250.3791
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	269.2164	205.1053	161.0100	70.2822	18.9781	0.0000	0.0000	0.0000	0.0000	75.8132	175.7746	274.1992 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1250.3791
Space heating per m2										(98c) / (4) =		24.9976 (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	269.2164	205.1053	161.0100	70.2822	18.9781	0.0000	0.0000	0.0000	0.0000	75.8132	175.7746	274.1992 (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)	291.6754	222.2159	174.4421	76.1454	20.5613	0.0000	0.0000	0.0000	0.0000	82.1379	190.4384	297.0739 (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	192.4052	170.2806	181.3595	160.7137	156.6068	142.0160	140.8845	146.0215	147.1015	162.9351	171.8825	190.4846 (64)
Efficiency of water heater	84.8131	84.4781	83.7939	82.3391	80.6839	79.8000	79.8000	79.8000	79.8000	82.4537	84.1101	84.8760 (216)
Fuel for water heating, kWh/month	226.8579	201.5676	216.4352	195.1853	194.0993	177.9649	176.5470	182.9843	184.3378	197.6081	204.3543	224.4268 (217)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and 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	15.9451	12.7917	11.5175	8.4382	6.5179	5.3252	5.9459	7.7287	10.0388	13.1714	14.8771	16.3882 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-13.5536	-20.1624	-30.5685	-36.3268	-40.9181	-38.8583	-38.4088	-35.4019	-30.3885	-23.9265	-15.2784	-11.5999 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

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Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-4.7561	-10.2378	-20.7819	-31.8508	-42.7322	-43.1411	-42.6097	-35.7738	-25.8413	-14.8225	-6.4097	-3.7423 (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	(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	(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	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1354.6902 (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												2382.3684 (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)												128.6858 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-618.0910 (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												3333.6534 (238)

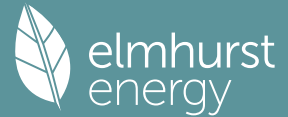
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1354.6902	0.2100	284.4849 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2382.3684	0.2100	500.2974 (264)
Space and water heating			784.7823 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	128.6858	0.1443	18.5733 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-335.3918	0.1335	-44.7587
PV Unit electricity exported	-282.6992	0.1253	-35.4284
Total			-80.1871 (269)
Total CO2, kg/year			735.0978 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.7000 (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	1354.6902	1.1300	1530.8000 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2382.3684	1.1300	2692.0763 (278)
Space and water heating			4222.8762 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	128.6858	1.5338	197.3825 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-335.3918	1.4932	-500.7908
PV Unit electricity exported	-282.6992	0.4600	-130.0390
Total			-630.8298 (283)
Total Primary energy kWh/year			3919.5297 (286)
Target Primary Energy Rate (TPER)			78.3600 (287)

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Plot Reference	B3.1-3.3 1B2P Mid				Issued on Date	19/12/2025	
Assessment Reference	1B2P			Plot Type Ref	1B2P		
Plot Address					SAP Version	10.2	
SAP Rating	80 C		DER	3.64		TER	12.59
Environmental	98 A		% DER < TER				71.09
CO ₂ Emissions (t/year)	0.17		DFEE	21.38		TFEE	23.77
Compliance Check	See BREL		% DFEE < TFEE				10.06
% DPER < TPER	42.39		DPER	38.62		TPER	67.04
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	50.0200 (1b)	2.5000 (2b)	125.0500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.0500 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000 (23c)
Effective ac	0.3026	0.2994	0.2962	0.2802	0.2771	0.2611	0.2611	0.2579	0.2675	0.2771	0.2834	0.2898 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			8.4300	0.9615	8.1058		(27)
External Wall	18.5300	8.4300	10.1000	0.1600	1.6160	14.0000	141.4000 (29a)
Communal Wall	11.2000	1.8900	9.3100	0.2100	1.9551	14.0000	130.3400 (29a)
Total net area of external elements Aum(A, m ²)			29.7300				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	13.5669	(33)
Main dwelling							
Party Wall			41.0700	0.0000	0.0000	20.0000	821.4000 (32)
Party Floor			50.0200			80.0000	4001.6000 (32d)
Party Ceiling			50.0200			100.0000	5002.0000 (32b)
Stud			85.0000			9.0000	765.0000 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 10861.7400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							217.1479 (35)
List of Thermal Bridges							

elmhurst
energy

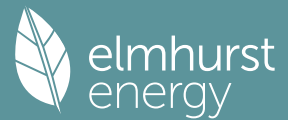
Ventilation heat loss calculated monthly (39)m = 0.33 x (25)m x (5)												
(39)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	12.4857	12.3542	12.2226	11.5649	11.4334	10.7757	10.7757	10.6442	11.0388	11.4334	11.6965	11.9595 (38)
Heat transfer coeff	28.8487	28.7171	28.5856	27.9279	27.7964	27.1387	27.1387	27.0071	27.4018	27.7964	28.0594	28.3225 (39)
Average = Sum(39)m / 12 =												27.8950
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.5767	0.5741	0.5715	0.5583	0.5557	0.5426	0.5426	0.5399	0.5478	0.5557	0.5610	0.5662 (40)
HLP (average)												0.5577
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

Assumed occupancy												1.6907 (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	22.7287	22.3911	21.9158	21.0393	20.3830	19.6553	19.2623	19.7343	20.2482	21.0269	21.9214	22.6518 (42b)
Hot water usage for other uses	31.9444	30.7827	29.6211	28.4595	27.2979	26.1363	26.1363	27.2979	28.4595	29.6211	30.7827	31.9444 (42c)
Average daily hot water use (litres/day)												50.1134 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	54.6730	53.1739	51.5369	49.4988	47.6810	45.7916	45.3986	47.0322	48.7078	50.6480	52.7041	54.5962 (44)
Energy content (annual)	86.5887	75.7189	79.2103	67.7614	64.1877	56.3062	54.9056	58.2357	60.0615	68.7289	75.0867	85.4844 (45)
Distribution loss (46)m = 0.15 x (45)m	12.9883	11.3578	11.8815	10.1642	9.6282	8.4459	8.2358	8.7354	9.0092	10.3093	11.2630	12.8227 (46)
Water storage loss (or HIU loss):												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	141.8655	125.6463	134.4871	121.2551	119.4645	109.7998	110.1824	113.5125	113.5552	124.0057	128.5804	140.7612 (62)
PVWHRs	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	141.8655	125.6463	134.4871	121.2551	119.4645	109.7998	110.1824	113.5125	113.5552	124.0057	128.5804	140.7612 (64)
12Total per year (kWh/year)												1483.1159 (64)
Electric shower(s)	42.0972	37.5090	40.9584	39.0861	39.8195	37.9840	39.2501	39.8195	39.0861	40.9584	40.1882	42.0972 (64a)
												478.8537 (64a)
Heat gains from water heating, kWh/month	83.5365	74.4957	80.7985	75.0971	75.5187	71.0127	72.2901	73.5397	72.5369	77.3134	77.8083	83.1693 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.7400	84.9622	76.7400	79.2980	76.7400	79.2980	76.7400	76.7400	79.2980	76.7400	79.2980	76.7400 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.2859	148.8143	144.9628	136.7636	126.4135	116.6859	110.1872	108.6589	112.5103	120.7096	131.0596	140.7872 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534 (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)	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276 (71)
Water heating gains (Table 5)	112.2802	110.8567	108.6001	104.3016	101.5037	98.6288	97.1641	98.8437	100.7457	103.9159	108.0671	111.7867 (72)
Total internal gains	384.6665	392.9935	378.6633	368.7235	353.0175	342.9730	332.4517	332.6029	340.9144	349.7258	366.7851	377.6743 (73)

[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
-----	-----					-----	-----	-----	-----	-----		-----	-----
Northwest						8.4300	11.2829	0.4000	0.7000			0.7700	18.4562 (81)
-----	-----					-----	-----	-----	-----	-----		-----	-----
Solar gains	18.4562	37.5680	67.6856	111.1593	149.4199	159.2974	149.0195	118.8000	82.4760	45.9111	23.2226	15.0722	(83)
Total gains	403.1226	430.5615	446.3489	479.8828	502.4374	502.2704	481.4711	451.4029	423.3904	395.6369	390.0077	392.7466	(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	104.5854	105.0645	105.5479	108.0335	108.5448	111.1752	111.1752	111.7167	110.1079	108.5448	107.5271	106.5283
alpha	7.9724	8.0043	8.0365	8.2022	8.2363	8.4117	8.4117	8.4478	8.3405	8.2363	8.1685	8.1019
util living area	0.9506	0.9179	0.8537	0.6920	0.5135	0.3458	0.2480	0.2752	0.4463	0.7150	0.8910	0.9553 (86)
MIT	20.7332	20.8181	20.9094	20.9841	20.9986	21.0000	21.0000	21.0000	20.9997	20.9831	20.8844	20.7270 (87)
Th 2	20.4510	20.4534	20.4557	20.4676	20.4700	20.4820	20.4820	20.4844	20.4772	20.4700	20.4653	20.4605 (88)
util rest of house	0.9416	0.9045	0.8334	0.6644	0.4845	0.3178	0.2188	0.2444	0.4126	0.6827	0.8727	0.9471 (89)
MIT 2	20.2172	20.2985	20.3827	20.4562	20.4691	20.4820	20.4820	20.4844	20.4770	20.4584	20.3711	20.2201 (90)
Living area fraction	fLA = Living area / (4) =											0.4658 (91)
MIT	20.4575	20.5405	20.6280	20.7021	20.7158	20.7232	20.7233	20.7246	20.7205	20.7028	20.6102	20.4562 (92)
Temperature adjustment												0.0000
adjusted MIT	20.4575	20.5405	20.6280	20.7021	20.7158	20.7232	20.7233	20.7246	20.7205	20.7028	20.6102	20.4562 (93)
8. Space heating requirement												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9417	0.9068	0.8400	0.6767	0.4980	0.3308	0.2324	0.2587	0.4283	0.6970	0.8779	0.9470 (94)
Useful gains	379.6137	390.4258	374.9414	324.7142	250.1964	166.1668	111.8999	116.7929	181.3242	275.7665	342.3718	371.9246 (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	466.1236	449.1511	403.8576	329.6070	250.6053	166.1769	111.9003	116.7938	181.4125	280.8216	379.0883	460.4169 (97)
Space heating kWh	64.3634	39.4634	21.5136	3.5229	0.3042	0.0000	0.0000	0.0000	0.0000	3.7611	26.4359	65.8383 (98a)
Space heating requirement - total per year (kWh/year)												225.2028
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	64.3634	39.4634	21.5136	3.5229	0.3042	0.0000	0.0000	0.0000	0.0000	3.7611	26.4359	65.8383 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												225.2028
Space heating per m2	(98c) / (4) =											4.5023 (99)

