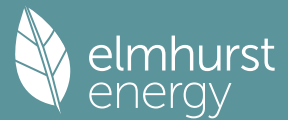


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7. Mean internal temperature (heating season)												
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	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	0.9518	0.9290	0.8889	0.8024	0.6755	0.5168	0.3896	0.4320	0.6408	0.8442	0.9288	0.9568 (86)
MIT	19.0799	19.3597	19.7739	20.2986	20.6838	20.9016	20.9696	20.9577	20.8018	20.2871	19.6070	19.0363 (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	0.9443	0.9182	0.8719	0.7730	0.6291	0.4518	0.3106	0.3505	0.5768	0.8139	0.9162	0.9500 (89)
MIT 2	18.2848	18.5590	18.9611	19.4628	19.8071	19.9912	20.0359	20.0321	19.9180	19.4665	18.8132	18.2483 (90)
Living area fraction	18.6379	18.9146	19.3221	19.8340	20.1964	20.3955	20.4506	20.4431	20.3105	19.8310	19.1657	0.4441 (91)
MIT	18.6379	18.9146	19.3221	19.8340	20.1964	20.3955	20.4506	20.4431	20.3105	19.8310	19.1657	18.5983 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.4879	18.7646	19.1721	19.6840	20.0464	20.2455	20.3006	20.2931	20.1605	19.6810	19.0157	18.4483 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9292	0.9011	0.8544	0.7612	0.6296	0.4658	0.3320	0.3719	0.5851	0.8010	0.8997	0.9357 (94)
Useful gains	461.5710	508.2223	532.0603	531.2987	468.7586	342.9375	233.4110	242.8417	348.7622	420.7255	436.5457	446.1178 (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	945.4847	921.6849	840.3432	706.3565	545.3363	364.2682	238.7732	250.5645	393.0169	593.3283	782.4254	940.2266 (97)
Space heating kWh	360.0318	277.8469	229.3625	126.0416	56.9738	0.0000	0.0000	0.0000	0.0000	128.4165	249.0334	367.6169 (98a)
Space heating requirement - total per year (kWh/year)												1795.3234
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	360.0318	277.8469	229.3625	126.0416	56.9738	0.0000	0.0000	0.0000	0.0000	128.4165	249.0334	367.6169 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1795.3234
Space heating per m2										(98c) / (4) =		28.9942 (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 %)												88.9000 (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	360.0318	277.8469	229.3625	126.0416	56.9738	0.0000	0.0000	0.0000	0.0000	128.4165	249.0334	367.6169 (98)
Space heating efficiency (main heating system 1)	88.9000	88.9000	88.9000	88.9000	88.9000	0.0000	0.0000	0.0000	0.0000	88.9000	88.9000	88.9000 (210)
Space heating fuel (main heating system)	404.9852	312.5387	258.0005	141.7791	64.0875	0.0000	0.0000	0.0000	0.0000	144.4505	280.1276	413.5174 (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	226.1651	200.1638	213.1132	188.5760	183.5880	166.2894	164.7846	170.8765	172.2391	191.0132	201.8001	223.8637 (64)
Efficiency of water heater	85.3724	85.0842	84.5392	83.5375	82.1829	80.3000	80.3000	80.3000	80.3000	83.5493	84.8332	80.3000 (216)
Fuel for water heating, kWh/month	264.9161	235.2536	252.0879	225.7382	223.3895	207.0851	205.2112	212.7977	214.4946	228.6234	237.8787	85.4368 (217)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	262.0224 (219)
(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	19.6548	17.7527	19.6548	19.0207	19.6548	19.0207	19.6548	19.6548	19.0207	19.6548	19.0207	19.6548 (221)
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 (232)
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 (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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												2019.4864 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												2769.4983 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7700)												
mechanical ventilation fans (SFP = 0.7700)												145.4191 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)

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Total electricity for the above, kWh/year	231.4191	(231)
Electricity for lighting (calculated in Appendix L)	153.5922	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5173.9960	(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	2019.4864	0.2100	424.0921 (261)
Total CO2 associated with community systems			0.0000 (262)
Water heating (other fuel)	2769.4983	0.2100	581.5947 (264)
Space and water heating			1005.6868 (265)
Pumps, fans and electric keep-hot	231.4191	0.1387	32.1007 (267)
Energy for lighting	153.5922	0.1443	22.1681 (268)
Total CO2, kg/year			1059.9556 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			17.1200 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2019.4864	1.1300	2282.0196 (275)
Total CO2 associated with community systems			0.0000 (276)
Water heating (other fuel)	2769.4983	1.1300	3129.5331 (278)
Space and water heating			5411.5527 (279)
Pumps, fans and electric keep-hot	231.4191	1.5128	350.0908 (281)
Energy for lighting	153.5922	1.5338	235.5849 (282)
Total Primary energy kWh/year			5997.2284 (286)
Dwelling Primary energy Rate (DPER)			96.8500 (287)

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

1. Overall dwelling characteristics

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

2. Ventilation rate

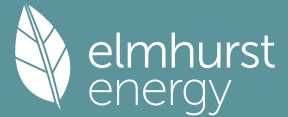
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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
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	Openings	NetArea	U-value	A x U	K-value	A x K
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Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K
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						(36a) =	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)													
(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 =													79.2689
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	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)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

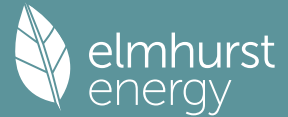
Assumed occupancy													2.0354 (42)
Hot water usage for mixer showers													
Hot water usage for baths													
Hot water usage for other uses													
Average daily hot water use (litres/day)													109.4196 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	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													
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	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.5411	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
WWHRS	239.4798	211.9117	225.2472	198.1075	192.1325	173.2108	170.4907	177.5802	179.4217	199.9914	212.5912	236.8541	(62)
PV diverter	-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)
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)
12Total per year (kWh/year)	212.8065	188.3215	200.5450	177.6531	173.0697	156.8987	155.2007	161.3208	162.5445	180.0951	190.0511	210.6747	(64)
Electric shower(s)													
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													2169 (64)
Heat gains from water heating, kWh/month													
	75.4229	66.6634	70.6906	61.8023	59.6799	53.5241	52.5185	54.8413	55.5892	62.2930	66.6181	74.5499	(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	89.7006	99.3114	89.7006	92.6907	89.7006	92.6907	89.7006	89.7006	92.6907	89.7006	92.6907	89.7006	(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)	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	101.3749	99.2014	95.0142	85.8365	80.2150	74.3390	70.5894	73.7114	77.2072	83.7272	92.5251	100.2014	(72)
	425.3680	434.6499	416.2036	400.1200	379.0168	361.3905	346.8075	348.0849	359.2191	375.6449	399.9245	416.3512	(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			
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	501.8147	583.9258	662.6383	762.4006	826.7965	821.7411	784.2519	721.0879	646.5957	552.8165	495.1653	479.2848 (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	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	0.9557	0.9334	0.8938	0.8105	0.6891	0.5387	0.4134	0.4600	0.6670	0.8579	0.9355	0.9604 (86)
MIT	18.5817	18.9062	19.4041	20.0383	20.5314	20.8319	20.9406	20.9191	20.6839	20.0168	19.1956	18.5280 (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	0.9482	0.9223	0.8758	0.7786	0.6372	0.4623	0.3166	0.3605	0.5945	0.8262	0.9228	0.9536 (89)
MIT 2	17.0602	17.4681	18.0885	18.8623	19.4288	19.7459	19.8378	19.8259	19.6122	18.8601	17.8452	16.9976 (90)
Living area fraction	17.7359	18.1068	18.6728	19.3846	19.9185	20.2282	20.3276	20.3114	fLA = Living area / (4) =	19.3738	18.4450	17.6773 (92)
MIT	17.7359	18.1068	18.6728	19.3846	19.9185	20.2282	20.3276	20.3114	20.0882	19.3738	18.4450	17.6773 (93)
Temperature adjustment												0.0000
adjusted MIT	17.7359	18.1068	18.6728	19.3846	19.9185	20.2282	20.3276	20.3114	20.0882	19.3738	18.4450	17.6773 (93)
8. Space heating requirement												
Utilisation	0.9293	0.9005	0.8533	0.7636	0.6402	0.4878	0.3572	0.4010	0.6100	0.8102	0.9022	0.9359 (94)
Useful gains	466.3420	525.8304	565.4348	582.1953	529.3002	400.8645	280.1077	289.1528	394.4195	447.8764	446.7513	448.5530 (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	1079.8788	1059.2497	974.3186	831.1075	650.2904	441.5548	292.4406	306.3756	471.3443	694.2311	900.9845	1074.4404 (97)
Space heating kWh	456.4713	358.4578	304.2095	179.2168	90.0167	0.0000	0.0000	0.0000	0.0000	183.2879	327.0479	465.6602 (98a)
Space heating requirement - total per year (kWh/year)												2364.3681
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	456.4713	358.4578	304.2095	179.2168	90.0167	0.0000	0.0000	0.0000	0.0000	183.2879	327.0479	465.6602 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2364.3681
Space heating per m2										(98c) / (4) =		38.1842 (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 %)												92.4000 (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	456.4713	358.4578	304.2095	179.2168	90.0167	0.0000	0.0000	0.0000	0.0000	183.2879	327.0479	465.6602 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	494.0166	387.9413	329.2311	193.9576	97.4206	0.0000	0.0000	0.0000	0.0000	198.3636	353.9479	503.9612 (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	212.8065	188.3215	200.5450	177.6531	173.0697	156.8987	155.2007	161.3208	162.5445	180.0951	190.0511	210.6747 (64)
Efficiency of water heater	85.9723	85.7374	85.2716	84.4002	83.0489	80.3000	80.3000	80.3000	80.3000	84.4191	85.5332	80.3000 (216)
Fuel for water heating, kWh/month	247.5290	219.6492	235.1838	210.4889	208.3950	195.3906	193.2760	200.8976	202.4215	213.3344	222.1956	244.8851 (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	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)	-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)	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)	-4.3526	-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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

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Annual totals kWh/year		
Space heating fuel - main system 1	2558.8399	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2593.6469	(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	4776.7961	(238)

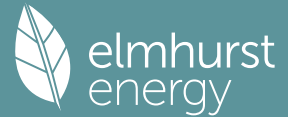
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2558.8399	0.2100	537.3564 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2593.6469	0.2100	544.6658 (264)
Space and water heating			1082.0222 (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			1036.2040 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.7300 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2558.8399	1.1300	2891.4891 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2593.6469	1.1300	2930.8210 (278)
Space and water heating			5822.3100 (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			5540.4958 (286)
Target Primary Energy Rate (TPER)			89.4800 (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	83 B	DER	15.73	TER	15.48	
Environmental	88 B	% DER < TER				-1.61
CO ₂ Emissions (t/year)	0.96	DFEE	42.54	TFEE	41.49	
Compliance Check	See BREL	% DFEE < TFEE				-2.52
% DPER < TPER	-8.48	DPER	89.66	TPER	82.65	
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

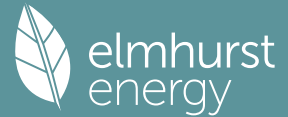
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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

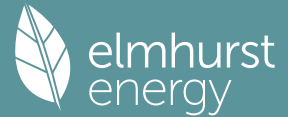
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.2009 (42)
Hot water usage for mixer showers												
	76.4016	75.2535	73.5804	70.3792	68.0168	65.3823	63.8848	65.5452	67.3654	70.1941	73.4640	76.1089 (42a)
Hot water usage for baths												
	26.4074	26.0152	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)												128.7138 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	139.9783	137.0864	133.5094	127.9383	123.4618	118.6301	116.6760	120.2365	124.0054	129.0903	134.7512	139.5963 (44)
Energy conte	221.6915	195.2092	205.1989	175.1411	166.2033	145.8696	141.1095	148.8779	152.9110	175.1744	191.9778	218.5741 (45)
Energy content (annual)										Total = Sum(45)m =		2137.9381
Distribution loss (46)m = 0.15 x (45)m												
	33.2537	29.2814	30.7798	26.2712	24.9305	21.8804	21.1664	22.3317	22.9366	26.2762	28.7967	32.7861 (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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
	272.6504	241.2366	256.1578	224.4562	217.1622	195.1847	192.0684	199.8368	202.2261	226.1333	241.2928	269.5330 (62)
WWHRS	-38.1483	-33.7387	-35.3292	-29.2540	-27.2637	-23.3297	-21.8679	-23.2543	-24.1378	-28.4558	-32.2370	-37.4419 (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	234.5020	207.4978	220.8286	195.2022	189.8985	171.8549	170.2005	176.5824	178.0882	197.6774	209.0558	232.0911 (64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				2383.4796 (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	86.4521	76.4139	80.9684	70.5632	68.0023	60.8304	59.6586	62.2416	63.1717	70.9852	76.1614	85.4156 (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	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)	116.1991	113.7112	108.8285	98.0044	91.4010	84.4867	80.1863	83.6581	87.7384	95.4102	105.7797	114.8059 (72)
Total internal gains	465.5419	475.4860	455.1274	436.8045	413.3947	393.9790	377.9188	379.3879	391.7595	409.9301	437.1059	455.6336 (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	560.1132	648.2955	716.3318	791.5419	831.5771	816.2958	782.2465	736.6189	686.0931	608.2125	552.6692	535.0024 (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	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	0.9898	0.9776	0.9497	0.8692	0.7233	0.5314	0.3864	0.4269	0.6633	0.9067	0.9783	0.9918 (86)
MIT	19.9473	20.1539	20.4234	20.7355	20.9202	20.9876	20.9981	20.9969	20.9615	20.7093	20.2776	19.9139 (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	0.9868	0.9713	0.9358	0.8366	0.6669	0.4584	0.3058	0.3425	0.5865	0.8751	0.9710	0.9894 (89)
MIT 2	19.1027	19.3070	19.5684	19.8626	20.0140	20.0686	20.0734	20.0752	20.0507	19.8491	19.4392	19.0767 (90)
Living area fraction									FLA = Living area / (4) =			0.4034 (91)
MIT	19.4435	19.6486	19.9133	20.2147	20.3795	20.4393	20.4465	20.4470	20.4181	20.1961	19.7774	19.4145 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.2935	19.4986	19.7633	20.0647	20.2295	20.2893	20.2965	20.2970	20.2681	20.0461	19.6274	19.2645 (93)

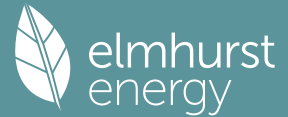
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9837	0.9667	0.9308	0.8367	0.6775	0.4757	0.3253	0.3628	0.6036	0.8744	0.9668	0.9867 (94)
Useful gains	551.0045	626.7348	666.7635	662.3114	563.3579	388.3057	254.4435	267.2574	414.1446	531.8426	534.3377	527.9075 (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	1068.6477	1037.8888	940.5774	781.7478	595.7046	392.2422	254.8475	267.9768	427.4666	659.7196	879.4082	1062.9061 (97)
Space heating kWh	385.1265	276.2955	203.7175	85.9942	24.0659	0.0000	0.0000	0.0000	0.0000	95.1405	248.4508	398.0390 (98a)
Space heating requirement - total per year (kWh/year)												1716.8298
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	385.1265	276.2955	203.7175	85.9942	24.0659	0.0000	0.0000	0.0000	0.0000	95.1405	248.4508	398.0390 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1716.8298
Space heating per m2										(98c) / (4) =		25.1845 (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 %)												88.9000 (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	385.1265	276.2955	203.7175	85.9942	24.0659	0.0000	0.0000	0.0000	0.0000	95.1405	248.4508	398.0390 (98)
Space heating efficiency (main heating system 1)	88.9000	88.9000	88.9000	88.9000	88.9000	0.0000	0.0000	0.0000	0.0000	88.9000	88.9000	88.9000 (210)
Space heating fuel (main heating system)	433.2132	310.7936	229.1536	96.7314	27.0708	0.0000	0.0000	0.0000	0.0000	107.0197	279.4722	447.7379 (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	234.5020	207.4978	220.8286	195.2022	189.8985	171.8549	170.2005	176.5824	178.0882	197.6774	209.0558	232.0911 (64)
Efficiency of water heater (217)m	85.4371	84.9958	84.2089	82.7480	81.1833	80.3000	80.3000	80.3000	80.3000	82.9059	84.7524	80.3000 (216)
Fuel for water heating, kWh/month	274.4734	244.1272	262.2389	235.8995	233.9131	214.0161	211.9558	219.9034	221.7786	238.4360	246.6666	271.3682 (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	23.3736	21.1117	23.3736	22.6197	23.3736	22.6197	23.3736	23.3736	22.6197	23.3736	22.6197	23.3736 (231)
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 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1931.1922 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												2874.7770 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9100)												
mechanical ventilation fans (SFP = 0.9100)												189.2058 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												275.2058 (231)
Electricity for lighting (calculated in Appendix L)												172.9042 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)

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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	5254.0792 (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	1931.1922	0.2100	405.5504 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2874.7770	0.2100	603.7032 (264)
Space and water heating			1009.2535 (265)
Pumps, fans and electric keep-hot	275.2058	0.1387	38.1744 (267)
Energy for lighting	172.9042	0.1443	24.9554 (268)
Total CO2, kg/year			1072.3834 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			15.7300 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1931.1922	1.1300	2182.2472 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2874.7770	1.1300	3248.4981 (278)
Space and water heating			5430.7452 (279)
Pumps, fans and electric keep-hot	275.2058	1.5128	416.3314 (281)
Energy for lighting	172.9042	1.5338	265.2062 (282)
Total Primary energy kWh/year			6112.2828 (286)
Dwelling Primary energy Rate (DPER)			89.6600 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
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

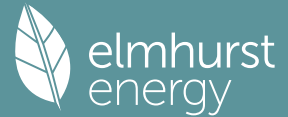
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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)

	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	5.0000	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

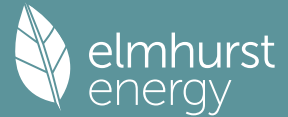
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			15.1600	1.1450	17.3588		(27)
Ground Floor			68.1700	0.1300	8.8621		(28a)
External Wall	52.2700	15.1600	37.1100	0.1800	6.6798		(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)

Full SAP Calculation Printout



Fabric heat loss, W/K = Sum (A x U)											
(26)...(30) + (32) = 41.9349											
(33)											
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K											
List of Thermal Bridges											
240.1684 (35)											
K1 Element											
E2 Other lintels (including other steel lintels)											
E4 Jamb											
E5 Ground floor (normal)											
E7 Party floor between dwellings (in blocks of flats)											
E16 Corner (normal)											
E17 Corner (inverted - internal area greater than external area)											
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											
Point Thermal bridges											
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											
Heat transfer coeff											
Average = Sum(39)m / 12 =											
HLP											
HLP (average)											
Days in mont											
4. Water heating energy requirements (kWh/year)											
Assumed occupancy											
Hot water usage for mixer showers											
Hot water usage for baths											
Hot water usage for other uses											
Average daily hot water use (litres/day)											
Daily hot water use											
Energy conte											
Energy content (annual)											
Distribution loss (46)m = 0.15 x (45)m											
Water storage loss (or HIU loss):											
Total storage loss											
If cylinder contains dedicated solar storage											
Primary loss											
Combi loss											
Total heat required for water heating calculated for each month											
WWHRS											
PV diverter											
Solar input											
FGHRS											
Output from w/h											
12Total per year (kWh/year)											
Electric shower(s)											
Heat gains from water heating, kWh/month											
5. Internal gains (see Table 5 and 5a)											
Metabolic gains (Table 5), Watts											
(66)m											
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											
Pumps, fans											
Losses e.g. evaporation (negative values) (Table 5)											
Water heating gains (Table 5)											
Total internal gains											
6. Solar gains											
[Jan]											
Area											
Solar flux											
Specific data											
Specific data											
Access factor											
Gains											
South											
West											
Solar gains											
Total gains											

Full SAP Calculation Printout



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	0.9905	0.9789	0.9525	0.8795	0.7457	0.5636	0.4153	0.4615	0.7008	0.9197	0.9808	0.9924 (86)
MIT	19.6231	19.8673	20.1987	20.5906	20.8526	20.9684	20.9937	20.9899	20.9167	20.5513	20.0144	19.5810 (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	0.9875	0.9725	0.9383	0.8456	0.6832	0.4752	0.3133	0.3547	0.6128	0.8887	0.9738	0.9900 (89)
MIT 2	18.2998	18.6091	19.0220	19.4931	19.7718	19.8788	19.8937	19.8938	19.8405	19.4631	18.8049	18.2518 (90)
Living area fraction									fLA = Living area / (4) =			0.4034 (91)
MIT	18.8336	19.1167	19.4967	19.9358	20.2078	20.3183	20.3375	20.3360	20.2747	19.9021	19.2928	18.7880 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8336	19.1167	19.4967	19.9358	20.2078	20.3183	20.3375	20.3360	20.2747	19.9021	19.2928	18.7880 (93)

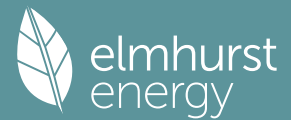
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9838	0.9670	0.9324	0.8473	0.7023	0.5100	0.3546	0.3979	0.6450	0.8892	0.9690	0.9868 (94)
Useful gains	564.3649	659.6749	721.2066	740.5159	653.8432	467.9221	311.8037	326.7591	486.4270	578.6509	554.9967	537.5910 (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	1248.0564	1218.3770	1111.6201	935.1137	719.6311	479.7161	313.5396	329.6870	519.6491	786.8213	1035.0075	1242.9284 (97)
Space heating kWh	508.6665	375.4478	290.4676	140.1104	48.9462	0.0000	0.0000	0.0000	0.0000	154.8788	345.6078	524.7711 (98a)
Space heating requirement - total per year (kWh/year)												2388.8962
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	508.6665	375.4478	290.4676	140.1104	48.9462	0.0000	0.0000	0.0000	0.0000	154.8788	345.6078	524.7711 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2388.8962
Space heating per m2										(98c) / (4) =		35.0432 (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 %)												92.4000 (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	508.6665	375.4478	290.4676	140.1104	48.9462	0.0000	0.0000	0.0000	0.0000	154.8788	345.6078	524.7711 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	550.5049	406.3288	314.3589	151.6346	52.9721	0.0000	0.0000	0.0000	0.0000	167.6177	374.0344	567.9341 (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	220.5080	195.0923	207.6625	183.7597	178.8799	162.0176	160.5984	166.5722	167.9324	186.2400	196.7479	218.2747 (64)
Efficiency of water heater (217)m	86.1111	85.7594	85.1005	83.8073	82.0043	80.3000	80.3000	80.3000	80.3000	83.9890	85.5753	80.3000 (216)
Fuel for water heating, kWh/month	256.0738	227.4881	244.0205	219.2644	218.1347	201.7653	199.9980	207.4373	209.1313	221.7434	229.9121	86.1884 (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	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)												
(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												2585.3855 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												2688.2220 (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)

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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	4848.9528 (238)

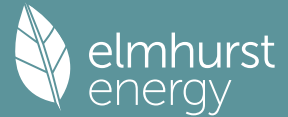
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2585.3855	0.2100	542.9309 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2688.2220	0.2100	564.5266 (264)
Space and water heating			1107.4576 (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			1055.4775 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.4800 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2585.3855	1.1300	2921.4856 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2688.2220	1.1300	3037.6909 (278)
Space and water heating			5959.1764 (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			5634.5594 (286)
Target Primary Energy Rate (TPER)			82.6500 (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	85 B	DER	12.53	TER	12.39		
Environmental	90 B	% DER < TER				-1.13	
CO ₂ Emissions (t/year)	0.78	DFEE	27.64	TFEE	27.65		
Compliance Check	See BREL	% DFEE < TFEE				0.03	
% DPER < TPER	-9.75	DPER	72.45	TPER	66.02		
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)

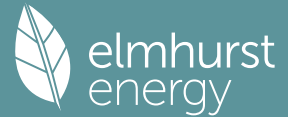
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	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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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	77.0867	77.3527	77.6205	78.9877	79.2669	80.6933	80.6933	80.9848	80.1166	79.2669	78.7104	78.1616
util living area	6.1391	6.1568	6.1747	6.2658	6.2845	6.3796	6.3796	6.3990	6.3411	6.2845	6.2474	6.2108
	0.9752	0.9442	0.8800	0.7352	0.5600	0.3899	0.2801	0.3098	0.5013	0.7943	0.9446	0.9800 (86)
MIT	20.3703	20.5642	20.7660	20.9342	20.9886	20.9991	20.9999	20.9998	20.9956	20.9137	20.6344	20.3395 (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	0.9696	0.9330	0.8592	0.7017	0.5202	0.3484	0.2365	0.2638	0.4524	0.7571	0.9317	0.9754 (89)
MIT 2	19.7206	19.9084	20.0971	20.2519	20.2952	20.3134	20.3138	20.3161	20.3070	20.2408	19.9880	19.6985 (90)
Living area fraction									fLA = Living area / (4) =			0.4034 (91)
MIT	19.9827	20.1729	20.3669	20.5271	20.5749	20.5900	20.5906	20.5919	20.5848	20.5123	20.2488	19.9571 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.8327	20.0229	20.2169	20.3771	20.4249	20.4400	20.4406	20.4419	20.4348	20.3623	20.0988	19.8071 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9655	0.9284	0.8570	0.7055	0.5273	0.3560	0.2445	0.2723	0.4613	0.7604	0.9275	0.9716 (94)
Ext temp.	540.7672	601.8730	613.8683	558.4367	438.4554	290.6374	191.2853	200.5719	316.5127	462.5129	512.5925	519.8198 (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	809.9028	785.8256	710.3075	584.0345	442.4189	290.8968	191.3034	200.6073	317.8136	495.0218	663.7972	802.5889 (97)
Space heating requirement - total per year (kWh/year)	200.2369	123.6161	71.7508	18.4304	2.9489	0.0000	0.0000	0.0000	0.0000	24.1866	108.8673	210.3801 (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)	200.2369	123.6161	71.7508	18.4304	2.9489	0.0000	0.0000	0.0000	0.0000	24.1866	108.8673	210.3801 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												760.4172
Space heating per m2										(98c) / (4) =		11.1547 (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 %)												88.9000 (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
	200.2369	123.6161	71.7508	18.4304	2.9489	0.0000	0.0000	0.0000	0.0000	24.1866	108.8673	210.3801 (98)
Space heating efficiency (main heating system 1)	88.9000	88.9000	88.9000	88.9000	88.9000	0.0000	0.0000	0.0000	0.0000	88.9000	88.9000	88.9000 (210)
Space heating fuel (main heating system)	225.2383	139.0508	80.7096	20.7317	3.3171	0.0000	0.0000	0.0000	0.0000	27.2065	122.4604	236.6481 (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	234.5020	207.4978	220.8286	195.2022	189.8985	171.8549	170.2005	176.5824	178.0882	197.6774	209.0558	232.0911 (64)
Efficiency of water heater (217)m	84.0448	83.3087	82.2513	80.9758	80.4190	80.3000	80.3000	80.3000	80.3000	81.1559	83.0512	80.3000 (216)
Fuel for water heating, kWh/month	279.0204	249.0709	268.4804	241.0623	236.1365	214.0161	211.9558	219.9034	221.7786	243.5775	251.7193	275.7359 (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	23.3736	21.1117	23.3736	22.6197	23.3736	22.6197	23.3736	23.3736	22.6197	23.3736	22.6197	23.3736 (231)
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 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												855.3624 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												2912.4572 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9100)												
mechanical ventilation fans (SFP = 0.9100)												189.2058 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												275.2058 (231)
Electricity for lighting (calculated in Appendix L)												172.9042 (232)

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

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PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4215.9296 (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	855.3624	0.2100	179.6261 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2912.4572	0.2100	611.6160 (264)
Space and water heating			791.2421 (265)
Pumps, fans and electric keep-hot	275.2058	0.1387	38.1744 (267)
Energy for lighting	172.9042	0.1443	24.9554 (268)
Total CO2, kg/year			854.3720 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.5300 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	855.3624	1.1300	966.5595 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2912.4572	1.1300	3291.0766 (278)
Space and water heating			4257.6361 (279)
Pumps, fans and electric keep-hot	275.2058	1.5128	416.3314 (281)
Energy for lighting	172.9042	1.5338	265.2062 (282)
Total Primary energy kWh/year			4939.1737 (286)
Dwelling Primary energy Rate (DPER)			72.4500 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
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

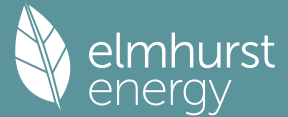
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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
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)

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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			0.0000			(36a) =
Total fabric heat loss			(33) + (36) + (36a) =			34.7341 (37)

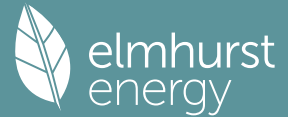
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	32.5771	32.4041	32.2344	31.4376	31.2885	30.5945	30.5945	30.4660	30.8618	31.2885	31.5901	31.9054	(38)
Average = Sum(39)m / 12 =	67.3112	67.1381	66.9685	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													
	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):													
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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
WWHRS	248.4501	219.8046	233.5398	205.1870	198.8494	179.1056	176.6158	183.6050	185.6124	207.0827	220.3602	245.6994	(62)
PV diverter	-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)
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)
12Total per year (kWh/year)	220.5080	195.0923	207.6625	183.7597	178.8799	162.0176	160.5984	166.5722	167.9324	186.2400	196.7479	218.2747	(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	78.4055	69.2878	73.4479	64.1562	61.9133	55.4841	54.5206	56.8446	57.6476	64.6509	69.2013	77.4909	(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	97.3459	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	105.3838	103.1068	98.7202	89.1058	83.2168	77.0613	73.2804	76.4040	80.0662	86.8964	96.1129	104.1545	(72)
	454.7318	464.8874	445.0244	427.9113	405.2158	386.5590	371.0181	372.1390	384.0926	401.4214	427.4445	444.9874	(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	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)						

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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	573.6499	682.1817	773.4603	873.9450	931.0164	917.5556	879.3971	821.3054	754.1814	650.7436	572.7581	544.7896 (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	0.9825	0.9604	0.9124	0.7961	0.6298	0.4511	0.3261	0.3638	0.5814	0.8565	0.9636	0.9860 (86)
MIT	19.9644	20.2129	20.5092	20.8055	20.9487	20.9923	20.9988	20.9979	20.9738	20.7602	20.3142	19.9217 (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	0.9781	0.9512	0.8934	0.7595	0.5779	0.3909	0.2612	0.2949	0.5137	0.8196	0.9534	0.9825 (89)
MIT 2	18.9037	19.2150	19.5768	19.9226	20.0688	20.1138	20.1178	20.1190	20.0980	19.8848	19.3531	18.8560 (90)
Living area fraction									fLA =	Living area / (4) =		0.4034 (91)
MIT	19.3316	19.6176	19.9529	20.2787	20.4238	20.4681	20.4732	20.4736	20.4513	20.2379	19.7408	19.2859 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3316	19.6176	19.9529	20.2787	20.4238	20.4681	20.4732	20.4736	20.4513	20.2379	19.7408	19.2859 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9735	0.9453	0.8900	0.7669	0.5967	0.4150	0.2874	0.3227	0.5400	0.8254	0.9484	0.9783 (94)
Useful gains	558.4278	644.8956	688.3695	670.2622	555.4994	380.7452	252.7167	265.0347	407.2434	537.1561	543.2060	532.9810 (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	1011.7929	988.1107	900.9233	752.9507	575.9654	383.3578	253.0299	265.5967	416.6168	636.3202	838.3928	1005.3159 (97)
Space heating kWh	337.3037	230.6405	158.1400	59.5357	15.2267	0.0000	0.0000	0.0000	0.0000	73.7781	212.5345	351.4172 (98a)
Space heating requirement - total per year (kWh/year)												1438.5763
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	337.3037	230.6405	158.1400	59.5357	15.2267	0.0000	0.0000	0.0000	0.0000	73.7781	212.5345	351.4172 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1438.5763
Space heating per m2										(98c) / (4) =		21.1028 (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 %)												92.4000 (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	337.3037	230.6405	158.1400	59.5357	15.2267	0.0000	0.0000	0.0000	0.0000	73.7781	212.5345	351.4172 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	365.0473	249.6109	171.1472	64.4326	16.4791	0.0000	0.0000	0.0000	0.0000	79.8464	230.0157	380.3216 (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	220.5080	195.0923	207.6625	183.7597	178.8799	162.0176	160.5984	166.5722	167.9324	186.2400	196.7479	218.2747 (64)
Efficiency of water heater (217)m	85.2891	84.7411	83.8048	82.2470	80.9140	80.3000	80.3000	80.3000	80.3000	82.5663	84.5472	80.3000 (216)
Fuel for water heating, kWh/month	258.5417	230.2217	247.7932	223.4242	221.0740	201.7653	199.9980	207.4373	209.1313	225.5641	232.7078	255.6034 (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)												
(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												1556.9008 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												2713.2622 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:

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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	3845.5083 (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	1556.9008	0.2100	326.9492 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2713.2622	0.2100	569.7851 (264)
Space and water heating			896.7342 (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			844.7542 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.3900 (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	1556.9008	1.1300	1759.2979 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2713.2622	1.1300	3065.9863 (278)
Space and water heating			4825.2842 (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			4500.6672 (286)
Target Primary Energy Rate (TPER)			66.0200 (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	82 B	DER	16.08	TER	15.40
Environmental	87 B	% DER < TER			-4.42
CO ₂ Emissions (t/year)	1	DFEE	42.41	TFEE	41.34
Compliance Check	See BREL	% DFEE < TFEE			-2.59
% DPER < TPER	-11.40	DPER	91.55	TPER	82.18
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)

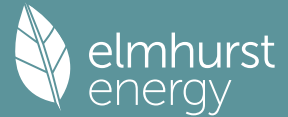
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.1626	0.1594	0.1562	0.1403	0.1371	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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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	32.0791	32.1597	32.2406	32.6515	32.7350	33.1587	33.1587	33.2447	32.9879	32.7350	32.5685	32.4037
alpha	3.1386	3.1440	3.1494	3.1768	3.1823	3.2106	3.2106	3.2163	3.1992	3.1823	3.1712	3.1602
util living area	0.9486	0.9206	0.8760	0.7873	0.6620	0.5051	0.3778	0.4144	0.6136	0.8250	0.9219	0.9544 (86)
MIT	19.1829	19.4863	19.8894	20.3732	20.7195	20.9146	20.9746	20.9655	20.8362	20.3726	19.7062	19.1334 (87)
Th 2	20.0418	20.0440	20.0462	20.0571	20.0592	20.0701	20.0701	20.0723	20.0658	20.0592	20.0549	20.0505 (88)
util rest of house	0.9406	0.9089	0.8579	0.7572	0.6161	0.4420	0.3024	0.3369	0.5507	0.7929	0.9085	0.9473 (89)
MIT 2	18.4003	18.6965	19.0862	19.5472	19.8552	20.0204	20.0597	20.0572	19.9624	19.5599	18.9238	18.3583 (90)
Living area fraction									fLA = Living area / (4) =			0.4034 (91)
MIT	18.7160	19.0151	19.4102	19.8804	20.2039	20.3812	20.4287	20.4236	20.3149	19.8878	19.2394	18.6710 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.5660	18.8651	19.2602	19.7304	20.0539	20.2312	20.2787	20.2736	20.1649	19.7378	19.0894	18.5210 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9252	0.8914	0.8405	0.7457	0.6158	0.4533	0.3196	0.3542	0.5578	0.7805	0.8916	0.9328 (94)
Useful gains	518.2266	577.8862	602.0728	590.2909	512.0851	370.0674	250.0274	260.9062	382.6861	474.6914	492.7741	499.0482 (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	1021.1723	997.1305	908.8124	761.6611	585.9974	389.9598	254.7546	267.5574	422.1720	640.9838	845.3179	1014.8413 (97)
Space heating kWh	374.1916	281.7322	228.2143	123.3866	54.9908	0.0000	0.0000	0.0000	0.0000	123.7215	253.8316	383.7501 (98a)
Space heating requirement - total per year (kWh/year)												1823.8186
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	374.1916	281.7322	228.2143	123.3866	54.9908	0.0000	0.0000	0.0000	0.0000	123.7215	253.8316	383.7501 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1823.8186
Space heating per m2										(98c) / (4) =		26.7540 (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 %)												88.9000 (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	374.1916	281.7322	228.2143	123.3866	54.9908	0.0000	0.0000	0.0000	0.0000	123.7215	253.8316	383.7501 (98)
Space heating efficiency (main heating system 1)	88.9000	88.9000	88.9000	88.9000	88.9000	0.0000	0.0000	0.0000	0.0000	88.9000	88.9000	88.9000 (210)
Space heating fuel (main heating system)	420.9129	316.9091	256.7090	138.7926	61.8569	0.0000	0.0000	0.0000	0.0000	139.1693	285.5248	431.6649 (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	234.5020	207.4978	220.8286	195.2022	189.8985	171.8549	170.2005	176.5824	178.0882	197.6774	209.0558	232.0911 (64)
Efficiency of water heater (217)m	85.3773	85.0373	84.4520	83.4256	82.0831	80.3000	80.3000	80.3000	80.3000	83.4060	84.7984	80.3000 (216)
Fuel for water heating, kWh/month	274.6655	244.0081	261.4840	233.9835	231.3491	214.0161	211.9558	219.9034	221.7786	237.0064	246.5328	85.4510 (217)
Space cooling fuel requirement												271.6072 (219)
(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	23.3736	21.1117	23.3736	22.6197	23.3736	22.6197	23.3736	23.3736	22.6197	23.3736	22.6197	23.3736 (231)
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 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												2051.5394 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												2868.2906 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9100)												
mechanical ventilation fans (SFP = 0.9100)												189.2058 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												275.2058 (231)

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Electricity for lighting (calculated in Appendix L)	172.9042 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	5367.9400 (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	2051.5394	0.2100	430.8233 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2868.2906	0.2100	602.3410 (264)
Space and water heating			1033.1643 (265)
Pumps, fans and electric keep-hot	275.2058	0.1387	38.1744 (267)
Energy for lighting	172.9042	0.1443	24.9554 (268)
Total CO2, kg/year			1096.2942 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			16.0800 (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	2051.5394	1.1300	2318.2396 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2868.2906	1.1300	3241.1684 (278)
Space and water heating			5559.4079 (279)
Pumps, fans and electric keep-hot	275.2058	1.5128	416.3314 (281)
Energy for lighting	172.9042	1.5338	265.2062 (282)
Total Primary energy kWh/year			6240.9455 (286)
Dwelling Primary energy Rate (DPER)			91.5500 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
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		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 170.4250 (5)
Dwelling volume			

2. Ventilation rate

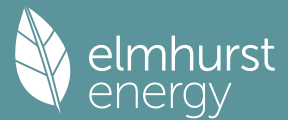
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number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

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							

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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 month	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

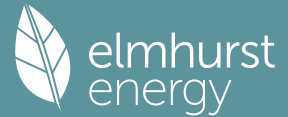
Assumed occupancy													2.2009 (42)
Hot water usage for mixer showers													
	61.1213	60.2028	58.8643	56.3033	54.4134	52.3058	51.1078	52.4362	53.8923	56.1553	58.7712	60.8871	(42a)
Hot water usage for baths													
	26.4074	26.0152	25.4629	24.4446	23.6821	22.8366	22.3799	22.9284	23.5255	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	
	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 conte	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)													
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):													
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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	248.4501	219.8046	233.5398	205.1870	198.8494	179.1056	176.6158	183.6050	185.6124	207.0827	220.3602	245.6994	(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													
	220.5080	195.0923	207.6625	183.7597	178.8799	162.0176	160.5984	166.5722	167.9324	186.2400	196.7479	218.2747	(64)
12Total per year (kWh/year)													
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													
	78.4055	69.2878	73.4479	64.1562	61.9133	55.4841	54.5206	56.8446	57.6476	64.6509	69.2013	77.4909	(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	
	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	97.3459	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	3.0000	3.0000	3.0000	3.0000	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)													
	105.3838	103.1068	98.7202	89.1058	83.2168	77.0613	73.2804	76.4040	80.0662	86.8964	96.1129	104.1545	(72)
Total internal gains													
	454.7318	464.8874	445.0244	427.9113	405.2158	386.5590	371.0181	372.1390	384.0926	401.4214	427.4445	444.9874	(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
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	573.6499	682.1817	773.4603	873.9450	931.0164	917.5556	879.3971	821.3054	754.1814	650.7436	572.7581	544.7896 (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	0.9515	0.9233	0.8784	0.7919	0.6710	0.5219	0.3962	0.4362	0.6340	0.8357	0.9272	0.9572 (86)
MIT	18.7370	19.0906	19.5740	20.1542	20.5930	20.8575	20.9518	20.9357	20.7430	20.1447	19.3419	18.6747 (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	0.9434	0.9110	0.8588	0.7590	0.6196	0.4483	0.3050	0.3428	0.5625	0.8016	0.9134	0.9500 (89)
MIT 2	17.2750	17.7174	18.3166	19.0204	19.5211	19.7988	19.8776	19.8690	19.6957	19.0308	18.0463	17.2015 (90)
Living area fraction	fLA = Living area / (4) = 0.4034 (91)											
MIT	17.8648	18.2714	18.8239	19.4778	19.9535	20.2259	20.3109	20.2993	20.1182	19.4802	18.5690	17.7958 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.8648	18.2714	18.8239	19.4778	19.9535	20.2259	20.3109	20.2993	20.1182	19.4802	18.5690	17.7958 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9238	0.8885	0.8366	0.7452	0.6226	0.4710	0.3399	0.3777	0.5778	0.7867	0.8922	0.9316 (94)
Useful gains	529.9195	606.1179	647.0680	651.2374	579.6834	432.1554	298.9305	310.2048	435.7591	511.9610	510.9902	507.5300 (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	1158.2566	1139.4275	1048.0722	891.1498	694.1055	469.2256	309.5072	324.7150	503.5492	746.8083	967.9802	1151.7712 (97)
Space heating kWh	467.4828	358.3841	298.3471	172.7369	85.1301	0.0000	0.0000	0.0000	0.0000	174.7264	329.0328	479.3155 (98a)
Space heating requirement - total per year (kWh/year)						0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	2365.1556
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
Space heating kWh	467.4828	358.3841	298.3471	172.7369	85.1301	0.0000	0.0000	0.0000	0.0000	174.7264	329.0328	479.3155 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2365.1556
Space heating per m2	(98c) / (4) = 34.6950 (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 %)												92.4000 (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	467.4828	358.3841	298.3471	172.7369	85.1301	0.0000	0.0000	0.0000	0.0000	174.7264	329.0328	479.3155 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	505.9338	387.8615	322.8865	186.9447	92.1321	0.0000	0.0000	0.0000	0.0000	189.0979	356.0961	518.7397 (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	220.5080	195.0923	207.6625	183.7597	178.8799	162.0176	160.5984	166.5722	167.9324	186.2400	196.7479	218.2747 (64)
Efficiency of water heater (217)m	85.9497	85.6661	85.1571	84.2490	82.8855	80.3000	80.3000	80.3000	80.3000	84.2449	85.4745	86.0175 (217)
Fuel for water heating, kWh/month	256.5547	227.7359	243.8581	218.1149	215.8158	201.7653	199.9980	207.4373	209.1313	221.0699	230.1832	253.7563 (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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												2559.6922 (211)

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Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2685.4206	(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	4820.4581	(238)

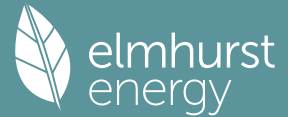
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2559.6922	0.2100	537.5354 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2685.4206	0.2100	563.9383 (264)
Space and water heating			1101.4737 (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			1049.4936 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.4000 (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	2559.6922	1.1300	2892.4522 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2685.4206	1.1300	3034.5253 (278)
Space and water heating			5926.9775 (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			5602.3605 (286)
Target Primary Energy Rate (TPER)			82.1800 (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	86 B	DER	10.57	TER	10.78		
Environmental	91 B	% DER < TER				1.95	
CO ₂ Emissions (t/year)	0.86	DFEE	25.06	TFEE	26.57		
Compliance Check	See BREL	% DFEE < TFEE				5.70	
% DPER < TPER	-7.98	DPER	61.72	TPER	57.16		
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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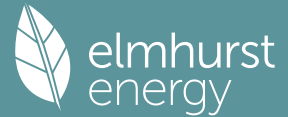
E2 Other lintels (including other steel lintels)								10.9100	0.0500	0.5455				
E4 Jamb								28.6200	0.0500	1.4310				
E7 Party floor between dwellings (in blocks of flats)								55.8700	0.0700	3.9109				
E16 Corner (normal)								10.0000	0.0900	0.9000				
E17 Corner (inverted - internal area greater 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		
Heat transfer coeff	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)	
Average = Sum(39)m / 12 =	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)	
												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		
												0.6628		

4. Water heating energy requirements (kWh/year)														
Assumed occupancy														
Hot water usage for mixer showers												2.6079	(42)	
	84.9328	83.6564	81.7965	78.2379	75.6117	72.6830	71.0183	72.8642	74.8876	78.0321	81.6672	84.6074	(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)												143.0900	(43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Energy conte	155.6130	152.3977	148.4209	142.2276	137.2509	131.8796	129.7075	133.6659	137.8560	143.5089	149.8020	155.1884	(44)	
Energy content (annual)	246.4530	217.0122	228.1174	194.7024	184.7661	162.1613	156.8699	165.5063	169.9902	194.7403	213.4204	242.9875	(45)	
Distribution loss (46)m = 0.15 x (45)m														
	36.9679	32.5518	34.2176	29.2054	27.7149	24.3242	23.5305	24.8259	25.4985	29.2110	32.0131	36.4481	(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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)	
Total heat required for water heating calculated for each month														
	297.4119	263.0396	279.0763	244.0175	235.7250	211.4764	207.8288	216.4652	219.3053	245.6992	262.7355	293.9464	(62)	
WWHRS	-42.4081	-37.5060	-39.2742	-32.5206	-30.3080	-25.9348	-24.3097	-25.8509	-26.8331	-31.6333	-35.8367	-41.6227	(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														
	255.0038	225.5336	239.8021	211.4969	205.4170	185.5416	183.5191	190.6142	192.4722	214.0659	226.8988	252.3237	(64)	
12Total per year (kWh/year)												2582.6890	(64)	
Electric shower(s)												2583	(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														
	94.6853	83.6634	88.5887	77.0673	74.1745	66.2474	64.8990	67.7706	68.8505	77.4909	83.2911	93.5331	(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	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)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), 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)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), 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)	
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)	
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	127.2652	124.4991	119.0709	107.0379	99.6969	92.0103	87.2298	91.0895	95.6257	104.1544	115.6820	125.7165	(72)	
	548.5050	560.9881	536.5769	515.3459	487.3899	465.0489	445.8436	447.2468	461.9532	482.6800	514.8225	536.5115	(73)	