9b. Energy requirements												

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space and Water												1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500 (305)
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system												1.5000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	64.3634	39.4634	21.5136	3.5229	0.3042	0.0000	0.0000	0.0000	0.0000	3.7611	26.4359	65.8383 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	101.3724	62.1549	33.8840	5.5485	0.4791	0.0000	0.0000	0.0000	0.0000	5.9237	41.6366	103.6953
Space heating requirement	101.3724	62.1549	33.8840	5.5485	0.4791	0.0000	0.0000	0.0000	0.0000	5.9237	41.6366	103.6953 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement	141.8655	125.6463	134.4871	121.2551	119.4645	109.7998	110.1824	113.5125	113.5552	124.0057	128.5804	140.7612 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	212.7983	188.4695	201.7307	181.8827	179.1968	164.6997	165.2736	170.2687	170.3328	186.0086	192.8706	211.1419
Water heating fuel	212.7983	188.4695	201.7307	181.8827	179.1968	164.6997	165.2736	170.2687	170.3328	186.0086	192.8706	211.1419 (310)
Cooling System Energy Efficiency Ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	9.9771	9.0115	9.9771	9.6552	9.9771	9.6552	9.9771	9.9771	9.6552	9.9771	9.6552	9.9771 (331)
Lighting	15.9106	12.7641	11.4927	8.4200	6.5039	5.3137	5.9330	7.7120	10.0171	13.1430	14.8450	16.3529 (332)
Electricity generated by PVs (Appendix M) (negative quantity)	-12.4805	-20.8558	-35.8898	-46.8625	-55.3907	-53.6269	-52.8419	-47.2251	-37.6661	-26.2893	-14.6546	-10.3152 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												354.6944 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2224.6738 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												3.5469 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7700)												
mechanical ventilation fans (SFP = 0.7700)												117.4720 (330a)
Total electricity for the above, kWh/year												117.4720 (331)
Electricity for lighting (calculated in Appendix L)												128.4080 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-414.0986 (333)
Wind generation												0.0000 (334)
Hydro-electric generation (Appendix N)												0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)

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Appendix Q - special features
 Energy saved or generated
 Energy used
 Total delivered energy for all uses

-0.0000 (336)
 0.0000 (337)
 2890.0033 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			280.0000 (367)
Space and Water heating from Heat pump	921.2029	0.1593	20.1802 (367)
Electrical energy for heat distribution (space & water)	3.5469	0.0000	3.6867 (372)
Overall CO2 factor for heat network			0.0525 (386)
Total CO2 associated with community systems			135.3547 (373)
Energy for instantaneous electric shower(s)	478.8537	0.1391	66.6191 (264a)
Space and water heating			135.3547 (376)
Pumps, fans and electric keep-hot	117.4720	0.1387	16.2948 (378)
Energy for lighting	128.4080	0.1443	18.5332 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-414.0986	0.1317	-54.5300
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-54.5300 (380)
Total CO2, kg/year			182.2719 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.6400 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	921.2029	1.5897	201.3747 (467)
Electrical energy for heat distribution (space & water)	3.5469	0.0000	39.4273 (472)
Overall CO2 factor for heat network			0.5612 (486)
Total CO2 associated with community systems			1447.5469 (473)
Energy for instantaneous electric shower(s)	478.8537	1.5143	725.1445 (278a)
Space and water heating			1447.5469 (476)
Pumps, fans and electric keep-hot	117.4720	1.5128	177.7116 (478)
Energy for lighting	128.4080	1.5338	196.9565 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-414.0986	1.4865	-615.5654
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-615.5654 (480)
Total Primary energy kWh/year			1931.7941 (483)
Dwelling Primary energy Rate (DPER)			38.6200 (484)

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

1. Overall dwelling characteristics

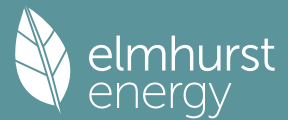
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	50.0200 (1b)	x 2.5000 (2b)	= 125.0500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 125.0500 (5)

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	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 20.0000 / (5) = 0.1599 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4099 (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) = 0.3484 (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	0.4443	0.4356	0.4268	0.3833	0.3746	0.3310	0.3310	0.3223	0.3484	0.3746	0.3920	0.4094 (22b)
Effective ac	0.5987	0.5949	0.5911	0.5735	0.5702	0.5548	0.5548	0.5519	0.5607	0.5702	0.5768	0.5838 (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						
Main dwelling													
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type			8.4300	1.1450	9.6527			(27)					
External Wall	18.5300	8.4300	10.1000	0.1800	1.8180			(29a)					
Communal Wall	11.2000	1.8900	9.3100	0.1800	1.6758			(29a)					
Total net area of external elements Aum(A, m2)			29.7300					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)... (30) + (32) =	15.0365			(33)					
Main dwelling													
Party Wall			41.0700	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							217.1479	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value		Total						
E2 Other lintels (including other steel lintels)				4.5200	0.0500		0.2260						
E4 Jamb				13.5200	0.0500		0.6760						
E7 Party floor between dwellings (in blocks of flats)				16.3700	0.0700		1.1459						
E18 Party wall between dwellings				7.5000	0.0600		0.4500						
E25 Staggered party wall between dwellings				2.5000	0.0600		0.1500						
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				32.8600	0.0000		0.0000						
E23 Balcony within or between dwellings, balcony support penetrates wall insulation				7.4100	0.0200		0.1482						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								2.7961 (36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	17.8326	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 24.7057	Feb 24.5476	Mar 24.3926	Apr 23.6645	May 23.5283	Jun 22.8942	Jul 22.8942	Aug 22.7767	Sep 23.1384	Oct 23.5283	Nov 23.8039	Dec 24.0920	(38)
Heat transfer coeff	42.5383	42.3802	42.2251	41.4971	41.3609	40.7267	40.7267	40.6093	40.9710	41.3609	41.6364	41.9245	(39)
Average = Sum(39)m / 12 =												41.4964	
HLP	Jan 0.8504	Feb 0.8473	Mar 0.8442	Apr 0.8296	May 0.8269	Jun 0.8142	Jul 0.8142	Aug 0.8119	Sep 0.8191	Oct 0.8269	Nov 0.8324	Dec 0.8382	(40)
HLP (average)												0.8296	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

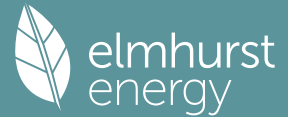
4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6907 (42)
Hot water usage for mixer showers													
52.5668	51.7768	50.6257	48.4231	46.7977	44.9851	43.9548	45.0972	46.3496	48.2958	50.5456	52.3654	(42a)	
Hot water usage for baths													
22.7287	22.3911	21.9158	21.0393	20.3830	19.6553	19.2623	19.7343	20.2482	21.0269	21.9214	22.6518	(42b)	
Hot water usage for other uses													
31.9444	30.7827	29.6211	28.4595	27.2979	26.1363	26.1363	27.2979	28.4595	29.6211	30.7827	31.9444	(42c)	
Average daily hot water use (litres/day)												98.5782	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
107.2398	104.9507	102.1626	97.9220	94.4787	90.7767	89.3534	92.1294	95.0573	98.9438	103.2498	106.9616	(44)	
Energy content (annual)	169.8417	149.4484	157.0201	134.0503	127.1865	111.6206	108.0652	114.0755	117.2152	134.2658	147.0982	167.4760	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1637.3633	
25.4762	22.4173	23.5530	20.1075	19.0780	16.7431	16.2098	17.1113	17.5823	20.1399	22.0647	25.1214	(46)	
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)	
If cylinder contains dedicated solar storage													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(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	(61)	
Total heat required for water heating calculated for each month													
216.4366	191.5341	203.6150	179.1421	173.7814	156.7124	154.6601	160.6704	162.3070	180.8607	192.1901	214.0709	(62)	
WWHRS	-24.0313	-21.2535	-22.2555	-18.4284	-17.1746	-14.6964	-13.7756	-14.6489	-15.2055	-17.9256	-20.3075	-23.5863	(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													
192.4052	170.2806	181.3595	160.7137	156.6068	142.0160	140.8845	146.0215	147.1015	162.9351	171.8825	190.4846	(64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1962.6915	(64)
Electric shower(s)												1963	(64)
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													
93.7483	83.3602	89.4851	80.6452	79.5654	73.1873	73.2076	75.2060	75.0475	81.9193	84.9836	92.9617	(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	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	76.7400	84.9622	76.7400	79.2980	76.7400	79.2980	76.7400	76.7400	79.2980	76.7400	79.2980	76.7400	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	147.2859	148.8143	144.9628	136.7636	126.4135	116.6859	110.1872	108.6589	112.5103	120.7096	131.0596	140.7872	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	(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)													
	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	(71)
Water heating gains (Table 5)													
	126.0057	124.0479	120.2757	112.0072	106.9428	101.6491	98.3973	101.0834	104.2327	110.1066	118.0328	124.9485	(72)

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Total internal gains
401.3920 409.1846 393.3388 379.4291 361.4566 345.9933 333.6849 334.8426 344.4013 358.9165 379.7508 393.8361 (73)

6. Solar gains

[Jan]	Area		Solar flux		Specific data		FF		Access		Gains	
	m2		Table 6a		or Table 6b		or Table 6c		factor		W	
			W/m2						Table 6d			
Northwest	8.4300		11.2829		0.6300		0.7000		0.7700		29.0684 (81)	
Solar gains	29.0684	59.1697	106.6049	175.0759	235.3363	250.8934	234.7056	187.1101	129.8997	72.3100	36.5756	23.7388 (83)
Total gains	430.4604	468.3543	499.9437	554.5050	596.7929	596.8867	568.3905	521.9526	474.3011	431.2265	416.3264	417.5749 (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	70.9279	71.1925	71.4539	72.7075	72.9470	74.0828	74.0828	74.2970	73.6411	72.9470	72.4642	71.9662
alpha	5.7285	5.7462	5.7636	5.8472	5.8631	5.9389	5.9389	5.9531	5.9094	5.8631	5.8309	5.7977
util living area	0.9769	0.9608	0.9235	0.8084	0.6262	0.4349	0.3150	0.3574	0.5844	0.8532	0.9540	0.9798 (86)
MIT	20.2618	20.4080	20.6161	20.8623	20.9720	20.9972	20.9997	20.9993	20.9858	20.8407	20.5358	20.2462 (87)
Th 2	20.2098	20.2126	20.2152	20.2277	20.2301	20.2410	20.2410	20.2431	20.2368	20.2301	20.2253	20.2204 (88)
util rest of house	0.9714	0.9520	0.9070	0.7752	0.5798	0.3841	0.2608	0.2988	0.5242	0.8183	0.9422	0.9750 (89)
MIT 2	19.3647	19.5484	19.8040	20.0957	20.2078	20.2394	20.2409	20.2428	20.2276	20.0809	19.7194	19.3537 (90)
Living area fraction	19.7826	19.9488	20.1823	20.4528	20.5637	20.5924	20.5944	20.5952	20.5808	20.4348	20.0997	19.7694 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7826	19.9488	20.1823	20.4528	20.5637	20.5924	20.5944	20.5952	20.5808	20.4348	20.0997	19.7694 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9679	0.9485	0.9062	0.7853	0.6002	0.4077	0.2861	0.3261	0.5517	0.8282	0.9400	0.9716 (94)
Useful gains	416.6219	444.2476	453.0686	435.4544	358.1918	243.3387	162.6080	170.2176	261.6621	357.1540	391.3667	405.7192 (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	658.6019	637.7715	577.7363	479.4067	366.6119	244.0521	162.6769	170.3639	265.5241	406.7771	541.2626	652.7414 (97)
Space heating kWh	180.0331	130.0481	92.7528	31.6456	6.2645	0.0000	0.0000	0.0000	0.0000	36.9196	107.9250	183.7846 (98a)
Space heating requirement - total per year (kWh/year)												769.3733
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	180.0331	130.0481	92.7528	31.6456	6.2645	0.0000	0.0000	0.0000	0.0000	36.9196	107.9250	183.7846 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												769.3733
Space heating per m2										(98c) / (4) =		15.3813 (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	180.0331	130.0481	92.7528	31.6456	6.2645	0.0000	0.0000	0.0000	0.0000	36.9196	107.9250	183.7846 (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)	195.0522	140.8971	100.4906	34.2856	6.7872	0.0000	0.0000	0.0000	0.0000	39.9995	116.9285	199.1165 (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	192.4052	170.2806	181.3595	160.7137	156.6068	142.0160	140.8845	146.0215	147.1015	162.9351	171.8825	190.4846 (64)
Efficiency of water heater (217)m	83.9110	83.4629	82.6339	81.1531	80.1123	79.8000	79.8000	79.8000	79.8000	81.3226	83.0465	79.8000 (216)
Fuel for water heating, kWh/month	229.2968	204.0194	219.4735	198.0377	195.4841	177.9649	176.5470	182.9843	184.3378	200.3565	206.9715	226.8226 (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	15.9451	12.7917	11.5175	8.4382	6.5179	5.3252	5.9459	7.7287	10.0388	13.1714	14.8771	16.3882 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-13.5536	-20.1624	-30.5685	-36.3268	-40.9181	-38.8583	-38.4088	-35.4019	-30.3885	-23.9265	-15.2784	-11.5999 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-4.7561	-10.2378	-20.7819	-31.8508	-42.7322	-43.1411	-42.6097	-35.7738	-25.8413	-14.8225	-6.4097	-3.7423 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												

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(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												833.5572	(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												2402.2959	(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)												128.6858	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-618.0910	(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												2832.4479	(238)

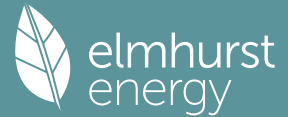
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	833.5572	0.2100	175.0470	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2402.2959	0.2100	504.4821	(264)
Space and water heating			679.5292	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	128.6858	0.1443	18.5733	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-335.3918	0.1335	-44.7587	
PV Unit electricity exported	-282.6992	0.1253	-35.4284	
Total			-80.1871	(269)
Total CO2, kg/year			629.8446	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.5900	(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	833.5572	1.1300	941.9197	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2402.2959	1.1300	2714.5944	(278)
Space and water heating			3656.5141	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	128.6858	1.5338	197.3825	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-335.3918	1.4932	-500.7908	
PV Unit electricity exported	-282.6992	0.4600	-130.0390	
Total			-630.8298	(283)
Total Primary energy kWh/year			3353.1675	(286)
Target Primary Energy Rate (TPER)			67.0400	(287)

Full SAP Calculation Printout



Plot Reference	B3.1-3.3 1B2P Mid				Issued on Date	19/12/2025		
Assessment Reference	1B2P		Plot Type Ref		1B2P			
Plot Address					SAP Version	10.2		
SAP Rating	80 C		DER	3.64		TER	12.59	
Environmental	98 A		% DER < TER				71.09	
CO ₂ Emissions (t/year)	0.17		DFEE	21.38		TFEE	23.77	
Compliance Check	See BREL		% DFEE < TFEE				10.06	
% DPER < TPER	42.39		DPER	38.62		TPER	67.04	
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001		
Client	ROK, Wilf Foster							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	50.0200 (1b)	2.5000 (2b)	125.0500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0200		125.0500 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 125.0500 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1599 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.3099 (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) = 0.2634 (21)

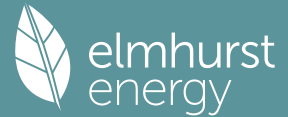
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3359	0.3293	0.3227	0.2898	0.2832	0.2503	0.2503	0.2437	0.2634	0.2832	0.2964	0.3095 (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	0.5564	0.5542	0.5521	0.5420	0.5401	0.5313	0.5313	0.5297	0.5347	0.5401	0.5439	0.5479 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			8.4300	0.9615	8.1058		(27)
External Wall	18.5300	8.4300	10.1000	0.1600	1.6160	14.0000	141.4000 (29a)
Communal Wall	11.2000	1.8900	9.3100	0.2100	1.9551	14.0000	130.3400 (29a)
Total net area of external elements Aum(A, m ²)			29.7300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	13.5669		(33)
Main dwelling							
Party Wall			41.0700	0.0000	0.0000	20.0000	821.4000 (32)
Party Floor			50.0200			80.0000	4001.6000 (32a)
Party Ceiling			50.0200			100.0000	5002.0000 (32b)
Stud			85.0000			9.0000	765.0000 (32c)
Heat capacity Cm = Sum (A x k)						(28)...(30) + (32) + (32a)...(32e) =	10861.7400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							217.1479 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				4.5200	0.0500	0.2260	
E4 Jamb				13.5200	0.0500	0.6760	

7. Mean internal temperature (heating season)											
Temperature during heating periods in the living area from Table 9, Th _l (C)											21.0000 (85)
Utilisation factor for gains for living area, n _{il,m} (see Table 9a)											
Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aug	Sep	Oct	Nov	Dec

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tau	76.7251	76.9019	77.0760	77.9042	78.0612	78.8002	78.8002	78.9386	78.5139	78.0612	77.7443	77.4158
alpha	6.1150	6.1268	6.1384	6.1936	6.2041	6.2533	6.2533	6.2626	6.2343	6.2041	6.1830	6.1611
util living area	0.9926	0.9865	0.9722	0.9121	0.7704	0.5583	0.4069	0.4577	0.7137	0.9346	0.9840	0.9938 (86)
MIT	20.1492	20.2795	20.4731	20.7529	20.9323	20.9921	20.9991	20.9981	20.9675	20.7458	20.4138	20.1278 (87)
Th 2	20.2653	20.2669	20.2684	20.2757	20.2770	20.2834	20.2834	20.2845	20.2809	20.2770	20.2743	20.2714 (88)
util rest of house	0.9907	0.9830	0.9649	0.8907	0.7260	0.4987	0.3411	0.3875	0.6516	0.9138	0.9792	0.9922 (89)
MIT 2	19.4875	19.6175	19.8085	20.0786	20.2319	20.2796	20.2831	20.2839	20.2631	20.0777	19.7571	19.4714 (90)
Living area fraction									FLA = Living area / (4) =			0.4658 (91)
MIT	19.7957	19.9258	20.1181	20.3927	20.5582	20.6115	20.6166	20.6166	20.5912	20.3889	20.0630	19.7771 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7957	19.9258	20.1181	20.3927	20.5582	20.6115	20.6166	20.6166	20.5912	20.3889	20.0630	19.7771 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9891	0.9811	0.9631	0.8945	0.7439	0.5262	0.3717	0.4202	0.6792	0.9174	0.9776	0.9908 (94)
Useful gains	326.1354	350.8324	360.3391	365.9817	321.8477	228.0874	153.5895	160.7480	240.4129	298.2495	310.9223	316.5906 (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	609.3572	589.5200	533.0807	445.1006	342.3785	230.1702	153.7895	161.1642	249.4455	378.3532	503.0757	607.0927 (97)
Space heating kWh	210.7170	160.3981	128.5198	56.9656	15.2749	0.0000	0.0000	0.0000	0.0000	59.5971	138.3505	216.1335 (98a)
Space heating requirement - total per year (kWh/year)												985.9565
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	210.7170	160.3981	128.5198	56.9656	15.2749	0.0000	0.0000	0.0000	0.0000	59.5971	138.3505	216.1335 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												985.9565
Space heating per m2										(98c) / (4) =		19.7112 (99)

8c. Space cooling requirement

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

Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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	359.9130	283.3358	290.4833	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9518	0.9799	0.9675	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	342.5525	277.6485	281.0429	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	477.5199	455.4119	421.1272	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	97.1765	132.2560	104.2227	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	24.2941	33.0640	26.0557	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												83.4138 (107)
Energy for space heating												19.7112 (99)
Energy for space cooling												1.6676 (108)
Total												21.3789 (109)
Fabric Energy Efficiency (DFEE)												21.4 (109)

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

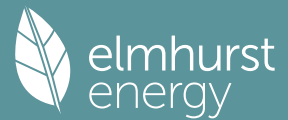
1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	50.0200 (1b)	x 2.5000 (2b)	= 125.0500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	125.0500 (5)

2. Ventilation rate

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1599 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4099	(18)
Number of sides sheltered	2	(19)

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Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3484 (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 infiltr rate	0.4443	0.4356	0.4268	0.3833	0.3746	0.3310	0.3310	0.3223	0.3484	0.3746	0.3920	0.4094	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													(23c)
Effective ac	0.5987	0.5949	0.5911	0.5735	0.5702	0.5548	0.5548	0.5519	0.5607	0.5702	0.5768	0.5838	(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	
Main dwelling								
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type			8.4300	1.1450	9.6527			(27)
External Wall	18.5300	8.4300	10.1000	0.1800	1.8180			(29a)
Communal Wall	11.2000	1.8900	9.3100	0.1800	1.6758			(29a)
Total net area of external elements Aum(A, m2)			29.7300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.0365			(33)
Main dwelling								
Party Wall			41.0700	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							217.1479	(35)