6. Solar gains														
[Jan]														
				Area		Solar flux		g		FF		Access	Gains	
				m2		Table 6a		W/m2		factor		Table 6d	W	
Northeast				5.5300		11.2829		0.4000		0.7700		0.7700	12.1071	(75)
Southeast				6.5300		36.7938		0.4000		0.7700		0.7700	46.6208	(77)
Southwest				8.4300		36.7938		0.4000		0.7700		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	667.4186	767.5634	829.9041	896.6967	930.8768	912.5171	874.2593	828.2072	785.5909	713.8698	657.9859	637.8028	(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	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	0.9763	0.9457	0.8876	0.7520	0.5789	0.4026	0.2892	0.3178	0.5062	0.7926	0.9444	0.9809 (86)	
MIT	20.4353	20.6150	20.7891	20.9400	20.9899	20.9993	20.9999	20.9999	20.9968	20.9304	20.6839	20.4081 (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	0.9713	0.9355	0.8690	0.7216	0.5421	0.3642	0.2489	0.2757	0.4619	0.7583	0.9323	0.9768 (89)	
MIT 2	19.8482	20.0228	20.1867	20.3285	20.3692	20.3870	20.3873	20.3896	20.3809	20.3253	20.1010	19.8298 (90)	
Living area fraction									fLA = Living area / (4) =				0.3268 (91)
MIT	20.0401	20.2164	20.3836	20.5283	20.5720	20.5871	20.5875	20.5891	20.5822	20.5230	20.2915	20.0188 (92)	
Temperature adjustment												-0.1500	
adjusted MIT	19.8901	20.0664	20.2336	20.3783	20.4220	20.4371	20.4375	20.4391	20.4322	20.3730	20.1415	19.8688 (93)	

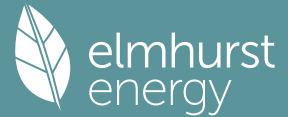
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9669	0.9303	0.8650	0.7219	0.5449	0.3673	0.2522	0.2791	0.4655	0.7582	0.9273	0.9730	(94)
Useful gains	645.3565	714.0261	717.8689	647.2958	507.1950	335.2045	220.5141	231.1408	365.7120	541.2524	610.1447	620.5610	(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	943.1919	914.0199	824.4685	675.6869	511.3992	335.4357	220.5279	231.1678	366.8428	573.0219	770.7459	933.3332	(97)
Space heating kWh	221.5895	134.3958	79.3101	20.4416	3.1279	0.0000	0.0000	0.0000	0.0000	23.6365	115.6328	232.7025	(98a)
Space heating requirement - total per year (kWh/year)												830.8368	
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	221.5895	134.3958	79.3101	20.4416	3.1279	0.0000	0.0000	0.0000	0.0000	23.6365	115.6328	232.7025	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												830.8368	
Space heating per m2										(98c) / (4) =		9.3637	(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 %)													88.9000 (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	221.5895	134.3958	79.3101	20.4416	3.1279	0.0000	0.0000	0.0000	0.0000	23.6365	115.6328	232.7025	(98)
Space heating efficiency (main heating system 1)	88.9000	88.9000	88.9000	88.9000	88.9000	0.0000	0.0000	0.0000	0.0000	88.9000	88.9000	88.9000	(210)
Space heating fuel (main heating system)	249.2571	151.1764	89.2127	22.9939	3.5184	0.0000	0.0000	0.0000	0.0000	26.5878	130.0707	261.7576	(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	255.0038	225.5336	239.8021	211.4969	205.4170	185.5416	183.5191	190.6142	192.4722	214.0659	226.8988	252.3237	(64)
Efficiency of water heater	84.0818	83.3093	82.2782	80.9905	80.4167	80.3000	80.3000	80.3000	80.3000	81.0799	83.0109	84.2083	(216)
Fuel for water heating, kWh/month	303.2806	270.7185	291.4528	261.1379	255.4408	231.0606	228.5419	237.3776	239.6913	264.0183	273.3362	299.6423	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	28.2202	25.4892	28.2202	27.3099	28.2202	27.3099	28.2202	28.2202	27.3099	28.2202	27.3099	28.2202	(231)
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	(232)
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	(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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												934.5746	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												3155.6989	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9100)													
mechanical ventilation fans (SFP = 0.9100)												246.2701	(230a)
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												332.2701	(231)
Electricity for lighting (calculated in Appendix L)												229.4186	(232)

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

PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4651.9623 (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	934.5746	0.2100	196.2607 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3155.6989	0.2100	662.6968 (264)
Space and water heating			858.9574 (265)
Pumps, fans and electric keep-hot	332.2701	0.1387	46.0900 (267)
Energy for lighting	229.4186	0.1443	33.1122 (268)
Total CO2, kg/year			938.1596 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.5700 (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	934.5746	1.1300	1056.0693 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3155.6989	1.1300	3565.9398 (278)
Space and water heating			4622.0091 (279)
Pumps, fans and electric keep-hot	332.2701	1.5128	502.6582 (281)
Energy for lighting	229.4186	1.5338	351.8900 (282)
Total Primary energy kWh/year			5476.5573 (286)
Dwelling Primary energy Rate (DPER)			61.7200 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
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		(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)

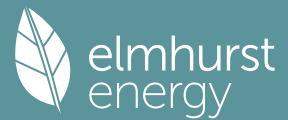
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1352 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3852	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3275 (21)

	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)
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			1.8900	1.0000	1.8900		(26)
TER Opaque door							

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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)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	42.9811	42.7334	42.4905	41.3499	41.1365	40.1431	40.1431	39.9591	40.5258	41.1365	41.5682	42.0196
Average = Sum(39)m / 12 =	85.7782	85.5304	85.2876	84.1470	83.9336	82.9402	82.9402	82.7562	83.3228	83.9336	84.3653	84.8166
	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
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)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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):													
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	
Combi loss													(61)
	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	
Total heat required for water heating calculated for each month													
	270.5093	239.2145	253.9326	222.5967	215.3675	193.6020	190.6507	198.4210	200.8365	224.5214	239.4655	267.4515	(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													
	239.4471	211.7429	225.1659	198.7767	193.1681	174.6058	172.8449	179.4862	181.1823	201.3513	213.2166	236.9645	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2427.9524	(64)
Electric shower(s)												2428	(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)
Heat gains from water heating, kWh/month													
	85.7402	75.7416	80.2285	69.9449	67.4056	60.3042	59.1873	61.7709	62.7096	70.4493	75.5538	84.7235	(65)

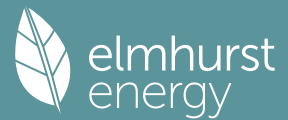
5. Internal gains (see Table 5 and 5a)

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													(70)
	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)													
	-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)													
	115.2422	112.7107	107.8340	97.1457	90.5989	83.7558	79.5528	83.0254	87.0967	94.6899	104.9358	113.8757	(72)
Total internal gains													
	536.4820	549.1996	525.3400	505.4537	478.2920	456.7943	438.1666	439.1827	453.4242	473.2154	504.0763	524.6706	(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
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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	722.0243	871.5233	983.0290	1100.4968	1170.2960	1155.0135	1106.6554	1033.6191	958.4104	833.9469	727.4562	682.7165 (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	0.9824	0.9583	0.9108	0.7986	0.6346	0.4546	0.3289	0.3668	0.5804	0.8513	0.9623	0.9861 (86)	
MIT	19.9337	20.2006	20.4961	20.7938	20.9438	20.9914	20.9986	20.9977	20.9724	20.7586	20.3007	19.8890 (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													
	0.9781	0.9491	0.8922	0.7633	0.5840	0.3954	0.2649	0.2989	0.5146	0.8150	0.9523	0.9827 (89)	
MIT 2	18.8814	19.2160	19.5774	19.9278	20.0831	20.1329	20.1375	20.1389	20.1161	19.9003	19.3535	18.8318 (90)	
Living area fraction										FLA = Living area / (4) =		0.3268 (91)	
MIT	19.2253	19.5378	19.8776	20.2108	20.3644	20.4135	20.4190	20.4196	20.3960	20.1808	19.6631	19.1773 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.2253	19.5378	19.8776	20.2108	20.3644	20.4135	20.4190	20.4196	20.3960	20.1808	19.6631	19.1773 (93)	

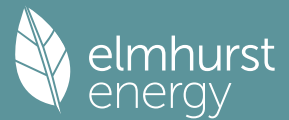
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9727	0.9418	0.8865	0.7669	0.5981	0.4144	0.2858	0.3211	0.5349	0.8173	0.9458	0.9779 (94)	
Useful gains	702.2995	820.8055	871.4566	844.0144	699.9273	478.6882	316.3285	331.8973	512.6963	681.6215	688.0271	667.6549 (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	1280.2651	1251.9768	1140.9463	951.7721	727.2346	482.1741	316.7468	332.6429	524.5973	804.1503	1059.8868	1270.3249 (97)	
Space heating kWh	430.0064	289.7471	200.5004	77.5855	20.3166	0.0000	0.0000	0.0000	0.0000	91.1614	267.7390	448.3864 (98a)	
Space heating requirement - total per year (kWh/year)												1825.4429	
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	430.0064	289.7471	200.5004	77.5855	20.3166	0.0000	0.0000	0.0000	0.0000	91.1614	267.7390	448.3864 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1825.4429	
Space heating per m2										(98c) / (4) =		20.5730 (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 %)													92.4000 (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	430.0064	289.7471	200.5004	77.5855	20.3166	0.0000	0.0000	0.0000	0.0000	91.1614	267.7390	448.3864 (98)	
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)	
Space heating fuel (main heating system)	465.3749	313.5791	216.9917	83.9670	21.9877	0.0000	0.0000	0.0000	0.0000	98.6595	289.7608	485.2667 (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	239.4471	211.7429	225.1659	198.7767	193.1681	174.6058	172.8449	179.4862	181.1823	201.3513	213.2166	236.9645 (64)	
Efficiency of water heater (217)m	85.6202	85.0539	84.1336	82.5417	81.0461	80.3000	80.3000	80.3000	80.3000	82.7962	84.8705	85.7256 (216)	
Fuel for water heating, kWh/month	279.6620	248.9514	267.6288	240.8199	238.3434	217.4418	215.2489	223.5196	225.6318	243.1892	251.2259	276.4222 (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)													
(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												1975.5875 (211)	
Space heating fuel - main system 2												0.0000 (213)	
Space heating fuel - secondary												0.0000 (215)	
Efficiency of water heater												80.3000	

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Water heating fuel used	2928.0849 (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	4312.7527 (238)

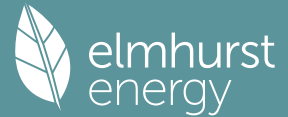
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1975.5875	0.2100	414.8734 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2928.0849	0.2100	614.8978 (264)
Space and water heating			1029.7712 (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			956.7825 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.7800 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1975.5875	1.1300	2232.4139 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2928.0849	1.1300	3308.7360 (278)
Space and water heating			5541.1499 (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			5071.7422 (286)
Target Primary Energy Rate (TPER)			57.1600 (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	83 B	DER	14.50	TER	14.03		
Environmental	87 B	% DER < TER				-3.35	
CO ₂ Emissions (t/year)	1.16	DFEE	41.40	TFEE	41.61		
Compliance Check	See BREL	% DFEE < TFEE				0.50	
% DPER < TPER	-11.00	DPER	82.87	TPER	74.66		
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

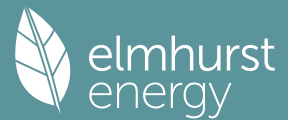
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	22.4411	22.2077	21.9744	20.8077	20.5744	19.4077	19.4077	19.1744	19.8744	20.5744	21.0411	21.5077 (38)
Heat transfer coeff	88.6872	88.4539	88.2205	87.0539	86.8205	85.6539	85.6539	85.4205	86.1205	86.8205	87.2872	87.7539 (39)
Average = Sum(39)m / 12 =												86.9955
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9995	0.9969	0.9943	0.9811	0.9785	0.9653	0.9653	0.9627	0.9706	0.9785	0.9837	0.9890 (40)
HLP (average)												0.9805
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	84.9328	83.6564	81.7965	78.2379	75.6117	72.6830	71.0183	72.8642	74.8876	78.0321	81.6672	84.6074 (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)												143.0900 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	155.6130	152.3977	148.4209	142.2276	137.2509	131.8796	129.7075	133.6659	137.8560	143.5089	149.8020	155.1884 (44)
Energy content (annual)	246.4530	217.0122	228.1174	194.7024	184.7661	162.1613	156.8699	165.5063	169.9902	194.7403	213.4204	242.9875 (45)
Distribution loss (46)m = 0.15 x (45)m												2376.7271
Water storage loss (or HIU loss):	36.9679	32.5518	34.2176	29.2054	27.7149	24.3242	23.5305	24.8259	25.4985	29.2110	32.0131	36.4481 (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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	297.4119	263.0396	279.0763	244.0175	235.7250	211.4764	207.8288	216.4652	219.3053	245.6992	262.7355	293.9464 (62)
WWHRS	-42.4081	-37.5060	-39.2742	-32.5206	-30.3080	-25.9348	-24.3097	-25.8509	-26.8331	-31.6333	-35.8367	-41.6227 (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	255.0038	225.5336	239.8021	211.4969	205.4170	185.5416	183.5191	190.6142	192.4722	214.0659	226.8988	252.3237 (64)
12Total per year (kWh/year)												2582.6890 (64a)
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	94.6853	83.6634	88.5887	77.0673	74.1745	66.2474	64.8990	67.7706	68.8505	77.4909	83.2911	93.5331 (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	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	-104.3174 (71)
Water heating gains (Table 5)	127.2652	124.4991	119.0709	107.0379	99.6969	92.0103	87.2298	91.0895	95.6257	104.1544	115.6820	125.7165 (72)
Total internal gains	548.5050	560.9881	536.5769	515.3459	487.3899	465.0489	445.8436	447.2468	461.9532	482.6800	514.8225	536.5115 (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	40.1858 (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	667.4186	767.5634	829.9041	896.6967	930.8768	912.5171	874.2593	828.2072	785.5909	713.8698	657.9859	637.8028 (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	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	0.9511	0.9257	0.8891	0.8146	0.7014	0.5462	0.4133	0.4497	0.6447	0.8383	0.9261	0.9565 (86)
MIT	19.0981	19.3951	19.7813	20.2697	20.6504	20.8868	20.9647	20.9535	20.8009	20.3108	19.6355	19.0511 (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	0.9440	0.9153	0.8733	0.7881	0.6590	0.4841	0.3362	0.3715	0.5852	0.8095	0.9140	0.9502 (89)
MIT 2	18.3538	18.6449	19.0210	19.4925	19.8388	20.0431	20.0967	20.0927	19.9769	19.5421	18.8925	18.3140 (90)
Living area fraction	fLA = Living area / (4) = 0.3268 (91)											
MIT	18.5971	18.8901	19.2695	19.7466	20.1040	20.3189	20.3804	20.3740	20.2462	19.7933	19.1353	18.5549 (92)
Temperature adjustment	-0.1500											
adjusted MIT	18.4471	18.7401	19.1195	19.5966	19.9540	20.1689	20.2304	20.2240	20.0962	19.6433	18.9853	18.4049 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9277	0.8964	0.8534	0.7715	0.6514	0.4882	0.3468	0.3815	0.5843	0.7925	0.8955	0.9349 (94)
Useful gains	619.1359	688.0728	708.2428	691.8132	606.4136	445.5058	303.1862	315.9999	459.0368	565.7533	589.2085	596.2755 (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	1254.6666	1224.2078	1113.2955	931.1762	716.6188	476.9965	310.9563	326.6509	516.3992	785.1474	1037.4383	1246.5372 (97)
Space heating kWh	472.8348	360.2827	301.3592	172.3414	81.9926	0.0000	0.0000	0.0000	0.0000	163.2293	322.7255	483.7947 (98a)
Space heating requirement - total per year (kWh/year)	2358.5602											
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	472.8348	360.2827	301.3592	172.3414	81.9926	0.0000	0.0000	0.0000	0.0000	163.2293	322.7255	483.7947 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2358.5602											
Space heating per m2	(98c) / (4) = 26.5813 (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 %)												88.9000 (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	472.8348	360.2827	301.3592	172.3414	81.9926	0.0000	0.0000	0.0000	0.0000	163.2293	322.7255	483.7947 (98)
Space heating efficiency (main heating system 1)	88.9000	88.9000	88.9000	88.9000	88.9000	0.0000	0.0000	0.0000	0.0000	88.9000	88.9000	88.9000 (210)
Space heating fuel (main heating system)	531.8727	405.2674	338.9868	193.8598	92.2302	0.0000	0.0000	0.0000	0.0000	183.6100	363.0208	544.2010 (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	255.0038	225.5336	239.8021	211.4969	205.4170	185.5416	183.5191	190.6142	192.4722	214.0659	226.8988	252.3237 (64)
Efficiency of water heater	85.6849	85.3796	84.8721	83.9462	82.5790	80.3000	80.3000	80.3000	80.3000	83.8075	85.1359	80.3000 (216)
Fuel for water heating, kWh/month	297.6066	264.1538	282.5451	251.9434	248.7522	231.0606	228.5419	237.3776	239.6913	255.4258	266.5137	85.7520 (217)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
(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	28.2202	25.4892	28.2202	27.3099	28.2202	27.3099	28.2202	28.2202	27.3099	28.2202	27.3099	28.2202 (231)
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 (232)
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 (233a)
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	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)
(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)	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)
(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)	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)
(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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	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)
(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)	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)
(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)	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)
(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	2653.0486 (211)											
Space heating fuel - main system 2	0.0000 (213)											
Space heating fuel - secondary	0.0000 (215)											
Efficiency of water heater	80.3000											
Water heating fuel used	3097.8603 (219)											
Space cooling fuel	0.0000 (221)											
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9100)												
mechanical ventilation fans (SFP = 0.9100)												246.2701 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)

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Total electricity for the above, kWh/year	332.2701 (231)
Electricity for lighting (calculated in Appendix L)	229.4186 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	6312.5976 (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	2653.0486	0.2100	557.1402 (261)
Total CO2 associated with community systems			0.0000 (273)
Water heating (other fuel)	3097.8603	0.2100	650.5507 (264)
Space and water heating			1207.6909 (265)
Pumps, fans and electric keep-hot	332.2701	0.1387	46.0900 (267)
Energy for lighting	229.4186	0.1443	33.1122 (268)
Total CO2, kg/year			1286.8930 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			14.5000 (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	2653.0486	1.1300	2997.9449 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3097.8603	1.1300	3500.5821 (278)
Space and water heating			6498.5270 (279)
Pumps, fans and electric keep-hot	332.2701	1.5128	502.6582 (281)
Energy for lighting	229.4186	1.5338	351.8900 (282)
Total Primary energy kWh/year			7353.0753 (286)
Dwelling Primary energy Rate (DPER)			82.8700 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
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

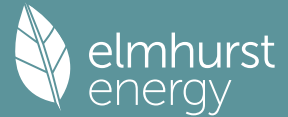
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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)

	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)
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	Openings	NetArea	U-value	A x U	K-value	A x K
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Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K
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	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	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)
Average = Sum(39)m / 12 =	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)
												110.5590	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	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)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

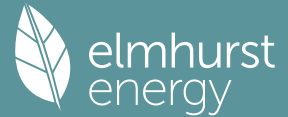
Assumed occupancy													2.6079 (42)
Hot water usage for mixer showers													
67.9462	66.9251	65.4372	62.5903	60.4893	58.1464	56.8146	58.2913	59.9100	62.4257	65.3337	67.6859	67.6859	(42a)
Hot water usage for baths													
29.3423	28.9066	28.2929	27.1614	26.3142	25.3747	24.8673	25.4766	26.1401	27.1454	28.3002	29.2431	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	41.3379	(42c)
Average daily hot water use (litres/day)												127.4290	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
138.6264	135.6664	132.0616	126.5800	122.1286	117.3430	115.5038	119.0931	122.8785	127.9025	133.4686	138.2669	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)													
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):													
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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
270.5093	239.2145	253.9326	222.5967	215.3675	193.6020	190.6507	198.4210	200.8365	224.5214	239.4655	267.4515	267.4515	(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	239.4471	211.7429	225.1659	198.7767	193.1681	174.6058	172.8449	179.4862	181.1823	201.3513	213.2166	236.9645	(64)
12Total per year (kWh/year)												2427.9524	(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	85.7402	75.7416	80.2285	69.9449	67.4056	60.3042	59.1873	61.7709	62.7096	70.4493	75.5538	84.7235	(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	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	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	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	36.0397	(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)													
-104.3174	-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)													
115.2422	112.7107	107.8340	97.1457	90.5989	83.7558	79.5528	83.0254	87.0967	94.6899	104.9358	113.8757	113.8757	(72)
Total internal gains	536.4820	549.1996	525.3400	505.4537	478.2920	456.7943	438.1666	439.1827	453.4242	473.2154	504.0763	524.6706	(73)

6. Solar gains

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[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	
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	722.0243	871.5233	983.0290	1100.4968	1170.2960	1155.0135	1106.6554	1033.6191	958.4104	833.9469	727.4562	682.7165 (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	24.7023	24.7570	24.8108	25.0668	25.1152	25.3434	25.3434	25.3861	25.2550	25.1152	25.0174	24.9158
util living area	2.6468	2.6505	2.6541	2.6711	2.6743	2.6896	2.6896	2.6924	2.6837	2.6743	2.6678	2.6611
	0.9492	0.9190	0.8755	0.7942	0.6785	0.5323	0.4074	0.4474	0.6382	0.8315	0.9238	0.9553 (86)
MIT	18.5496	18.9333	19.4320	20.0382	20.5180	20.8228	20.9368	20.9172	20.6972	20.0573	19.2015	18.4831 (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	0.9410	0.9066	0.8562	0.7624	0.6283	0.4589	0.3146	0.3529	0.5679	0.7978	0.9099	0.9481 (89)
MIT 2	17.0448	17.5251	18.1446	18.8844	19.4380	19.7635	19.8619	19.8506	19.6475	18.9285	17.8763	16.9662 (90)
Living area fraction	17.5366	17.9853	18.5654	19.2615	19.7910	20.1097	20.2132	20.1992	fLA = Living area / (4) =	19.2974	18.3095	0.3268 (91)
MIT	17.5366	17.9853	18.5654	19.2615	19.7910	20.1097	20.2132	20.1992	19.9906	19.2974	18.3095	17.4619 (92)
Temperature adjustment												0.0000
adjusted MIT	17.5366	17.9853	18.5654	19.2615	19.7910	20.1097	20.2132	20.1992	19.9906	19.2974	18.3095	17.4619 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9179	0.8796	0.8288	0.7420	0.6237	0.4740	0.3423	0.3800	0.5748	0.7768	0.8843	0.9265 (94)
Useful gains	662.7458	766.6216	814.7793	816.6107	729.8880	547.4461	378.8330	392.7542	550.8921	647.7712	643.2628	632.5193 (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	1485.0326	1464.8146	1347.7130	1145.5702	892.8154	602.5050	395.1159	414.7572	646.4076	959.7292	1241.7641	1475.1213 (97)
Space heating kWh	611.7814	469.1857	396.5027	236.8508	121.2180	0.0000	0.0000	0.0000	0.0000	232.0967	430.9210	626.8959 (98a)
Space heating requirement - total per year (kWh/year)												3125.4521
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	611.7814	469.1857	396.5027	236.8508	121.2180	0.0000	0.0000	0.0000	0.0000	232.0967	430.9210	626.8959 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3125.4521
Space heating per m2										(98c) / (4) =		35.2243 (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 %)												92.4000 (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	611.7814	469.1857	396.5027	236.8508	121.2180	0.0000	0.0000	0.0000	0.0000	232.0967	430.9210	626.8959 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	662.1011	507.7767	429.1155	256.3321	131.1883	0.0000	0.0000	0.0000	0.0000	251.1869	466.3647	678.4588 (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	239.4471	211.7429	225.1659	198.7767	193.1681	174.6058	172.8449	179.4862	181.1823	201.3513	213.2166	236.9645 (64)
Water heating requirement	86.3001	86.0347	85.5803	84.7580	83.4112	80.3000	80.3000	80.3000	80.3000	84.6868	85.8563	86.3628 (217)
Efficiency of water heater	277.4587	246.1132	263.1049	234.5228	231.5854	217.4418	215.2489	223.5196	225.6318	237.7601	248.3412	274.3825 (219)
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 (221)
Space cooling fuel requirement	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)
(221)m	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)	-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)	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)	-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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

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Annual totals kWh/year		
Space heating fuel - main system 1	3382.5239	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2895.1108	(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	5686.7150	(238)

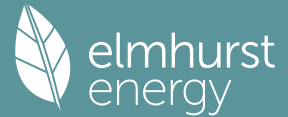
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3382.5239	0.2100	710.3300 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2895.1108	0.2100	607.9733 (264)
Space and water heating			1318.3033 (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			1245.3146 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.0300 (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	3382.5239	1.1300	3822.2521 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2895.1108	1.1300	3271.4753 (278)
Space and water heating			7093.7273 (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			6624.3196 (286)
Target Primary Energy Rate (TPER)			74.6600 (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	84 B	DER	12.25	TER	12.71		
Environmental	89 B	% DER < TER				3.62	
CO ₂ Emissions (t/year)	1.12	DFEE	36.24	TFEE	38.33		
Compliance Check	See BREL	% DFEE < TFEE				5.46	
% DPER < TPER	-5.67	DPER	71.31	TPER	67.48		
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)

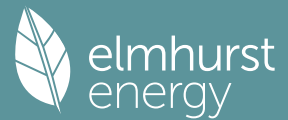
2. Ventilation rate

											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)

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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

	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) = 12.6130 (36)
 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 (38)
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 (39)
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	Dec 0.7974 (40)
HLP (average)												0.7882
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	88.2784	86.9518	85.0186	81.3197	78.5901	75.5461	73.8158	75.7344	77.8375	81.1059	84.8841	87.9402 (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)												148.7278 (43)
Daily hot water use	161.7443	158.4022	154.2686	147.8313	142.6585	137.0755	134.8179	138.9324	143.2877	149.1634	155.7044	161.3030 (44)
Energy content (annual)	256.1635	225.5626	237.1051	202.3736	192.0458	168.5503	163.0506	172.0273	176.6880	202.4133	221.8294	252.5615 (45)
Distribution loss (46)m = $0.15 \times (45)\text{m}$	38.4245	33.8344	35.5658	30.3560	28.8069	25.2826	24.4576	25.8041	26.5032	30.3620	33.2744	37.8842 (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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	307.1224	271.5900	288.0640	251.6887	243.0047	217.8654	214.0095	222.9862	226.0031	253.3722	271.1445	303.5204 (62)
WWHRS	-44.0786	-38.9835	-40.8212	-33.8016	-31.5019	-26.9564	-25.2673	-26.8692	-27.8901	-32.8794	-37.2483	-43.2623 (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	263.0438	232.6065	247.2428	217.8871	211.5028	190.9090	188.7422	196.1170	198.1130	220.4928	233.8962	260.2581 (64)
12Total per year (kWh/year)												2660.8114 (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	97.9141	86.5064	91.5772	79.6180	76.5950	68.3718	66.9540	69.9388	71.0775	80.0421	86.0870	96.7164 (65)

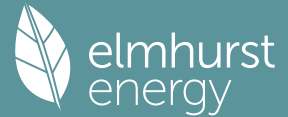
5. Internal gains (see Table 5 and 5a)

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)	131.6049	128.7298	123.0876	110.5806	102.9502	94.9608	89.9920	94.0038	98.7188	107.5835	119.5653	129.9952 (72)
Total internal gains	594.8227	609.0438	582.1814	559.5938	529.1153	505.3322	484.3523	485.6509	501.6777	523.6230	558.4530	581.6766 (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
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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	667.1935	750.6165	815.3315	899.6293	945.8415	931.9256	890.4866	834.5143	772.8409	691.6109	648.6909	641.1908 (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	0.9809	0.9666	0.9373	0.8566	0.7186	0.5321	0.3908	0.4326	0.6658	0.8928	0.9656	0.9836 (86)

MIT	19.7842	19.9902	20.2792	20.6447	20.8758	20.9763	20.9954	20.9928	20.9347	20.6251	20.1580	19.7595 (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	0.9773	0.9606	0.9261	0.8327	0.6776	0.4769	0.3280	0.3671	0.6095	0.8693	0.9584	0.9806 (89)
MIT 2	19.1297	19.3340	19.6171	19.9714	20.1757	20.2642	20.2758	20.2770	20.2320	19.9622	19.5106	19.1129 (90)
Living area fraction									fLA = Living area / (4) =			0.3787 (91)
MIT	19.3775	19.5825	19.8679	20.2264	20.4409	20.5339	20.5483	20.5481	20.4981	20.2133	19.7558	19.3578 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.2275	19.4325	19.7179	20.0764	20.2909	20.3839	20.3983	20.3981	20.3481	20.0633	19.6058	19.2078 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9713	0.9526	0.9168	0.8261	0.6791	0.4852	0.3385	0.3779	0.6156	0.8619	0.9506	0.9751 (94)
Useful gains	648.0392	715.0602	747.4696	743.1883	642.3573	452.1751	301.4635	315.3898	475.7779	596.0930	616.6754	625.2534 (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	1246.1450	1208.9520	1095.7512	910.3021	697.2183	461.0172	302.7562	317.5194	501.6480	768.0241	1022.2053	1235.4249 (97)
Space heating kWh	444.9907	331.8953	259.1215	120.3219	40.8166	0.0000	0.0000	0.0000	0.0000	127.9167	291.9815	453.9677 (98a)
Space heating requirement - total per year (kWh/year)												2071.0119
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	444.9907	331.8953	259.1215	120.3219	40.8166	0.0000	0.0000	0.0000	0.0000	127.9167	291.9815	453.9677 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2071.0119
Space heating per m2										(98c) / (4) =		20.0602 (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 %)

88.9000 (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	444.9907	331.8953	259.1215	120.3219	40.8166	0.0000	0.0000	0.0000	0.0000	127.9167	291.9815	453.9677 (98)
Space heating efficiency (main heating system 1)	88.9000	88.9000	88.9000	88.9000	88.9000	0.0000	0.0000	0.0000	0.0000	88.9000	88.9000	88.9000 (210)
Space heating fuel (main heating system)	500.5520	373.3356	291.4753	135.3452	45.9129	0.0000	0.0000	0.0000	0.0000	143.8883	328.4381	510.6498 (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	263.0438	232.6065	247.2428	217.8871	211.5028	190.9090	188.7422	196.1170	198.1130	220.4928	233.8962	260.2581 (64)
Efficiency of water heater (217)m	85.4982	85.1426	84.4822	83.1621	81.5766	80.3000	80.3000	80.3000	80.3000	83.2570	84.8578	85.5609 (216)
Fuel for water heating, kWh/month	307.6602	273.1964	292.6567	262.0030	259.2691	237.7448	235.0463	244.2304	246.7160	264.8339	275.6329	304.1787 (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	39.3187	35.5136	39.3187	38.0503	39.3187	38.0503	39.3187	39.3187	38.0503	39.3187	38.0503	39.3187 (231)
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 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												2329.5972 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												3203.1684 (219)
Space cooling fuel												0.0000 (221)

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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 (230a)
central heating pump			41.0000 (230c)
main heating flue fan			45.0000 (230e)
Total electricity for the above, kWh/year			462.9455 (231)
Electricity for lighting (calculated in Appendix L)			267.0211 (232)
Energy saving/generation technologies (Appendices M ,N and Q)			
PV generation			0.0000 (233)
Wind generation			0.0000 (234)
Hydro-electric generation (Appendix N)			0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)			0.0000 (235)
Appendix Q - special features			
Energy saved or generated			-0.0000 (236)
Energy used			0.0000 (237)
Total delivered energy for all uses			6262.7322 (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	2329.5972	0.2100	489.2154 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3203.1684	0.2100	672.6654 (264)
Space and water heating			1161.8808 (265)
Pumps, fans and electric keep-hot	462.9455	0.1387	64.2162 (267)
Energy for lighting	267.0211	0.1443	38.5394 (268)
Total CO2, kg/year			1264.6364 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.2500 (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	2329.5972	1.1300	2632.4449 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3203.1684	1.1300	3619.5803 (278)
Space and water heating			6252.0251 (279)
Pumps, fans and electric keep-hot	462.9455	1.5128	700.3439 (281)
Energy for lighting	267.0211	1.5338	409.5659 (282)
Total Primary energy kWh/year			7361.9350 (286)
Dwelling Primary energy Rate (DPER)			71.3100 (287)