List of Thermal Bridges													
K1 Element						Length	Psi-value	Total					
E2 Other lintels (including other steel lintels)						4.5200	0.0500	0.2260					
E4 Jamb						13.5200	0.0500	0.6760					
E7 Party floor between dwellings (in blocks of flats)						16.3700	0.0700	1.1459					
E18 Party wall between dwellings						7.5000	0.0600	0.4500					
E25 Staggered party wall between dwellings						2.5000	0.0600	0.1500					
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)						32.8600	0.0000	0.0000					
E23 Balcony within or between dwellings, balcony support penetrates wall insulation						7.4100	0.0200	0.1482					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												2.7961	(36)
Point Thermal bridges												(36a) =	0.0000
Total fabric heat loss												(33) + (36) + (36a) =	17.8326 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	24.7057	24.5476	24.3926	23.6645	23.5283	22.8942	22.8942	22.7767	23.1384	23.5283	23.8039	24.0920	(38)
Average = Sum(39)m / 12 =	42.5383	42.3802	42.2251	41.4971	41.3609	40.7267	40.7267	40.6093	40.9710	41.3609	41.6364	41.9245	(39)
												41.4964	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.8504	0.8473	0.8442	0.8296	0.8269	0.8142	0.8142	0.8119	0.8191	0.8269	0.8324	0.8382	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

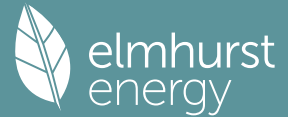
4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6907 (42)
Hot water usage for mixer showers													
Hot water usage for baths	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 other uses	22.7287	22.3911	21.9158	21.0393	20.3830	19.6553	19.2623	19.7343	20.2482	21.0269	21.9214	22.6518	(42b)
Average daily hot water use (litres/day)	31.9444	30.7827	29.6211	28.4595	27.2979	26.1363	26.1363	27.2979	28.4595	29.6211	30.7827	31.9444	(42c)
												50.1134	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	54.6730	53.1739	51.5369	49.4988	47.6810	45.7916	45.3986	47.0322	48.7078	50.6480	52.7041	54.5962	(44)
Energy content (annual)	86.5887	75.7189	79.2103	67.7614	64.1877	56.3062	54.9056	58.2357	60.0615	68.7289	75.0867	85.4844	(45)
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 (or HIU 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													
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	(57)
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	(59)
Total heat required for water heating calculated for each month	73.6004	64.3610	67.3288	57.5972	54.5596	47.8602	46.6698	49.5003	51.0523	58.4196	63.8237	72.6618	(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	73.6004	64.3610	67.3288	57.5972	54.5596	47.8602	46.6698	49.5003	51.0523	58.4196	63.8237	72.6618	(64)
12Total per year (kWh/year)												707.4347	(64)
Electric shower(s)	42.0972	37.5090	40.9584	39.0861	39.8195	37.9840	39.2501	39.8195	39.0861	40.9584	40.1882	42.0972	(64a)
Heat gains from water heating, kWh/month	28.9244	25.4675	27.0718	24.1708	23.5948	21.4610	21.4800	22.3300	22.5346	24.8445	26.0030	28.6898	(65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													478.8537 (64a)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	(66)
	76.7400	84.9622	76.7400	79.2980	76.7400	79.2980	76.7400	76.7400	79.2980	76.7400	79.2980	76.7400	(67)

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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.2859	148.8143	144.9628	136.7636	126.4135	116.6859	110.1872	108.6589	112.5103	120.7096	131.0596	140.7872 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534 (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)	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276 (71)
Water heating gains (Table 5)	38.8769	37.8981	36.3868	33.5706	31.7134	29.8070	28.8709	30.0134	31.2980	33.3931	36.1152	38.5615 (72)
Total internal gains	311.2631	320.0348	306.4500	297.9925	283.2273	274.1512	264.1585	263.7726	271.4667	279.2030	294.8332	304.4491 (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	

Northwest	8.4300				11.2829		0.6300		0.7000		0.7700		29.0684 (81)	

Solar gains	29.0684	59.1697	106.6049	175.0759	235.3363	250.8934	234.7056	187.1101	129.8997	72.3100	36.5756	23.7388 (83)		
Total gains	340.3316	379.2045	413.0549	473.0684	518.5636	525.0446	498.8642	450.8827	401.3664	351.5130	331.4089	328.1878 (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	70.9279	71.1925	71.4539	72.7075	72.9470	74.0828	74.0828	74.2970	73.6411	72.9470	72.4642	71.9662
alpha	5.7285	5.7462	5.7636	5.8472	5.8631	5.9389	5.9389	5.9531	5.9094	5.8631	5.8309	5.7977
util living area	0.9923	0.9845	0.9638	0.8781	0.7036	0.4925	0.3587	0.4130	0.6755	0.9254	0.9831	0.9936 (86)
MIT	20.0509	20.2126	20.4539	20.7782	20.9494	20.9947	20.9993	20.9985	20.9704	20.7316	20.3533	20.0342 (87)
Th 2	20.2098	20.2126	20.2152	20.2277	20.2301	20.2410	20.2410	20.2431	20.2368	20.2301	20.2253	20.2204 (88)
util rest of house	0.9902	0.9805	0.9545	0.8512	0.6559	0.4357	0.2971	0.3457	0.6111	0.9020	0.9780	0.9919 (89)
MIT 2	19.3446	19.5063	19.7438	20.0554	20.1976	20.2386	20.2408	20.2426	20.2210	20.0221	19.6568	19.3366 (90)
Living area fraction	FLA = Living area / (4) =											
MIT	19.6736	19.8353	20.0746	20.3921	20.5478	20.5908	20.5942	20.5947	20.5701	20.3526	19.9813	19.6616 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.6736	19.8353	20.0746	20.3921	20.5478	20.5908	20.5942	20.5947	20.5701	20.3526	19.9813	19.6616 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9885	0.9782	0.9526	0.8574	0.6761	0.4621	0.3258	0.3771	0.6400	0.9061	0.9760	0.9904 (94)
Useful gains	336.4119	370.9385	393.4556	405.5925	350.5951	242.6003	162.5276	170.0214	256.8604	318.5122	323.4661	325.0252 (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	653.9664	632.9611	573.1877	476.8880	365.9519	243.9853	162.6688	170.3443	265.0851	403.3749	536.3294	648.2184 (97)
Space heating kWh	236.2605	176.0792	133.7207	51.3328	11.4255	0.0000	0.0000	0.0000	0.0000	63.1378	153.2616	240.4558 (98a)
Space heating requirement - total per year (kWh/year)	1065.6738											
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	236.2605	176.0792	133.7207	51.3328	11.4255	0.0000	0.0000	0.0000	0.0000	63.1378	153.2616	240.4558 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1065.6738											
Space heating per m2	(98c) / (4) = 21.3050 (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	382.8314	301.3779	308.6308	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9705	0.9877	0.9778	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	371.5372	297.6770	301.7672	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	584.5801	555.5646	500.9701	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	153.3909	191.8684	148.2069	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	38.3477	47.9671	37.0517	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	123.3665 (107)											
Energy for space heating	21.3050 (99)											
Energy for space cooling	2.4663 (108)											
Total	23.7713 (109)											
Fabric Energy Efficiency (TFEE)	23.8 (109)											

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Plot Reference	B3.1-3.3 1B2P Mid				Issued on Date	19/12/2025	
Assessment Reference	1B2P		Plot Type Ref	1B2P			
Plot Address					SAP Version	10.2	
SAP Rating	80 C	DER	3.64	TER	12.59		
Environmental	98 A	% DER < TER				71.09	
CO ₂ Emissions (t/year)	0.17	DFEE	21.38	TFEE	23.77		
Compliance Check	See BREL	% DFEE < TFEE				10.06	
% DPER < TPER	42.39	DPER	38.62	TPER	67.04		
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	50.0200 (1b)	2.5000 (2b)	125.0500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.0500 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000 (23c)
Effective ac	0.3026	0.2994	0.2962	0.2802	0.2771	0.2611	0.2611	0.2579	0.2675	0.2771	0.2834	0.2898 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			8.4300	0.9615	8.1058		(27)
External Wall	18.5300	8.4300	10.1000	0.1600	1.6160	14.0000	141.4000 (29a)
Communal Wall	11.2000	1.8900	9.3100	0.2100	1.9551	14.0000	130.3400 (29a)
Total net area of external elements Aum(A, m ²)			29.7300				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	13.5669	(33)
Main dwelling							
Party Wall			41.0700	0.0000	0.0000	20.0000	821.4000 (32)
Party Floor			50.0200			80.0000	4001.6000 (32d)
Party Ceiling			50.0200			100.0000	5002.0000 (32b)
Stud			85.0000			9.0000	765.0000 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 10861.7400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							217.1479 (35)
List of Thermal Bridges							

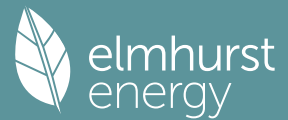
Ventilation heat loss calculated monthly (39)m = 0.33 x (25)m x (5)												
(39)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	12.4857	12.3542	12.2226	11.5649	11.4334	10.7757	10.7757	10.6442	11.0388	11.4334	11.6965	11.9595 (38)
Heat transfer coeff	28.8487	28.7171	28.5856	27.9279	27.7964	27.1387	27.1387	27.0071	27.4018	27.7964	28.0594	28.3225 (39)
Average = Sum(39)m / 12 =												27.8950
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.5767	0.5741	0.5715	0.5583	0.5557	0.5426	0.5426	0.5399	0.5478	0.5557	0.5610	0.5662 (40)
HLP (average)												0.5577
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

Assumed occupancy												1.6907 (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	22.7287	22.3911	21.9158	21.0393	20.3830	19.6553	19.2623	19.7343	20.2482	21.0269	21.9214	22.6518 (42b)
Hot water usage for other uses	31.9444	30.7827	29.6211	28.4595	27.2979	26.1363	26.1363	27.2979	28.4595	29.6211	30.7827	31.9444 (42c)
Average daily hot water use (litres/day)												50.1134 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	54.6730	53.1739	51.5369	49.4988	47.6810	45.7916	45.3986	47.0322	48.7078	50.6480	52.7041	54.5962 (44)
Energy content (annual)	86.5887	75.7189	79.2103	67.7614	64.1877	56.3062	54.9056	58.2357	60.0615	68.7289	75.0867	85.4844 (45)
Distribution loss (46)m = 0.15 x (45)m	12.9883	11.3578	11.8815	10.1642	9.6282	8.4459	8.2358	8.7354	9.0092	10.3093	11.2630	12.8227 (46)
Water storage loss (or HIU loss):												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	141.8655	125.6463	134.4871	121.2551	119.4645	109.7998	110.1824	113.5125	113.5552	124.0057	128.5804	140.7612 (62)
PVWHRs	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	141.8655	125.6463	134.4871	121.2551	119.4645	109.7998	110.1824	113.5125	113.5552	124.0057	128.5804	140.7612 (64)
12Total per year (kWh/year)												1483.1159 (64a)
Electric shower(s)	42.0972	37.5090	40.9584	39.0861	39.8195	37.9840	39.2501	39.8195	39.0861	40.9584	40.1882	42.0972 (64a)
												478.8537 (64a)
Heat gains from water heating, kWh/month	83.5365	74.4957	80.7985	75.0971	75.5187	71.0127	72.2901	73.5397	72.5369	77.3134	77.8083	83.1693 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.7400	84.9622	76.7400	79.2980	76.7400	79.2980	76.7400	76.7400	79.2980	76.7400	79.2980	76.7400 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.2859	148.8143	144.9628	136.7636	126.4135	116.6859	110.1872	108.6589	112.5103	120.7096	131.0596	140.7872 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534 (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)	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276 (71)
Water heating gains (Table 5)	112.2802	110.8567	108.6001	104.3016	101.5037	98.6288	97.1641	98.8437	100.7457	103.9159	108.0671	111.7867 (72)
Total internal gains	384.6665	392.9935	378.6633	368.7235	353.0175	342.9730	332.4517	332.6029	340.9144	349.7258	366.7851	377.6743 (73)

[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
Northwest						8.4300	11.2829	0.4000	0.7000			0.7700	18.4562 (81)
Solar gains	18.4562	37.5680	67.6856	111.1593	149.4199	159.2974	149.0195	118.8000	82.4760	45.9111	23.2226	15.0722	(83)
Total gains	403.1226	430.5615	446.3489	479.8828	502.4374	502.2704	481.4711	451.4029	423.3904	395.6369	390.0077	392.7466	(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	104.5854	105.0645	105.5479	108.0335	108.5448	111.1752	111.1752	111.7167	110.1079	108.5448	107.5271	106.5283
alpha	7.9724	8.0043	8.0365	8.2022	8.2363	8.4117	8.4117	8.4478	8.3405	8.2363	8.1685	8.1019
util living area	0.9506	0.9179	0.8537	0.6920	0.5135	0.3458	0.2480	0.2752	0.4463	0.7150	0.8910	0.9553 (86)
MIT	20.7332	20.8181	20.9094	20.9841	20.9986	21.0000	21.0000	21.0000	20.9997	20.9831	20.8844	20.7270 (87)
Th 2	20.4510	20.4534	20.4557	20.4676	20.4700	20.4820	20.4820	20.4844	20.4772	20.4700	20.4653	20.4605 (88)
util rest of house	0.9416	0.9045	0.8334	0.6644	0.4845	0.3178	0.2188	0.2444	0.4126	0.6827	0.8727	0.9471 (89)
MIT 2	20.2172	20.2985	20.3827	20.4562	20.4691	20.4820	20.4820	20.4844	20.4770	20.4584	20.3711	20.2201 (90)
Living area fraction	fLA = Living area / (4) = 0.4658 (91)											
MIT	20.4575	20.5405	20.6280	20.7021	20.7158	20.7232	20.7233	20.7246	20.7205	20.7028	20.6102	20.4562 (92)
Temperature adjustment	0.0000											
adjusted MIT	20.4575	20.5405	20.6280	20.7021	20.7158	20.7232	20.7233	20.7246	20.7205	20.7028	20.6102	20.4562 (93)
8. Space heating requirement												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9417	0.9068	0.8400	0.6767	0.4980	0.3308	0.2324	0.2587	0.4283	0.6970	0.8779	0.9470 (94)
Useful gains	379.6137	390.4258	374.9414	324.7142	250.1964	166.1668	111.8999	116.7929	181.3242	275.7665	342.3718	371.9246 (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	466.1236	449.1511	403.8576	329.6070	250.6053	166.1769	111.9003	116.7938	181.4125	280.8216	379.0883	460.4169 (97)
Space heating kWh	64.3634	39.4634	21.5136	3.5229	0.3042	0.0000	0.0000	0.0000	0.0000	3.7611	26.4359	65.8383 (98a)
Space heating requirement - total per year (kWh/year)	225.2028											
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	64.3634	39.4634	21.5136	3.5229	0.3042	0.0000	0.0000	0.0000	0.0000	3.7611	26.4359	65.8383 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	225.2028											
Space heating per m2	(98c) / (4) = 4.5023 (99)											

9b. Energy requirements												

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)											
Fraction of space heat from community system	1.0000 (302)											
Fraction of heat from community Heat pump-Space and Water	1.0000 (303a)											
Factor for control and charging method (Table 4c(3)) for space heating	1.0500 (305)											
Factor for charging method (Table 4c(3)) for water heating	1.0000 (305a)											
Distribution loss factor (Table 12c) for community heating system	1.5000 (306)											
Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
Space heating:												
Space heating requirement	64.3634	39.4634	21.5136	3.5229	0.3042	0.0000	0.0000	0.0000	0.0000	3.7611	26.4359	65.8383 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	101.3724	62.1549	33.8840	5.5485	0.4791	0.0000	0.0000	0.0000	0.0000	5.9237	41.6366	103.6953
Space heating requirement	101.3724	62.1549	33.8840	5.5485	0.4791	0.0000	0.0000	0.0000	0.0000	5.9237	41.6366	103.6953 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)											
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement	141.8655	125.6463	134.4871	121.2551	119.4645	109.7998	110.1824	113.5125	113.5552	124.0057	128.5804	140.7612 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	212.7983	188.4695	201.7307	181.8827	179.1968	164.6997	165.2736	170.2687	170.3328	186.0086	192.8706	211.1419
Water heating fuel	212.7983	188.4695	201.7307	181.8827	179.1968	164.6997	165.2736	170.2687	170.3328	186.0086	192.8706	211.1419 (310)
Cooling System Energy Efficiency Ratio	0.0000 (314)											
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	9.9771	9.0115	9.9771	9.6552	9.9771	9.6552	9.9771	9.9771	9.6552	9.9771	9.6552	9.9771 (331)
Lighting	15.9106	12.7641	11.4927	8.4200	6.5039	5.3137	5.9330	7.7120	10.0171	13.1430	14.8450	16.3529 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-12.4805	-20.8558	-35.8898	-46.8625	-55.3907	-53.6269	-52.8419	-47.2251	-37.6661	-26.2893	-14.6546	-10.3152 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating	354.6944 (307)											
Space heating fuel - secondary	0.0000 (309)											
Water heating fuel - community heating	2224.6738 (310)											
Efficiency of water heater	0.0000 (311)											
Electricity used for heat distribution	3.5469 (313)											
Space cooling fuel	0.0000 (321)											
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7700)												
mechanical ventilation fans (SFP = 0.7700)	117.4720 (330a)											
Total electricity for the above, kWh/year	117.4720 (331)											
Electricity for lighting (calculated in Appendix L)	128.4080 (332)											
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation	-414.0986 (333)											
Wind generation	0.0000 (334)											
Hydro-electric generation (Appendix N)	0.0000 (335a)											
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)											

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Appendix Q - special features
 Energy saved or generated
 Energy used
 Total delivered energy for all uses

-0.0000 (336)
 0.0000 (337)
 2890.0033 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Efficiency of heat source Heat pump			280.0000 (367)
Space and Water heating from Heat pump	921.2029	0.1593	20.1802 (367)
Electrical energy for heat distribution (space & water)	3.5469	0.0000	3.6867 (372)
Overall CO ₂ factor for heat network			0.0525 (386)
Total CO ₂ associated with community systems			135.3547 (373)
Energy for instantaneous electric shower(s)	478.8537	0.1391	66.6191 (264a)
Space and water heating			135.3547 (376)
Pumps, fans and electric keep-hot	117.4720	0.1387	16.2948 (378)
Energy for lighting	128.4080	0.1443	18.5332 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-414.0986	0.1317	-54.5300
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-54.5300 (380)
Total CO ₂ , kg/year			182.2719 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.6400 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	921.2029	1.5897	201.3747 (467)
Electrical energy for heat distribution (space & water)	3.5469	0.0000	39.4273 (472)
Overall CO ₂ factor for heat network			0.5612 (486)
Total CO ₂ associated with community systems			1447.5469 (473)
Energy for instantaneous electric shower(s)	478.8537	1.5143	725.1445 (278a)
Space and water heating			1447.5469 (476)
Pumps, fans and electric keep-hot	117.4720	1.5128	177.7116 (478)
Energy for lighting	128.4080	1.5338	196.9565 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-414.0986	1.4865	-615.5654
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-615.5654 (480)
Total Primary energy kWh/year			1931.7941 (483)
Dwelling Primary energy Rate (DPER)			38.6200 (484)

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

1. Overall dwelling characteristics

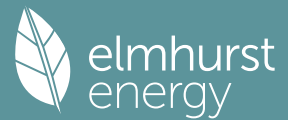
	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	50.0200 (1b)	x 2.5000 (2b)	= 125.0500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 125.0500 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 20.0000 / (5) = 0.1599 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4099 (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) = 0.3484 (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	0.4443	0.4356	0.4268	0.3833	0.3746	0.3310	0.3310	0.3223	0.3484	0.3746	0.3920	0.4094 (22b)
Effective ac	0.5987	0.5949	0.5911	0.5735	0.5702	0.5548	0.5548	0.5519	0.5607	0.5702	0.5768	0.5838 (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						
Main dwelling													
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type			8.4300	1.1450	9.6527			(27)					
External Wall	18.5300	8.4300	10.1000	0.1800	1.8180			(29a)					
Communal Wall	11.2000	1.8900	9.3100	0.1800	1.6758			(29a)					
Total net area of external elements Aum(A, m2)			29.7300					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.0365			(33)					
Main dwelling													
Party Wall			41.0700	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							217.1479	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value		Total						
E2 Other lintels (including other steel lintels)				4.5200	0.0500		0.2260						
E4 Jamb				13.5200	0.0500		0.6760						
E7 Party floor between dwellings (in blocks of flats)				16.3700	0.0700		1.1459						
E18 Party wall between dwellings				7.5000	0.0600		0.4500						
E25 Staggered party wall between dwellings				2.5000	0.0600		0.1500						
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				32.8600	0.0000		0.0000						
E23 Balcony within or between dwellings, balcony support penetrates wall insulation				7.4100	0.0200		0.1482						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								2.7961 (36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	17.8326	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 24.7057	Feb 24.5476	Mar 24.3926	Apr 23.6645	May 23.5283	Jun 22.8942	Jul 22.8942	Aug 22.7767	Sep 23.1384	Oct 23.5283	Nov 23.8039	Dec 24.0920	(38)
Heat transfer coeff	42.5383	42.3802	42.2251	41.4971	41.3609	40.7267	40.7267	40.6093	40.9710	41.3609	41.6364	41.9245	(39)
Average = Sum(39)m / 12 =												41.4964	
HLP	Jan 0.8504	Feb 0.8473	Mar 0.8442	Apr 0.8296	May 0.8269	Jun 0.8142	Jul 0.8142	Aug 0.8119	Sep 0.8191	Oct 0.8269	Nov 0.8324	Dec 0.8382	(40)
HLP (average)												0.8296	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