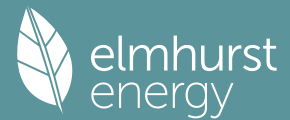
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics					
	Area (m2)		Storey height (m)		Volume (m3)
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)
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)
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)

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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			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

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	0.0000	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			0.0000 (36a)
Total fabric heat loss			(33) + (36) + (36a) = 60.2379 (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	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

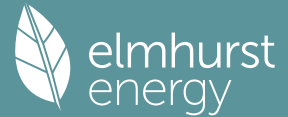
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7676 (42)
Hot water usage for mixer showers													
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 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)												132.4499 (43)	
Daily hot water use													
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):													
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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)	
Total heat required for water heating calculated for each month													
279.1601	246.8263	261.9299	229.4242	221.8452	199.2869	196.1547	204.2312	206.8068	231.3602	246.9579	275.9818	(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													
246.8743	218.2725	232.0300	204.6659	198.7714	179.5424	177.6475	184.5506	186.3784	207.2774	219.6750	244.2939	(64)	
12Total per year (kWh/year)													
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	(64a)	
												2500 (64)	
												2499.9795 (64)	
												0.0000 (64a)	
												0.0000 (64a)	
Heat gains from water heating, kWh/month													
88.6166	78.2725	82.8876	72.2150	69.5594	62.1944	61.0173	63.7028	64.6948	72.7232	78.0450	87.5598	(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 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)

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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)	119.1084	116.4769	111.4080	100.2987	93.4939	86.3811	82.0126	85.6220	89.8538	97.7462	108.3958	117.6880 (72)
Total internal gains	582.3261	596.7910	570.5019	549.3120	519.6589	496.7525	476.3728	477.2691	492.8128	513.7856	547.2835	569.3693 (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		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	696.3102	819.7679	937.7132	1084.8678	1176.0027	1168.6372	1116.0344	1026.7290	919.8947	778.3666	689.4082	663.1043 (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	0.9823	0.9680	0.9378	0.8609	0.7326	0.5625	0.4232	0.4739	0.7073	0.9082	0.9700	0.9850 (86)
MIT	19.1505	19.4266	19.8386	20.3593	20.7301	20.9248	20.9795	20.9692	20.8251	20.3073	19.6436	19.1123 (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	0.9787	0.9615	0.9252	0.8336	0.6834	0.4898	0.3345	0.3816	0.6382	0.8837	0.9629	0.9819 (89)
MIT 2	17.8408	18.1913	18.7089	19.3492	19.7712	19.9739	20.0166	20.0126	19.8856	19.3045	18.4778	17.7989 (90)
Living area fraction	18.3368	18.6591	19.1368	19.7318	20.1344	20.3340	20.3813	20.3749	20.2414	19.6843	18.9193	18.2963 (92)
MIT	18.3368	18.6591	19.1368	19.7318	20.1344	20.3340	20.3813	20.3749	20.2414	19.6843	18.9193	18.2963 (93)
Temperature adjustment												0.0000
adjusted MIT	18.3368	18.6591	19.1368	19.7318	20.1344	20.3340	20.3813	20.3749	20.2414	19.6843	18.9193	18.2963 (93)

8. Space heating requirement

Utilisation	0.9704	0.9502	0.9118	0.8247	0.6898	0.5136	0.3675	0.4154	0.6548	0.8738	0.9524	0.9745 (94)
Useful gains	675.6794	778.9749	854.9755	894.7303	811.1751	600.1877	410.1358	426.5037	602.3533	680.1248	656.6175	646.1628 (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	1601.5649	1565.4241	1433.7138	1212.7748	942.0010	632.9625	417.4011	437.8212	681.0072	1014.5819	1326.7154	1590.6320 (97)
Space heating kWh	688.8588	528.4938	430.5813	228.9920	97.3344	0.0000	0.0000	0.0000	0.0000	248.8361	482.4706	702.6851 (98a)
Space heating requirement - total per year (kWh/year)												3408.2521
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	688.8588	528.4938	430.5813	228.9920	97.3344	0.0000	0.0000	0.0000	0.0000	248.8361	482.4706	702.6851 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3408.2521
Space heating per m ²												(98c) / (4) = 33.0129 (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 %)												92.4000 (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	688.8588	528.4938	430.5813	228.9920	97.3344	0.0000	0.0000	0.0000	0.0000	248.8361	482.4706	702.6851 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	745.5182	571.9630	465.9970	247.8269	105.3403	0.0000	0.0000	0.0000	0.0000	269.3031	522.1543	760.4817 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	246.8743	218.2725	232.0300	204.6659	198.7714	179.5424	177.6475	184.5506	186.3784	207.2774	219.6750	244.2939 (64)
Efficiency of water heater (217)m	86.4571	86.2016	85.6865	84.6227	82.9373	80.3000	80.3000	80.3000	80.3000	84.7740	86.0178	86.5099 (216)
Fuel for water heating, kWh/month	285.5455	253.2118	270.7895	241.8569	239.6645	223.5896	221.2297	229.8264	232.1027	244.5058	255.3832	282.3885 (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	27.8929	22.3768	20.1478	14.7611	11.4019	9.3155	10.4012	13.5199	17.5610	23.0410	26.0247	28.6682 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-22.4744	-33.4855	-50.8266	-60.4367	-68.0505	-64.5491	-63.7381	-58.7262	-50.4200	-39.6940	-25.3315	-19.2246 (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)

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Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.7583	-16.7107	-33.9622	-52.1368	-70.0710	-70.8467	-70.0380	-58.7977	-42.4255	-24.2874	-10.4795	-6.1081	(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												3688.5845	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2980.0942	(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)												225.1121	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1020.5791	(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												5959.2116	(238)

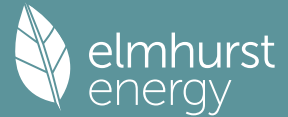
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3688.5845	0.2100	774.6028 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2980.0942	0.2100	625.8198 (264)
Space and water heating			1400.4225 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	225.1121	0.1443	32.4906 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-556.9572	0.1335	-74.3290
PV Unit electricity exported	-463.6219	0.1253	-58.0694
Total			-132.3984 (269)
Total CO2, kg/year			1312.4440 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.7100 (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	3688.5845	1.1300	4168.1005 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2980.0942	1.1300	3367.5064 (278)
Space and water heating			7535.6069 (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			6966.2235 (286)
Target Primary Energy Rate (TPER)			67.4800 (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	84 B	DER	14.97	TER	15.32	
Environmental	90 B	% DER < TER				2.28
CO ₂ Emissions (t/year)	0.69	DFEE	31.90	TFEE	33.83	
Compliance Check	See BREL	% DFEE < TFEE				5.70
% DPER < TPER	-4.74	DPER	85.61	TPER	81.73	
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)

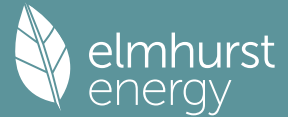
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.1626	0.1594	0.1562	0.1403	0.1371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

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	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	0.9861	0.9756	0.9514	0.8622	0.6918	0.4853	0.3513	0.3905	0.6231	0.8847	0.9692	0.9881 (86)
MIT	20.4278	20.5368	20.6895	20.8860	20.9786	20.9985	20.9999	20.9998	20.9920	20.8833	20.6448	20.4146 (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	0.9823	0.9693	0.9390	0.8330	0.6460	0.4341	0.2968	0.3328	0.5645	0.8533	0.9601	0.9848 (89)
MIT 2	19.7741	19.8823	20.0305	20.2175	20.2919	20.3159	20.3165	20.3187	20.3080	20.2206	19.9981	19.7692 (90)
Living area fraction									fLA = Living area / (4) =			0.4658 (91)
MIT	20.0786	20.1872	20.3375	20.5289	20.6118	20.6339	20.6348	20.6360	20.6266	20.5293	20.2993	20.0698 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.9286	20.0372	20.1875	20.3789	20.4618	20.4839	20.4848	20.4860	20.4766	20.3793	20.1493	19.9198 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9800	0.9666	0.9369	0.8365	0.6566	0.4467	0.3103	0.3470	0.5787	0.8569	0.9577	0.9827 (94)
Useful gains	388.2467	408.7686	409.1820	389.1704	318.4024	213.8138	141.3732	148.1340	231.7701	324.9206	362.3247	378.4349 (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	595.5480	574.8294	517.9772	426.8481	324.6595	214.1503	141.3924	148.1762	233.7623	362.3613	486.9615	590.7538 (97)
Space heating kWh	154.2322	111.5929	80.9436	27.1280	4.6553	0.0000	0.0000	0.0000	0.0000	27.8559	89.7384	157.9652 (98a)
Space heating requirement - total per year (kWh/year)												654.1115
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	154.2322	111.5929	80.9436	27.1280	4.6553	0.0000	0.0000	0.0000	0.0000	27.8559	89.7384	157.9652 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												654.1115
Space heating per m2										(98c) / (4) =		13.0770 (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 %)												88.9000 (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	154.2322	111.5929	80.9436	27.1280	4.6553	0.0000	0.0000	0.0000	0.0000	27.8559	89.7384	157.9652 (98)
Space heating efficiency (main heating system 1)	88.9000	88.9000	88.9000	88.9000	88.9000	0.0000	0.0000	0.0000	0.0000	88.9000	88.9000	88.9000 (210)
Space heating fuel (main heating system)	173.4895	125.5263	91.0502	30.5152	5.2365	0.0000	0.0000	0.0000	0.0000	31.3340	100.9431	177.6886 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	208.8047	184.8915	197.0468	174.7780	170.4472	154.6998	153.5067	158.9947	160.0592	177.1358	186.6910	206.7312 (64)
Efficiency of water heater (217)m	83.7416	83.3343	82.6274	81.3575	80.5071	80.3000	80.3000	80.3000	80.3000	81.3696	82.9035	80.3000 (216)
Fuel for water heating, kWh/month	249.3440	221.8673	238.4764	214.8272	211.7171	192.6523	191.1665	198.0009	199.3265	217.6927	225.1907	246.6612 (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	17.2812	15.6088	17.2812	16.7237	17.2812	16.7237	17.2812	17.2812	16.7237	17.2812	16.7237	17.2812 (231)
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 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												735.7835 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												2606.9226 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7700)												
mechanical ventilation fans (SFP = 0.7700)												117.4720 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												203.4720 (231)
Electricity for lighting (calculated in Appendix L)												128.4080 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)

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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	3674.5860 (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	735.7835	0.2100	154.5145 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2606.9226	0.2100	547.4537 (264)
Space and water heating			701.9683 (265)
Pumps, fans and electric keep-hot	203.4720	0.1387	28.2241 (267)
Energy for lighting	128.4080	0.1443	18.5332 (268)
Total CO2, kg/year			748.7256 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			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	735.7835	1.1300	831.4353 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2606.9226	1.1300	2945.8225 (278)
Space and water heating			3777.2578 (279)
Pumps, fans and electric keep-hot	203.4720	1.5128	307.8124 (281)
Energy for lighting	128.4080	1.5338	196.9565 (282)
Total Primary energy kWh/year			4282.0267 (286)
Dwelling Primary energy Rate (DPER)			85.6100 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	50.0200 (1b)	x 2.5000 (2b)	= 125.0500 (1b) - (3b)
Ground floor			(4)
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

	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)

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)

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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 0.0000
 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	(38)
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	(39)
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	(40)
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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	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):													
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	50.9589	46.0274	50.9589	48.2903	48.1453	44.7666	45.5335	46.9482	46.8776	50.4207	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	220.8006	195.4758	207.9790	182.3406	175.3318	156.3872	153.5986	161.0236	164.0928	184.6865	196.4133	218.4349	(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													
	196.7692	174.2222	185.7235	163.9122	158.1572	141.6908	139.8231	146.3747	148.8873	166.7609	176.1058	194.8486	(64)
12Total per year (kWh/year)													
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)
													(64a)
Heat gains from water heating, kWh/month													
	69.2121	61.1984	64.9489	56.6443	54.3258	48.3055	47.3150	49.6671	50.6934	57.2486	61.2389	68.4255	(65)

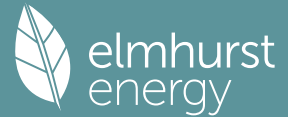
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	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)													
	93.0270	91.0691	87.2969	78.6726	73.0186	67.0910	63.5955	66.7569	70.4076	76.9470	85.0541	91.9697	(72)
Total internal gains													
	368.4132	376.2058	360.3601	346.0946	327.5324	311.4352	298.8831	300.5161	310.5762	325.7569	346.7720	360.8573	(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	0.6300	0.7000	0.7700	29.0684	(81)					

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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	397.4817	435.3755	466.9650	521.1704	562.8687	562.3286	533.5887	487.6262	440.4759	398.0669	383.3477	384.5961 (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	0.9920	0.9856	0.9694	0.9067	0.7622	0.5581	0.4104	0.4667	0.7310	0.9379	0.9839	0.9932 (86)	
MIT	19.9602	20.1108	20.3502	20.6860	20.9074	20.9865	20.9979	20.9960	20.9453	20.6603	20.2680	19.9419 (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	0.9895	0.9812	0.9599	0.8797	0.7069	0.4829	0.3259	0.3759	0.6538	0.9136	0.9782	0.9911 (89)	
MIT 2	18.8557	19.0483	19.3501	19.7623	19.9996	20.0766	20.0833	20.0845	20.0445	19.7435	19.2581	18.8401 (90)	
Living area fraction	fLA = Living area / (4) =												0.4658 (91)
MIT	19.3702	19.5433	19.8160	20.1926	20.4225	20.5004	20.5093	20.5091	20.4642	20.1706	19.7285	19.3533 (92)	
Temperature adjustment													0.0000
adjusted MIT	19.3702	19.5433	19.8160	20.1926	20.4225	20.5004	20.5093	20.5091	20.4642	20.1706	19.7285	19.3533 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9872	0.9782	0.9570	0.8836	0.7288	0.5176	0.3654	0.4183	0.6875	0.9165	0.9756	0.9890 (94)
Useful gains	392.3837	425.9028	446.8844	460.5176	410.1923	291.0460	194.9499	203.9711	302.8489	364.8459	373.9951	380.3788 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	780.5735	756.1451	685.5424	573.1505	441.5174	294.9293	195.4060	204.9068	319.6623	484.4471	642.7159	775.5796 (97)
Space heating kWh	288.8132	221.9229	177.5616	81.0957	23.3059	0.0000	0.0000	0.0000	0.0000	88.9833	193.4790	294.0294 (98a)
Space heating requirement - total per year (kWh/year)												1369.1909
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	288.8132	221.9229	177.5616	81.0957	23.3059	0.0000	0.0000	0.0000	0.0000	88.9833	193.4790	294.0294 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1369.1909
Space heating per m2											(98c) / (4) =	27.3729 (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 %)												92.4000 (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	288.8132	221.9229	177.5616	81.0957	23.3059	0.0000	0.0000	0.0000	0.0000	88.9833	193.4790	294.0294 (98)	
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)	
Space heating fuel (main heating system)	312.5684	240.1763	192.1662	87.7659	25.2228	0.0000	0.0000	0.0000	0.0000	96.3022	209.3929	318.2136 (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	196.7692	174.2222	185.7235	163.9122	158.1572	141.6908	139.8231	146.3747	148.8873	166.7609	176.1058	194.8486 (64)	
Efficiency of water heater	85.2023	84.9011	84.2852	82.9562	81.3102	80.3000	80.3000	80.3000	80.3000	83.0969	84.5835	80.3000 (216)	
Fuel for water heating, kWh/month	230.9435	205.2062	220.3513	197.5888	194.5108	176.4518	174.1259	182.2848	185.4138	200.6824	208.2034	85.2606 (217)	
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)	
Lighting	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 (235a)	
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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1													1481.8083 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													80.3000
Water heating fuel used													2404.2955 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000 (231)	

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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	3482.6986 (238)

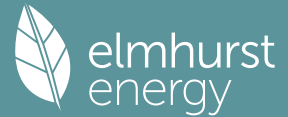
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1481.8083	0.2100	311.1797 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2404.2955	0.2100	504.9021 (264)
Space and water heating			816.0818 (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			766.3973 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.3200 (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	1481.8083	1.1300	1674.4434 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2404.2955	1.1300	2716.8539 (278)
Space and water heating			4391.2973 (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			4087.9508 (286)
Target Primary Energy Rate (TPER)			81.7300 (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	85 B	DER	13.09	TER	13.13		
Environmental	91 B	% DER < TER				0.30	
CO ₂ Emissions (t/year)	0.62	DFEE	21.38	TFEE	23.77		
Compliance Check	See BREL	% DFEE < TFEE				10.06	
% DPER < TPER	-7.98	DPER	75.50	TPER	69.92		
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 (38)m = 0.33 x (25)m x (5)												
(38)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	65.7085	64.7210	63.2821	60.5289	58.4972	56.2314	54.9435	56.3716	57.9370	60.3697	63.1820	65.4567 (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)												110.6944 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	120.3815	117.8949	114.8190	110.0278	106.1781	102.0230	100.3421	103.4037	106.6447	111.0178	115.8862	120.0529 (44)
Energy content (annual)	190.6549	167.8807	176.4725	150.6225	142.9362	125.4492	121.3550	128.0354	131.5036	150.6501	165.1011	187.9739 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1838.6351
Water storage loss (or HIU loss):	28.5982	25.1821	26.4709	22.5934	21.4404	18.8174	18.2033	19.2053	19.7255	22.5975	24.7652	28.1961 (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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	241.6138	213.9081	227.4314	199.9376	193.8951	174.7643	172.3139	178.9943	180.8187	201.6090	214.4162	238.9328 (62)
WWHRS	-32.8091	-29.0167	-30.3846	-25.1596	-23.4479	-20.0645	-18.8073	-19.9996	-20.7595	-24.4732	-27.7251	-32.2015 (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	208.8047	184.8915	197.0468	174.7780	170.4472	154.6998	153.5067	158.9947	160.0592	177.1358	186.6910	206.7312 (64)
12Total per year (kWh/year)									Total per year (kWh/year) = Sum(64)m =			2133.7865 (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	76.1325	67.3272	71.4168	62.4108	60.2660	54.0406	53.0903	55.3115	56.0537	62.8309	67.2249	75.2410 (65)

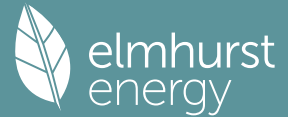
Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.7400	84.9622	76.7400	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	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)	102.3286	100.1893	95.9904	86.6816	81.0027	75.0564	71.3579	74.3434	77.8524	84.4501	93.3679	101.1304 (72)
Total internal gains	377.7148	385.3260	369.0535	354.1035	335.5165	319.4007	306.6455	308.1027	318.0210	333.2600	355.0859	370.0180 (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	
-----						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	396.1710	422.8941	436.7392	465.2628	484.9364	478.6981	455.6649	426.9027	400.4971	379.1711	378.3085	385.0902 (84)

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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	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	0.9548	0.9243	0.8647	0.7111	0.5317	0.3628	0.2621	0.2910	0.4716	0.7413	0.9040	0.9598 (86)
MIT	20.7199	20.8064	20.9002	20.9807	20.9981	20.9999	21.0000	21.0000	20.9995	20.9782	20.8695	20.7118 (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	0.9464	0.9116	0.8451	0.6833	0.5018	0.3334	0.2312	0.2584	0.4361	0.7089	0.8870	0.9522 (89)
MIT 2	20.2047	20.2878	20.3748	20.4537	20.4689	20.4819	20.4820	20.4844	20.4769	20.4549	20.3581	20.2058 (90)
Living area fraction									fLA = Living area / (4) =			0.4658 (91)
MIT	20.4446	20.5294	20.6195	20.6992	20.7154	20.7232	20.7233	20.7246	20.7203	20.6987	20.5963	20.4415 (92)
Temperature adjustment												-0.1500
adjusted MIT	20.2946	20.3794	20.4695	20.5492	20.5654	20.5732	20.5733	20.5746	20.5703	20.5487	20.4463	20.2915 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9437	0.9098	0.8456	0.6876	0.5072	0.3386	0.2366	0.2641	0.4424	0.7138	0.8864	0.9495 (94)
Useful gains	373.8821	384.7451	369.3079	319.9343	245.9664	162.0939	107.8290	112.7416	177.1882	270.6574	335.3162	365.6451 (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	461.4241	444.5237	399.3274	325.3375	246.4266	162.1057	107.8295	112.7427	177.2987	276.5370	374.4897	455.7515 (97)
Space heating kWh	65.1313	40.1712	22.3345	3.8903	0.3423	0.0000	0.0000	0.0000	0.0000	4.3745	28.2049	67.0391 (98a)
Space heating requirement - total per year (kWh/year)												231.4881
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	65.1313	40.1712	22.3345	3.8903	0.3423	0.0000	0.0000	0.0000	0.0000	4.3745	28.2049	67.0391 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												231.4881
Space heating per m2										(98c) / (4) =		4.6279 (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 %)													88.9000 (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	65.1313	40.1712	22.3345	3.8903	0.3423	0.0000	0.0000	0.0000	0.0000	4.3745	28.2049	67.0391 (98)	
Space heating efficiency (main heating system 1)	88.9000	88.9000	88.9000	88.9000	88.9000	0.0000	0.0000	0.0000	0.0000	88.9000	88.9000	88.9000 (210)	
Space heating fuel (main heating system)	73.2635	45.1870	25.1232	4.3761	0.3851	0.0000	0.0000	0.0000	0.0000	4.9207	31.7266	75.4096 (211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)	
Water heating													
Water heating requirement	208.8047	184.8915	197.0468	174.7780	170.4472	154.6998	153.5067	158.9947	160.0592	177.1358	186.6910	206.7312 (64)	
Efficiency of water heater	82.1904	81.7109	81.0987	80.4695	80.3156	80.3000	80.3000	80.3000	80.3000	80.4877	81.3327	82.2483 (216)	
Fuel for water heating, kWh/month	254.0499	226.2753	242.9716	217.1978	212.2219	192.6523	191.1665	198.0009	199.3265	220.0782	229.5400	251.3500 (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	17.2812	15.6088	17.2812	16.7237	17.2812	16.7237	17.2812	17.2812	16.7237	17.2812	16.7237	17.2812 (231)	
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 (232)	
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 (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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1													260.3916 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													80.3000
Water heating fuel used													2634.8308 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7700)													
mechanical ventilation fans (SFP = 0.7700)													117.4720 (230a)
central heating pump													41.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													203.4720 (231)
Electricity for lighting (calculated in Appendix L)													128.4080 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													0.0000 (233)
Wind generation													0.0000 (234)

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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	3227.1024 (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	260.3916	0.2100	54.6822 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2634.8308	0.2100	553.3145 (264)
Space and water heating			607.9967 (265)
Pumps, fans and electric keep-hot	203.4720	0.1387	28.2241 (267)
Energy for lighting	128.4080	0.1443	18.5332 (268)
Total CO2, kg/year			654.7540 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.0900 (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	260.3916	1.1300	294.2425 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2634.8308	1.1300	2977.3588 (278)
Space and water heating			3271.6013 (279)
Pumps, fans and electric keep-hot	203.4720	1.5128	307.8124 (281)
Energy for lighting	128.4080	1.5338	196.9565 (282)
Total Primary energy kWh/year			3776.3702 (286)
Dwelling Primary energy Rate (DPER)			75.5000 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
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

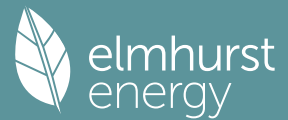
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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)
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

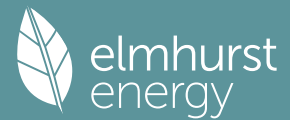
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			8.4300	1.1450	9.6527		(27)
External Wall	18.5300	8.4300	10.1000	0.1800	1.8180		(29a)
Communal Wall	11.2000	1.8900	9.3100	0.1800	1.6758		(29a)
Total net area of external elements Aum(A, m2)			29.7300				(31)

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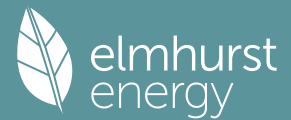
Fabric heat loss, W/K = Sum (A x U)						(26)...(30) + (32) =						15.0365		(33)		
Main dwelling																
Party Wall						41.0700		0.0000		0.0000				(32)		
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												217.1479		(35)		
List of Thermal Bridges																
K1 Element								Length		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)		
		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	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		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		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
		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):																
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		50.9589	46.0274	50.9589	48.2903	48.1453	44.7666	45.5335	46.9482	46.8776	50.4207	49.3151	50.9589	(61)		
Total heat required for water heating calculated for each month		220.8006	195.4758	207.9790	182.3406	175.3318	156.3872	153.5986	161.0236	164.0928	184.6865	196.4133	218.4349	(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		196.7692	174.2222	185.7235	163.9122	158.1572	141.6908	139.8231	146.3747	148.8873	166.7609	176.1058	194.8486	(64)		
12Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m =		1993.2754	(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		69.2121	61.1984	64.9489	56.6443	54.3258	48.3055	47.3150	49.6671	50.6934	57.2486	61.2389	68.4255	(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			
		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)		93.0270	91.0691	87.2969	78.6726	73.0186	67.0910	63.5955	66.7569	70.4076	76.9470	85.0541	91.9697	(72)		
Total internal gains		368.4132	376.2058	360.3601	346.0946	327.5324	311.4352	298.8831	300.5161	310.5762	325.7569	346.7720	360.8573	(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		0.6300		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		397.4817	435.3755	466.9650	521.1704	562.8687	562.3286	533.5887	487.6262	440.4759	398.0669	383.3477	384.5961	(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	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	0.9839	0.9712	0.9407	0.8376	0.6583	0.4609	0.3355	0.3823	0.6243	0.8852	0.9675	0.9862 (86)
MIT	20.1868	20.3388	20.5589	20.8322	20.9639	20.9963	20.9995	20.9990	20.9802	20.8009	20.4686	20.1700 (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	0.9799	0.9644	0.9270	0.8065	0.6110	0.4074	0.2778	0.3198	0.5617	0.8546	0.9586	0.9827 (89)
MIT 2	19.2710	19.4635	19.7366	20.0644	20.2010	20.2388	20.2409	20.2427	20.2236	20.0391	19.6380	19.2581 (90)
Living area fraction	fLA = Living area / (4) = 0.4658 (91)											
MIT	19.6976	19.8712	20.1196	20.4221	20.5563	20.5916	20.5943	20.5950	20.5760	20.3940	20.0249	19.6829 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.6976	19.8712	20.1196	20.4221	20.5563	20.5916	20.5943	20.5950	20.5760	20.3940	20.0249	19.6829 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9767	0.9609	0.9251	0.8147	0.6315	0.4322	0.3047	0.3489	0.5900	0.8617	0.9558	0.9798 (94)
Useful gains	388.2218	418.3394	431.9790	424.6202	355.4297	243.0467	162.5755	170.1437	259.8888	342.9965	366.4205	376.8377 (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	654.9881	634.4819	575.0911	478.1324	366.3061	244.0203	162.6732	170.3556	265.3298	405.0881	538.1471	649.1135 (97)
Space heating kWh	198.4741	145.2477	106.4754	38.5288	8.0920	0.0000	0.0000	0.0000	0.0000	46.1962	123.6431	202.5732 (98a)
Space heating requirement - total per year (kWh/year)	869.2305											
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	198.4741	145.2477	106.4754	38.5288	8.0920	0.0000	0.0000	0.0000	0.0000	46.1962	123.6431	202.5732 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	869.2305											
Space heating per m2	(98c) / (4) =											17.3777 (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 %)												92.4000 (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	198.4741	145.2477	106.4754	38.5288	8.0920	0.0000	0.0000	0.0000	0.0000	46.1962	123.6431	202.5732 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	214.7988	157.1945	115.2331	41.6978	8.7576	0.0000	0.0000	0.0000	0.0000	49.9958	133.8129	219.2351 (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	196.7692	174.2222	185.7235	163.9122	158.1572	141.6908	139.8231	146.3747	148.8873	166.7609	176.1058	194.8486 (64)
Efficiency of water heater	84.3999	83.9942	83.2341	81.8062	80.6799	80.3000	80.3000	80.3000	80.3000	82.0212	83.6374	80.3000 (216)
Fuel for water heating, kWh/month	233.1390	207.4217	223.1340	200.3666	196.0305	176.4518	174.1259	182.2848	185.4138	203.3144	210.5586	230.6859 (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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												940.7256 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												2422.9269 (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 O)												

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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	2960.2473 (238)

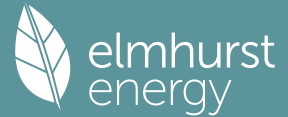
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	940.7256	0.2100	197.5524 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2422.9269	0.2100	508.8146 (264)
Space and water heating			706.3670 (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			656.6825 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.1300 (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	940.7256	1.1300	1063.0199 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2422.9269	1.1300	2737.9074 (278)
Space and water heating			3800.9273 (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			3497.5808 (286)
Target Primary Energy Rate (TPER)			69.9200 (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	83 B	DER	16.01	TER	15.79	
Environmental	89 B	% DER < TER				-1.39
CO ₂ Emissions (t/year)	0.74	DFEE	34.76	TFEE	35.71	
Compliance Check	See BREL	% DFEE < TFEE				2.67
% DPER < TPER	-8.25	DPER	91.19	TPER	84.24	
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

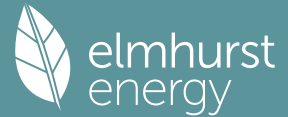
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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
P7 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	65.7085	64.7210	63.2821	60.5289	58.4972	56.2314	54.9435	56.3716	57.9370	60.3697	63.1820	65.4567 (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)												110.6944 (43)
Daily hot water use	120.3815	117.8949	114.8190	110.0278	106.1781	102.0230	100.3421	103.4037	106.6447	111.0178	115.8862	120.0529 (44)
Energy conte	190.6549	167.8807	176.4725	150.6225	142.9362	125.4492	121.3550	128.0354	131.5036	150.6501	165.1011	187.9739 (45)
Energy content (annual)										Total = Sum(45)m =		1838.6351
Distribution loss (46)m = 0.15 x (45)m	28.5982	25.1821	26.4709	22.5934	21.4404	18.8174	18.2033	19.2053	19.7255	22.5975	24.7652	28.1961 (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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	241.6138	213.9081	227.4314	199.9376	193.8951	174.7643	172.3139	178.9943	180.8187	201.6090	214.4162	238.9328 (62)
WWHRS	-32.8091	-29.0167	-30.3846	-25.1596	-23.4479	-20.0645	-18.8073	-19.9996	-20.7595	-24.7432	-27.7251	-32.2015 (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	208.8047	184.8915	197.0468	174.7780	170.4472	154.6998	153.5067	158.9947	160.0592	177.1358	186.6910	206.7312 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2133.7865 (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	76.1325	67.3272	71.4168	62.4108	60.2660	54.0406	53.0903	55.3115	56.0537	62.8309	67.2249	75.2410 (65)