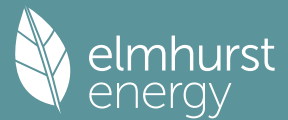
4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6907 (42)
Hot water usage for mixer showers	52.5668	51.7768	50.6257	48.4231	46.7977	44.9851	43.9548	45.0972	46.3496	48.2958	50.5456	52.3654	(42a)
Hot water usage for baths	22.7287	22.3911	21.9158	21.0393	20.3830	19.6553	19.2623	19.7343	20.2482	21.0269	21.9214	22.6518	(42b)
Hot water usage for other uses	31.9444	30.7827	29.6211	28.4595	27.2979	26.1363	26.1363	27.2979	28.4595	29.6211	30.7827	31.9444	(42c)
Average daily hot water use (litres/day)													98.5782 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	107.2398	104.9507	102.1626	97.9220	94.4787	90.7767	89.3534	92.1294	95.0573	98.9438	103.2498	106.9616	(44)
Energy content (annual)	169.8417	149.4484	157.0201	134.0503	127.1865	111.6206	108.0652	114.0755	117.2152	134.2658	147.0982	167.4760	(45)
Distribution loss (46)m = 0.15 x (45)m	25.4762	22.4173	23.5530	20.1075	19.0780	16.7431	16.2098	17.1113	17.5823	20.1399	22.0647	25.1214	(46)
Water storage loss (or HIU loss):													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.3938 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(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													
WWHRS	216.4366	191.5341	203.6150	179.1421	173.7814	156.7124	154.6601	160.6704	162.3070	180.8607	192.1901	214.0709	(62)
PV diverter	-24.0313	-21.2535	-22.2555	-18.4284	-17.1746	-14.6964	-13.7756	-14.6489	-15.2055	-17.9256	-20.3075	-23.5863	(63a)
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	(63b)
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	(63c)
Output from w/h	192.4052	170.2806	181.3595	160.7137	156.6068	142.0160	140.8845	146.0215	147.1015	162.9351	171.8825	190.4846	(64)
12Total per year (kWh/year)													1962.6915 (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)
													0.0000 (64a)
Heat gains from water heating, kWh/month	93.7483	83.3602	89.4851	80.6452	79.5654	73.1873	73.2076	75.2060	75.0475	81.9193	84.9836	92.9617	(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	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	76.7400	84.9622	76.7400	79.2980	76.7400	79.2980	76.7400	76.7400	79.2980	76.7400	79.2980	76.7400	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	147.2859	148.8143	144.9628	136.7636	126.4135	116.6859	110.1872	108.6589	112.5103	120.7096	131.0596	140.7872	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	(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)													
	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	(71)
Water heating gains (Table 5)													
	126.0057	124.0479	120.2757	112.0072	106.9428	101.6491	98.3973	101.0834	104.2327	110.1066	118.0328	124.9485	(72)

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Total internal gains
401.3920 409.1846 393.3388 379.4291 361.4566 345.9933 333.6849 334.8426 344.4013 358.9165 379.7508 393.8361 (73)

6. Solar gains

[Jan]	Area m2		Solar flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
Northwest	8.4300		11.2829		0.6300		0.7000		0.7700		29.0684 (81)	
Solar gains	29.0684	59.1697	106.6049	175.0759	235.3363	250.8934	234.7056	187.1101	129.8997	72.3100	36.5756	23.7388 (83)
Total gains	430.4604	468.3543	499.9437	554.5050	596.7929	596.8867	568.3905	521.9526	474.3011	431.2265	416.3264	417.5749 (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	70.9279	71.1925	71.4539	72.7075	72.9470	74.0828	74.0828	74.2970	73.6411	72.9470	72.4642	71.9662
alpha	5.7285	5.7462	5.7636	5.8472	5.8631	5.9389	5.9389	5.9531	5.9094	5.8631	5.8309	5.7977
util living area	0.9769	0.9608	0.9235	0.8084	0.6262	0.4349	0.3150	0.3574	0.5844	0.8532	0.9540	0.9798 (86)
MIT	20.2618	20.4080	20.6161	20.8623	20.9720	20.9972	20.9997	20.9993	20.9858	20.8407	20.5358	20.2462 (87)
Th 2	20.2098	20.2126	20.2152	20.2277	20.2301	20.2410	20.2410	20.2431	20.2368	20.2301	20.2253	20.2204 (88)
util rest of house	0.9714	0.9520	0.9070	0.7752	0.5798	0.3841	0.2608	0.2988	0.5242	0.8183	0.9422	0.9750 (89)
MIT 2	19.3647	19.5484	19.8040	20.0957	20.2078	20.2394	20.2409	20.2428	20.2276	20.0809	19.7194	19.3537 (90)
Living area fraction	19.7826	19.9488	20.1823	20.4528	20.5637	20.5924	20.5944	20.5952	20.5808	20.4348	20.0997	19.7694 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7826	19.9488	20.1823	20.4528	20.5637	20.5924	20.5944	20.5952	20.5808	20.4348	20.0997	19.7694 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9679	0.9485	0.9062	0.7853	0.6002	0.4077	0.2861	0.3261	0.5517	0.8282	0.9400	0.9716 (94)
Useful gains	416.6219	444.2476	453.0686	435.4544	358.1918	243.3387	162.6080	170.2176	261.6621	357.1540	391.3667	405.7192 (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	658.6019	637.7715	577.7363	479.4067	366.6119	244.0521	162.6769	170.3639	265.5241	406.7771	541.2626	652.7414 (97)
Space heating kWh	180.0331	130.0481	92.7528	31.6456	6.2645	0.0000	0.0000	0.0000	0.0000	36.9196	107.9250	183.7846 (98a)
Space heating requirement - total per year (kWh/year)												769.3733
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	180.0331	130.0481	92.7528	31.6456	6.2645	0.0000	0.0000	0.0000	0.0000	36.9196	107.9250	183.7846 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												769.3733
Space heating per m2										(98c) / (4) =		15.3813 (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	180.0331	130.0481	92.7528	31.6456	6.2645	0.0000	0.0000	0.0000	0.0000	36.9196	107.9250	183.7846 (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)	195.0522	140.8971	100.4906	34.2856	6.7872	0.0000	0.0000	0.0000	0.0000	39.9995	116.9285	199.1165 (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	192.4052	170.2806	181.3595	160.7137	156.6068	142.0160	140.8845	146.0215	147.1015	162.9351	171.8825	190.4846 (64)
Efficiency of water heater (217)m	83.9110	83.4629	82.6339	81.1531	80.1123	79.8000	79.8000	79.8000	79.8000	81.3226	83.0465	79.8000 (216)
Fuel for water heating, kWh/month	229.2968	204.0194	219.4735	198.0377	195.4841	177.9649	176.5470	182.9843	184.3378	200.3565	206.9715	226.8226 (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	15.9451	12.7917	11.5175	8.4382	6.5179	5.3252	5.9459	7.7287	10.0388	13.1714	14.8771	16.3882 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-13.5536	-20.1624	-30.5685	-36.3268	-40.9181	-38.8583	-38.4088	-35.4019	-30.3885	-23.9265	-15.2784	-11.5999 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-4.7561	-10.2378	-20.7819	-31.8508	-42.7322	-43.1411	-42.6097	-35.7738	-25.8413	-14.8225	-6.4097	-3.7423 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												

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(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												833.5572	(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												2402.2959	(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)												128.6858	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-618.0910	(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												2832.4479	(238)

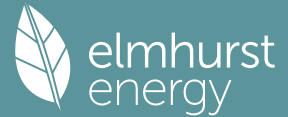
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	833.5572	0.2100	175.0470	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2402.2959	0.2100	504.4821	(264)
Space and water heating			679.5292	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	128.6858	0.1443	18.5733	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-335.3918	0.1335	-44.7587	
PV Unit electricity exported	-282.6992	0.1253	-35.4284	
Total			-80.1871	(269)
Total CO2, kg/year			629.8446	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.5900	(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	833.5572	1.1300	941.9197	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2402.2959	1.1300	2714.5944	(278)
Space and water heating			3656.5141	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	128.6858	1.5338	197.3825	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-335.3918	1.4932	-500.7908	
PV Unit electricity exported	-282.6992	0.4600	-130.0390	
Total			-630.8298	(283)
Total Primary energy kWh/year			3353.1675	(286)
Target Primary Energy Rate (TPER)			67.0400	(287)

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Plot Reference	B3.1-3.3 1B2P Top				Issued on Date	19/12/2025	
Assessment Reference	1B2P		Plot Type Ref		1B2P		
Plot Address					SAP Version	10.2	
SAP Rating	78 C		DER	4.82		TER	15.29
Environmental	97 A		% DER < TER				68.48
CO ₂ Emissions (t/year)	0.21		DFEE	34.76		TFEE	35.71
Compliance Check	See BREL		% DFEE < TFEE				2.67
% DPER < TPER	37.97		DPER	50.58		TPER	81.54
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	50.0200 (1b)	2.5000 (2b)	125.0500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0200		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.0500 (5)

2. Ventilation rate

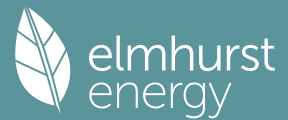
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000 (23c)
Effective ac	0.3026	0.2994	0.2962	0.2802	0.2771	0.2611	0.2611	0.2579	0.2675	0.2771	0.2834	0.2898 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			8.4300	0.9615	8.1058		(27)
External Wall	18.5300	8.4300	10.1000	0.1600	1.6160	14.0000	141.4000 (29a)
Communal Wall	11.2000	1.8900	9.3100	0.2100	1.9551	14.0000	130.3400 (29a)
Roof	50.0200		50.0200	0.1300	6.5026	9.0000	450.1800 (30)
Total net area of external elements Aum(A, m ²)			79.7500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.0695		(33)
Main dwelling							
Party Wall			41.0700	0.0000	0.0000	20.0000	821.4000 (32)
Party Floor			50.0200			80.0000	4001.6000 (32d)
Stud			85.0000			9.0000	765.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	6309.9200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							126.1479 (35)
List of Thermal Bridges							

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K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	4.5200	0.0500	0.2260
E4 Jamb	13.5200	0.0500	0.6760
E7 Party floor between dwellings (in blocks of flats)	4.4800	0.0700	0.3136
E18 Party wall between dwellings	7.5000	0.0600	0.4500
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.4300	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.4100	0.0200	0.1482
E15 Flat roof with parapet	7.4100	0.5600	4.1496
P4 Party wall - Roof (insulation at ceiling level)	16.4300	0.1200	1.9716
R7 Flat ceiling (inverted)	4.4800	0.0400	0.1792
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.2642 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	28.3337 (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	12.4857	12.3542	12.2226	11.5649	11.4334	10.7757	10.7757	10.6442	11.0388	11.4334	11.6965	11.9595 (38)
Heat transfer coeff	40.8194	40.6878	40.5563	39.8986	39.7671	39.1094	39.1094	38.9778	39.3725	39.7671	40.0301	40.2932 (39)
Average = Sum(39)m / 12 =												39.8657
HLP	0.8161	0.8134	0.8108	0.7977	0.7950	0.7819	0.7819	0.7792	0.7871	0.7950	0.8003	0.8055 (40)
HLP (average)												0.7970
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6907 (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	22.7287	22.3911	21.9158	21.0393	20.3830	19.6553	19.2623	19.7343	20.2482	21.0269	21.9214	22.6518 (42b)
Hot water usage for other uses	31.9444	30.7827	29.6211	28.4595	27.2979	26.1363	26.1363	27.2979	28.4595	29.6211	30.7827	31.9444 (42c)
Average daily hot water use (litres/day)												50.1134 (43)
Daily hot water use	54.6730	53.1739	51.5369	49.4988	47.6810	45.7916	45.3986	47.0322	48.7078	50.6480	52.7041	54.5962 (44)
Energy conte	86.5887	75.7189	79.2103	67.7614	64.1877	56.3062	54.9056	58.2357	60.0615	68.7289	75.0867	85.4844 (45)
Energy content (annual)										Total = Sum(45)m =		832.2761
Distribution loss (46)m = 0.15 x (45)m	12.9883	11.3578	11.8815	10.1642	9.6282	8.4459	8.2358	8.7354	9.0092	10.3093	11.2630	12.8227 (46)
Water storage loss (or HIU loss):												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	141.8655	125.6463	134.4871	121.2551	119.4645	109.7998	110.1824	113.5125	113.5552	124.0057	128.5804	140.7612 (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	141.8655	125.6463	134.4871	121.2551	119.4645	109.7998	110.1824	113.5125	113.5552	124.0057	128.5804	140.7612 (64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1483.1159 (64)
Electric shower(s)	42.0972	37.5090	40.9584	39.0861	39.8195	37.9840	39.2501	39.8195	39.0861	40.9584	40.1882	42.0972 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												478.8537 (64a)
Heat gains from water heating, kWh/month	83.5365	74.4957	80.7985	75.0971	75.5187	71.0127	72.2901	73.5397	72.5369	77.3134	77.8083	83.1693 (65)

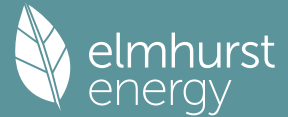
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.7400	84.9622	76.7400	79.2980	76.7400	79.2980	76.7400	76.7400	79.2980	76.7400	79.2980	76.7400 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.2859	148.8143	144.9628	136.7636	126.4135	116.6859	110.1872	108.6589	112.5103	120.7096	131.0596	140.7872 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534 (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)	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276 (71)
Water heating gains (Table 5)	112.2802	110.8567	108.6001	104.3016	101.5037	98.6288	97.1641	98.8437	100.7457	103.9159	108.0671	111.7867 (72)
Total internal gains	384.6665	392.9935	378.6633	368.7235	353.0175	342.9730	332.4517	332.6029	340.9144	349.7258	366.7851	377.6743 (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
Northwest	8.4300	11.2829	0.4000	0.7000	0.7700	18.4562 (81)

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Solar gains	18.4562	37.5680	67.6856	111.1593	149.4199	159.2974	149.0195	118.8000	82.4760	45.9111	23.2226	15.0722 (83)
Total gains	403.1226	430.5615	446.3489	479.8828	502.4374	502.2704	481.4711	451.4029	423.3904	395.6369	390.0077	392.7466 (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	42.9393	43.0781	43.2178	43.9302	44.0756	44.8168	44.8168	44.9680	44.5173	44.0756	43.7859	43.5000
alpha	3.8626	3.8719	3.8812	3.9287	3.9384	3.9878	3.9878	3.9979	3.9678	3.9384	3.9191	3.9000
util living area	0.9418	0.9225	0.8883	0.7995	0.6616	0.4823	0.3536	0.3912	0.5972	0.8148	0.9100	0.9460 (86)
MIT	19.8178	19.9897	20.2488	20.6097	20.8524	20.9681	20.9927	20.9892	20.9256	20.6405	20.2072	19.8005 (87)
Th 2	20.2394	20.2417	20.2440	20.2554	20.2576	20.2691	20.2691	20.2714	20.2645	20.2576	20.2531	20.2485 (88)
util rest of house	0.9337	0.9119	0.8729	0.7736	0.6222	0.4318	0.2964	0.3315	0.5446	0.7855	0.8963	0.9385 (89)
MIT 2	19.1660	19.3345	19.5862	19.9331	20.1484	20.2499	20.2659	20.2664	20.2165	19.9688	19.5569	19.1564 (90)
Living area fraction	19.4696	19.6397	19.8948	20.2482	20.4763	20.5845	20.6044	20.6031	20.5468	20.2817	19.8598	19.4564 (92)
MIT	19.4696	19.6397	19.8948	20.2482	20.4763	20.5845	20.6044	20.6031	20.5468	20.2817	19.8598	19.4564 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4696	19.6397	19.8948	20.2482	20.4763	20.5845	20.6044	20.6031	20.5468	20.2817	19.8598	19.4564 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9241	0.9024	0.8651	0.7733	0.6341	0.4539	0.3228	0.3589	0.5653	0.7865	0.8882	0.9292 (94)
Useful gains	372.5208	388.5347	386.1264	371.0955	318.6034	227.9656	155.4077	162.0005	239.3364	311.1708	346.4041	364.9383 (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	619.2137	599.7267	543.2447	452.7791	349.0087	234.0488	156.6115	163.8266	253.8267	385.0111	510.7767	614.7310 (97)
Space heating kWh	183.5395	141.9210	116.8960	58.8122	22.6216	0.0000	0.0000	0.0000	0.0000	54.9372	118.3483	185.8458 (98a)
Space heating requirement - total per year (kWh/year)												882.9215
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	183.5395	141.9210	116.8960	58.8122	22.6216	0.0000	0.0000	0.0000	0.0000	54.9372	118.3483	185.8458 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												882.9215
Space heating per m2										(98c) / (4) =		17.6514 (99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space and Water												1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500 (305)
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system												1.5000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	183.5395	141.9210	116.8960	58.8122	22.6216	0.0000	0.0000	0.0000	0.0000	54.9372	118.3483	185.8458 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	289.0748	223.5256	184.1112	92.6292	35.6290	0.0000	0.0000	0.0000	0.0000	86.5260	186.3985	292.7071
Space heating requirement	289.0748	223.5256	184.1112	92.6292	35.6290	0.0000	0.0000	0.0000	0.0000	86.5260	186.3985	292.7071 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement	141.8655	125.6463	134.4871	121.2551	119.4645	109.7998	110.1824	113.5125	113.5552	124.0057	128.5804	140.7612 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	212.7983	188.4695	201.7307	181.8827	179.1968	164.6997	165.2736	170.2687	170.3328	186.0086	192.8706	211.1419
Water heating fuel	212.7983	188.4695	201.7307	181.8827	179.1968	164.6997	165.2736	170.2687	170.3328	186.0086	192.8706	211.1419 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	9.9771	9.0115	9.9771	9.6552	9.9771	9.6552	9.9771	9.9771	9.6552	9.9771	9.6552	9.9771 (331)
Lighting	15.9106	12.7641	11.4927	8.4200	6.5039	5.3137	5.9330	7.7120	10.0171	13.1430	14.8450	16.3529 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-12.4805	-20.8558	-35.8898	-46.8625	-55.3907	-53.6269	-52.8419	-47.2251	-37.6661	-26.2893	-14.6546	-10.3152 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												1390.6013 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2224.6738 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												13.9060 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7700)												
mechanical ventilation fans (SFP = 0.7700)												117.4720 (330a)
Total electricity for the above, kWh/year												117.4720 (331)
Electricity for lighting (calculated in Appendix L)												128.4080 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-414.0986 (333)

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Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	3925.9102 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			280.0000 (367)
Space and Water heating from Heat pump	1291.1697	0.1558	77.3665 (367)
Electrical energy for heat distribution (space & water)	13.9060	0.0000	5.2879 (372)
Overall CO2 factor for heat network			0.0537 (386)
Total CO2 associated with community systems			194.1423 (373)
Energy for instantaneous electric shower(s)	478.8537	0.1391	66.6191 (264a)
Space and water heating			194.1423 (376)
Pumps, fans and electric keep-hot	117.4720	0.1387	16.2948 (378)
Energy for lighting	128.4080	0.1443	18.5332 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-414.0986	0.1317	-54.5300
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-54.5300 (380)
Total CO2, kg/year			241.0595 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.8200 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	1291.1697	1.5767	783.0748 (467)
Electrical energy for heat distribution (space & water)	13.9060	0.0000	55.7149 (472)
Overall CO2 factor for heat network			0.5658 (486)
Total CO2 associated with community systems			2045.5346 (473)
Energy for instantaneous electric shower(s)	478.8537	1.5143	725.1445 (278a)
Space and water heating			2045.5346 (476)
Pumps, fans and electric keep-hot	117.4720	1.5128	177.7116 (478)
Energy for lighting	128.4080	1.5338	196.9565 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-414.0986	1.4865	-615.5654
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-615.5654 (480)
Total Primary energy kWh/year			2529.7817 (483)
Dwelling Primary energy Rate (DPER)			50.5800 (484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	50.0200 (1b)	2.5000 (2b)	125.0500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.0500 (5)

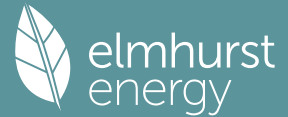
2. Ventilation rate

	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	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1599 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4099	(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) =		0.3484 (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)

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Adj infilt rate	0.4443	0.4356	0.4268	0.3833	0.3746	0.3310	0.3310	0.3223	0.3484	0.3746	0.3920	0.4094 (22b)
Effective ac	0.5987	0.5949	0.5911	0.5735	0.5702	0.5548	0.5548	0.5519	0.5607	0.5702	0.5768	0.5838 (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
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			8.4300	1.1450	9.6527		(27)
External Wall	18.5300	8.4300	10.1000	0.1800	1.8180		(29a)
Communal Wall	11.2000	1.8900	9.3100	0.1800	1.6758		(29a)
Roof	50.0200		50.0200	0.1100	5.5022		(30)
Total net area of external elements Aum(A, m2)			79.7500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	20.5387		(33)
Main dwelling							
Party Wall			41.0700	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							126.1479 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	4.5200	0.0500	0.2260
E4 Jamb	13.5200	0.0500	0.6760
E7 Party floor between dwellings (in blocks of flats)	4.4800	0.0700	0.3136
E18 Party wall between dwellings	7.5000	0.0600	0.4500
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.4300	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.4100	0.0200	0.1482
E15 Flat roof with parapet	7.4100	0.5600	4.1496
P4 Party wall - Roof (insulation at ceiling level)	16.4300	0.1200	1.9716
R7 Flat ceiling (inverted)	4.4800	0.0400	0.1792
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.2642 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	28.8029 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	24.7057	24.5476	24.3926	23.6645	23.5283	22.8942	22.8942	22.7767	23.1384	23.5283	23.8039	24.0920 (38)
Average = Sum(39)m / 12 =	53.5086	53.3505	53.1954	52.4674	52.3312	51.6970	51.6970	51.5796	51.9413	52.3312	52.6067	52.4667 (39)
HLP	1.0697	1.0666	1.0635	1.0489	1.0462	1.0335	1.0335	1.0312	1.0384	1.0462	1.0517	1.0575 (40)
HLP (average)												1.0489
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

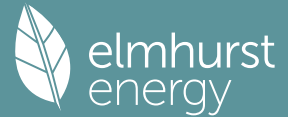
4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6907 (42)
Hot water usage for mixer showers												
Hot water usage for baths	52.5668	51.7768	50.6257	48.4231	46.7977	44.9851	43.9548	45.0972	46.3496	48.2958	50.5456	52.3654 (42a)
Hot water usage for other uses	22.7287	22.3911	21.9158	21.0393	20.3830	19.6553	19.2623	19.7343	20.2482	21.0269	21.9214	22.6518 (42b)
Average daily hot water use (litres/day)	31.9444	30.7827	29.6211	28.4595	27.2979	26.1363	26.1363	27.2979	28.4595	29.6211	30.7827	31.9444 (42c)
Daily hot water use	107.2398	104.9507	102.1626	97.9220	94.4787	90.7767	89.3534	92.1294	95.0573	98.9438	103.2498	106.9616 (44)
Energy conte	169.8417	149.4484	157.0201	134.0503	127.1865	111.6206	108.0652	114.0755	117.2152	134.2658	147.0982	167.4760 (45)
Energy content (annual)										Total = Sum(45)m =		1637.3633
Distribution loss (46)m = 0.15 x (45)m	25.4762	22.4173	23.5530	20.1075	19.0780	16.7431	16.2098	17.1113	17.5823	20.1399	22.0647	25.1214 (46)
Water storage loss (or HIU loss):												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (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	216.4366	191.5341	203.6150	179.1421	173.7814	156.7124	154.6601	160.6704	162.3070	180.8607	192.1901	214.0709 (62)
WWHRS	-24.0313	-21.2535	-22.2555	-18.4284	-17.1746	-14.6964	-13.7756	-14.6489	-15.2055	-17.9256	-20.3075	-23.5863 (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	192.4052	170.2806	181.3595	160.7137	156.6068	142.0160	140.8845	146.0215	147.1015	162.9351	171.8825	190.4846 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1962.6915 (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)
Heat gains from water heating, kWh/month	93.7483	83.3602	89.4851	80.6452	79.5654	73.1873	73.2076	75.2060	75.0475	81.9193	84.9836	92.9617 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.7400	84.9622	76.7400	79.2980	76.7400	79.2980	76.7400	76.7400	79.2980	76.7400	79.2980	76.7400 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.2859	148.8143	144.9628	136.7636	126.4135	116.6859	110.1872	108.6589	112.5103	120.7096	131.0596	140.7872 (68)

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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534 (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)	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276 (71)
Water heating gains (Table 5)	126.0057	124.0479	120.2757	112.0072	106.9428	101.6491	98.3973	101.0834	104.2327	110.1066	118.0328	124.9485 (72)
Total internal gains	401.3920	409.1846	393.3388	379.4291	361.4566	345.9933	333.6849	334.8426	344.4013	358.9165	379.7508	393.8361 (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	

Northwest					8.4300	11.2829	0.6300	0.7000	0.7700			29.0684 (81)	

Solar gains	29.0684	59.1697	106.6049	175.0759	235.3363	250.8934	234.7056	187.1101	129.8997	72.3100	36.5756	23.7388 (83)	
Total gains	430.4604	468.3543	499.9437	554.5050	596.7929	596.8867	568.3905	521.9526	474.3011	431.2265	416.3264	417.5749 (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	32.7565	32.8536	32.9494	33.4066	33.4935	33.9044	33.9044	33.9816	33.7449	33.4935	33.3181	33.1366
alpha	3.1838	3.1902	3.1966	3.2271	3.2329	3.2603	3.2603	3.2654	3.2497	3.2329	3.2212	3.2091
util living area	0.9468	0.9287	0.8950	0.8123	0.6809	0.5150	0.3878	0.4350	0.6489	0.8439	0.9227	0.9510 (86)
MIT	19.2457	19.4682	19.8287	20.3299	20.7080	20.9145	20.9743	20.9627	20.8155	20.3443	19.7402	19.2192 (87)
Th 2	20.0256	20.0282	20.0308	20.0428	20.0450	20.0555	20.0555	20.0574	20.0514	20.0450	20.0405	20.0357 (88)
util rest of house	0.9385	0.9176	0.8784	0.7832	0.6342	0.4499	0.3093	0.3530	0.5844	0.8130	0.9089	0.9433 (89)
MIT 2	17.9994	18.2789	18.7285	19.3420	19.7735	19.9924	20.0422	20.0368	19.9020	19.3747	18.6322	17.9727 (90)
Living area fraction									FLA = Living area / (4) =			0.4658 (91)
MIT	18.5799	18.8329	19.2410	19.8022	20.2088	20.4219	20.4764	20.4681	20.3275	19.8263	19.1483	18.5533 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5799	18.8329	19.2410	19.8022	20.2088	20.4219	20.4764	20.4681	20.3275	19.8263	19.1483	18.5533 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9227	0.9010	0.8625	0.7752	0.6427	0.4759	0.3449	0.3895	0.6042	0.8050	0.8933	0.9281 (94)
Useful gains	397.2039	421.9659	431.1818	429.8275	383.5492	284.0532	196.0122	203.2963	286.5527	347.1213	371.8977	387.5608 (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	764.0999	743.3260	677.7628	572.0097	445.2763	300.9760	200.3988	209.8310	323.4646	482.8245	633.8229	759.2163 (97)
Space heating kWh	272.9706	215.9540	183.4563	102.3712	45.9250	0.0000	0.0000	0.0000	0.0000	100.9632	188.5862	276.5117 (98a)
Space heating requirement - total per year (kWh/year)												1386.7381
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	272.9706	215.9540	183.4563	102.3712	45.9250	0.0000	0.0000	0.0000	0.0000	100.9632	188.5862	276.5117 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1386.7381
Space heating per m2										(98c) / (4) =		27.7237 (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	272.9706	215.9540	183.4563	102.3712	45.9250	0.0000	0.0000	0.0000	0.0000	100.9632	188.5862	276.5117 (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)	295.7428	233.9697	198.7609	110.9114	49.7562	0.0000	0.0000	0.0000	0.0000	109.3859	204.3187	299.5793 (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	192.4052	170.2806	181.3595	160.7137	156.6068	142.0160	140.8845	146.0215	147.1015	162.9351	171.8825	190.4846 (64)
Efficiency of water heater (217)m	84.8438	84.5938	84.0856	83.0763	81.6771	79.8000	79.8000	79.8000	79.8000	83.0191	84.2682	79.8000 (216)
Fuel for water heating, kWh/month	226.7757	201.2921	215.6844	193.4531	191.7389	177.9649	176.5470	182.9843	184.3378	196.2622	203.9707	224.3777 (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	7.0685	7.3041	7.0685	7.3041	7.3041 (231)
Lighting	15.9451	12.7917	11.5175	8.4382	6.5179	5.3252	5.9459	7.7287	10.0388	13.1714	14.8771	16.3882 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-13.5536	-20.1624	-30.5685	-36.3268	-40.9181	-38.8583	-38.4088	-35.4019	-30.3885	-23.9265	-15.2784	-11.5999 (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)

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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	-4.7561	-10.2378	-20.7819	-31.8508	-42.7322	-43.1411	-42.6097	-35.7738	-25.8413	-14.8225	-6.4097	-3.7423	(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												1502.4248	(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												2375.3888	(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)												128.6858	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-618.0910	(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												3474.4085	(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	1502.4248	0.2100	315.5092	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2375.3888	0.2100	498.8317	(264)
Space and water heating			814.3409	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	128.6858	0.1443	18.5733	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-335.3918	0.1335	-44.7587	
PV Unit electricity exported	-282.6992	0.1253	-35.4284	
Total			-80.1871	(269)
Total CO2, kg/year			764.6563	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.2900	(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	1502.4248	1.1300	1697.7401	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2375.3888	1.1300	2684.1894	(278)
Space and water heating			4381.9294	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	128.6858	1.5338	197.3825	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-335.3918	1.4932	-500.7908	
PV Unit electricity exported	-282.6992	0.4600	-130.0390	
Total			-630.8298	(283)
Total Primary energy kWh/year			4078.5829	(286)
Target Primary Energy Rate (TPER)			81.5400	(287)