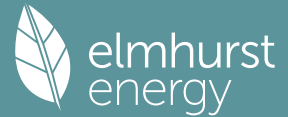
5. Internal gains (see Table 5 and 5a)

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	3.0000	3.0000	3.0000	3.0000	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)	102.3286	100.1893	95.9904	86.6816	81.0027	75.0564	71.3579	74.3434	77.8524	84.4501	93.3679	101.1304 (72)
Total internal gains	377.7148	385.3260	369.0535	354.1035	335.5165	319.4007	306.6455	308.1027	318.0210	333.2600	355.0859	370.0180 (73)

6. Solar gains

[Jan]												Gains
					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		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	396.1710	422.8941	436.7392	465.2628	484.9364	478.6981	455.6649	426.9027	400.4971	379.1711	378.3085	385.0902 (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	42.9393	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	0.9446	0.9261	0.8941	0.8116	0.6782	0.5033	0.3728	0.4123	0.6236	0.8306	0.9170	0.9490 (86)
MIT	19.7965	19.9681	20.2253	20.5858	20.8387	20.9629	20.9912	20.9870	20.9134	20.6112	20.1756	19.7766 (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	0.9368	0.9160	0.8793	0.7864	0.6390	0.4514	0.3128	0.3499	0.5703	0.8026	0.9041	0.9418 (89)
MIT 2	19.1454	19.3138	19.5642	19.9120	20.1376	20.2467	20.2652	20.2653	20.2080	19.9433	19.5271	19.1332 (90)
Living area fraction										fLA = Living area / (4) =		0.4658 (91)
MIT	19.4487	19.6186	19.8722	20.2258	20.4642	20.5803	20.6034	20.6015	20.5366	20.2544	19.8292	19.4329 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.2987	19.4686	19.7222	20.0758	20.3142	20.4303	20.4534	20.4515	20.3866	20.1044	19.6792	19.2829 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9253	0.9039	0.8678	0.7798	0.6421	0.4630	0.3280	0.3655	0.5795	0.7962	0.8926	0.9308 (94)
Useful gains	366.5836	382.2706	379.0012	362.8232	311.3688	221.6598	149.4748	156.0370	232.0970	301.9073	337.6786	358.4358 (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	612.2379	592.7636	536.2429	445.9008	342.5599	228.0203	150.7029	157.9171	247.5176	377.9632	503.5475	607.7392 (97)
Space heating kWh	182.7668	141.4514	116.9878	59.8159	23.2061	0.0000	0.0000	0.0000	0.0000	56.5856	119.4256	185.4817 (98a)
Space heating requirement - total per year (kWh/year)												885.7209
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	182.7668	141.4514	116.9878	59.8159	23.2061	0.0000	0.0000	0.0000	0.0000	56.5856	119.4256	185.4817 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												885.7209
Space heating per m2										(98c) / (4) =		17.7073 (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 %)

88.9000 (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	182.7668	141.4514	116.9878	59.8159	23.2061	0.0000	0.0000	0.0000	0.0000	56.5856	119.4256	185.4817 (98)
Space heating efficiency (main heating system 1)	88.9000	88.9000	88.9000	88.9000	88.9000	0.0000	0.0000	0.0000	0.0000	88.9000	88.9000	88.9000 (210)
Space heating fuel (main heating system)	205.5869	159.1129	131.5948	67.2845	26.1036	0.0000	0.0000	0.0000	0.0000	63.6508	134.3370	208.6409 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	208.8047	184.8915	197.0468	174.7780	170.4472	154.6998	153.5067	158.9947	160.0592	177.1358	186.6910	206.7312 (64)
Efficiency of water heater (217)m	84.0972	83.8144	83.3020	82.3308	81.2418	80.3000	80.3000	80.3000	80.3000	82.2258	83.4494	80.3000 (216)
Fuel for water heating, kWh/month	248.2897	220.5964	236.5451	212.2876	209.8024	192.6523	191.1665	198.0009	199.3265	215.4260	223.7176	245.6707 (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	17.2812	15.6088	17.2812	16.7237	17.2812	16.7237	17.2812	17.2812	16.7237	17.2812	16.7237	17.2812 (231)
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 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												996.3115 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												2593.4815 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7700)

mechanical ventilation fans (SFP = 0.7700)

117.4720 (230a)

central heating pump

41.0000 (230c)

main heating flue fan

45.0000 (230e)

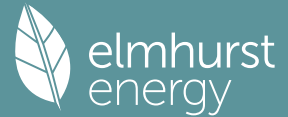
Total electricity for the above, kWh/year

203.4720 (231)

Electricity for lighting (calculated in Appendix L)

128.4080 (232)

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Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3921.6730 (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	996.3115	0.2100	209.2254 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2593.4815	0.2100	544.6311 (264)
Space and water heating			753.8565 (265)
Pumps, fans and electric keep-hot	203.4720	0.1387	28.2241 (267)
Energy for lighting	128.4080	0.1443	18.5332 (268)
Total CO2, kg/year			800.6138 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			16.0100 (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	996.3115	1.1300	1125.8320 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2593.4815	1.1300	2930.6341 (278)
Space and water heating			4056.4661 (279)
Pumps, fans and electric keep-hot	203.4720	1.5128	307.8124 (281)
Energy for lighting	128.4080	1.5338	196.9565 (282)
Total Primary energy kWh/year			4561.2350 (286)
Dwelling Primary energy Rate (DPER)			91.1900 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
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

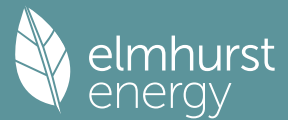
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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)

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)

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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	52.8948	(39)
												52.4667	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	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)
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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	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)	
Distribution loss (46)m = 0.15 x (45)m	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)	
Water storage loss (or HIU loss):	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)	
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	50.9589	46.0274	50.9589	48.2903	48.1453	44.7666	45.5335	46.9482	46.8776	50.4207	49.3151	50.9589 (61)	
Total heat required for water heating calculated for each month	220.8006	195.4758	207.9790	182.3406	175.3318	156.3872	153.5986	161.0236	164.0928	184.6865	196.4133	218.4349 (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	196.7692	174.2222	185.7235	163.9122	158.1572	141.6908	139.8231	146.3747	148.8873	166.7609	176.1058	194.8486 (64)	
12Total per year (kWh/year)													1993.2754 (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	69.2121	61.1984	64.9489	56.6443	54.3258	48.3055	47.3150	49.6671	50.6934	57.2486	61.2389	68.4255 (65)	

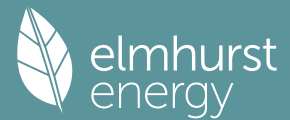
5. Internal gains (see Table 5 and 5a)

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)	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)	-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	93.0270	91.0691	87.2969	78.6726	73.0186	67.0910	63.5955	66.7569	70.4076	76.9470	85.0541	91.9697	(72)
	368.4132	376.2058	360.3601	346.0946	327.5324	311.4352	298.8831	300.5161	310.5762	325.7569	346.7720	360.8573	(73)

6. Solar gains

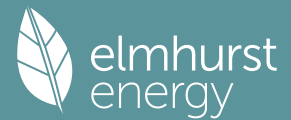
[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W
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					W/m2	or Table 6b		or Table 6c		Table 6d			
Northwest					8.4300	11.2829	0.6300	0.7000		0.7700		29.0684 (81)	
Solar gains	29.0684	59.1697	106.6049	175.0759	235.3363	250.8934	234.7056	187.1101	129.8997	72.3100	36.5756	23.7388	(83)
Total gains	397.4817	435.3755	466.9650	521.1704	562.8687	562.3286	533.5887	487.6262	440.4759	398.0669	383.3477	384.5961	(84)
7. Mean internal temperature (heating season)													
Temperature during heating periods in the living area from Table 9, Th1 (C)													
Utilisation factor for gains for living area, 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	0.9564	0.9401	0.9097	0.8326	0.7056	0.5404	0.4107	0.4616	0.6808	0.8669	0.9364	0.9602	(86)
MIT	19.1468	19.3754	19.7468	20.2700	20.6744	20.9015	20.9696	20.9556	20.7867	20.2759	19.6489	19.1184	(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	0.9493	0.9305	0.8948	0.8053	0.6596	0.4737	0.3284	0.3760	0.6167	0.8389	0.9246	0.9538	(89)
MIT 2	17.8761	18.1646	18.6296	19.2739	19.7397	19.9822	20.0396	20.0326	19.8761	19.2970	18.5207	17.8469	(90)
Living area fraction	18.4680	18.7286	19.1500	19.7379	20.1751	20.4104	20.4728	20.4626	fLA = Living area / (4) =	19.7530	19.0462	0.4658	(91)
MIT	18.4680	18.7286	19.1500	19.7379	20.1751	20.4104	20.4728	20.4626	20.3003	19.7530	19.0462	18.4392	(92)
Temperature adjustment	18.4680	18.7286	19.1500	19.7379	20.1751	20.4104	20.4728	20.4626	20.3003	19.7530	19.0462	0.0000	
adjusted MIT	18.4680	18.7286	19.1500	19.7379	20.1751	20.4104	20.4728	20.4626	20.3003	19.7530	19.0462	18.4392	(93)
8. Space heating requirement													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9347	0.9144	0.8786	0.7956	0.6662	0.4996	0.3655	0.4137	0.6346	0.8290	0.9094	0.9398	(94)
Useful gains	371.5375	398.1156	410.2844	414.6238	375.0064	280.9201	195.0145	201.7543	279.5113	329.9925	348.6186	361.4558	(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	758.1091	737.7624	672.9224	568.6362	443.5124	300.3823	200.2144	209.5448	322.0494	478.9848	628.4526	753.1784	(97)
Space heating kWh	287.6093	228.2427	195.4027	110.8890	50.9685	0.0000	0.0000	0.0000	0.0000	110.8503	201.4805	291.4416	(98a)
Space heating requirement - total per year (kWh/year)												1476.8845	
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	287.6093	228.2427	195.4027	110.8890	50.9685	0.0000	0.0000	0.0000	0.0000	110.8503	201.4805	291.4416	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1476.8845	
Space heating per m2										(98c) / (4) =		29.5259	(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 %)												92.4000	(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	287.6093	228.2427	195.4027	110.8890	50.9685	0.0000	0.0000	0.0000	0.0000	110.8503	201.4805	291.4416	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	311.2655	247.0159	211.4748	120.0097	55.1607	0.0000	0.0000	0.0000	0.0000	119.9678	218.0524	315.4130	(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	196.7692	174.2222	185.7235	163.9122	158.1572	141.6908	139.8231	146.3747	148.8873	166.7609	176.1058	194.8486	(64)
Efficiency of water heater (217)m	85.1935	84.9611	84.4905	83.5619	82.2390	80.3000	80.3000	80.3000	80.3000	83.5264	84.6707	85.2420	(216)
Fuel for water heating, kWh/month	230.9674	205.0613	219.8158	196.1565	192.3142	176.4518	174.1259	182.2848	185.4138	199.6505	207.9891	228.5827	(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) (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)
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												1598.3598	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2398.8138	(219)

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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	3593.7684 (238)

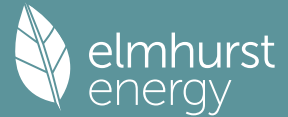
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1598.3598	0.2100	335.6556 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2398.8138	0.2100	503.7509 (264)
Space and water heating			839.4065 (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			789.7219 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.7900 (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	1598.3598	1.1300	1806.1466 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2398.8138	1.1300	2710.6596 (278)
Space and water heating			4516.8062 (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			4213.4596 (286)
Target Primary Energy Rate (TPER)			84.2400 (287)

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Plot Reference	B3.1-3.3 2B4P Ground				Issued on Date	19/12/2025	
Assessment Reference	2B4P			Plot Type Ref	2B4P		
Plot Address					SAP Version	10.2	
SAP Rating	84 B	DER	14.53	TER	14.72		
Environmental	89 B	% DER < TER				1.29	
CO ₂ Emissions (t/year)	0.9	DFEE	38.51	TFEE	39.60		
Compliance Check	See BREL	% DFEE < TFEE				2.76	
% DPER < TPER	-6.11	DPER	82.88	TPER	78.11		
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	69.6600 (1b)	2.5000 (2b)	174.1500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	174.1500 (5)

2. Ventilation rate

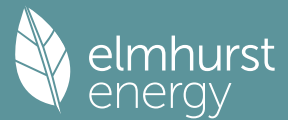
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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 infiltr 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			17.2800	0.9615	16.6154		(27)
Ground Floor			69.6600	0.1300	9.0558	110.0000	7662.6000 (28a)
External Wall	40.4300	17.2800	23.1500	0.1600	3.7040	14.0000	324.1000 (29a)
Communal Wall	18.1700	1.8900	16.2800	0.2100	3.4188	14.0000	227.9200 (29a)
Total net area of external elements Aum(A, m ²)			128.2600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.6840		(33)
Main dwelling							
Party Wall			28.9800	0.0000	0.0000	20.0000	579.6000 (32)
Party Ceiling			69.6600			100.0000	6966.0000 (32b)
Stud			120.0000			9.0000	1080.0000 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		16840.2200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							241.7488 (35)
List of Thermal Bridges							

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K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.9500	0.0500	0.4975
E3 Sill	3.6200	0.0500	0.1810
E4 Jamb	23.3000	0.0500	1.1650
E5 Ground floor (normal)	23.4400	0.1600	3.7504
E7 Party floor between dwellings (in blocks of flats)	23.4400	0.0700	1.6408
E16 Corner (normal)	2.5000	0.0900	0.2250
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	11.5900	0.0800	0.9272
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.5900	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.9869 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	43.6709 (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	17.3881	17.2049	17.0217	16.1058	15.9226	15.0067	15.0067	14.8235	15.3731	15.9226	16.2890	16.6554	(38)
Heat transfer coeff	61.0590	60.8758	60.6926	59.7767	59.5935	58.6776	58.6776	58.4944	59.0440	59.5935	59.9599	60.3263	(39)
Average = Sum(39)m / 12 =												59.7309	
HLP	0.8765	0.8739	0.8713	0.8581	0.8555	0.8423	0.8423	0.8397	0.8476	0.8555	0.8608	0.8660	(40)
HLP (average)												0.8575	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2378 (42)
Hot water usage for mixer showers	77.1761	76.0163	74.3262	71.0926	68.7063	66.0450	64.5324	66.2097	68.0483	70.9056	74.2087	76.8804	(42a)
Hot water usage for baths	26.6738	26.2777	25.7198	24.6913	23.9211	23.0670	22.6057	23.1597	23.7629	24.6767	25.7264	26.5837	(42b)
Hot water usage for other uses	37.5477	36.1824	34.8170	33.4516	32.0863	30.7209	30.7209	32.0863	33.4516	34.8170	36.1824	37.5477	(42c)
Average daily hot water use (litres/day)												130.0190	(43)
Daily hot water use	141.3977	138.4764	134.8631	129.2355	124.7136	119.8330	117.8590	121.4556	125.2628	130.3993	136.1175	141.0118	(44)
Energy conte	223.9394	197.1885	207.2795	176.9169	167.8885	147.3486	142.5403	150.3874	154.4615	176.9506	193.9244	220.7904	(45)
Energy content (annual)										Total = Sum(45)m =		2159.6161	
Distribution loss (46)m = 0.15 x (45)m	33.5909	29.5783	31.0919	26.5375	25.1833	22.1023	21.3810	22.5581	23.1692	26.5426	29.0887	33.1186	(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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	274.8983	243.2159	258.2384	226.2320	218.8474	196.6637	193.4992	201.3463	203.7766	227.9095	243.2395	271.7494	(62)
WWHRS	-38.5351	-34.0807	-35.6874	-29.5506	-27.5401	-23.5662	-22.0896	-23.4900	-24.3825	-28.7443	-32.5638	-37.8214	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	236.3632	209.1352	222.5511	196.6814	191.3073	173.0975	171.4096	177.8563	179.3941	199.1652	210.6757	233.9279	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2401.5645	(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	87.1996	77.0720	81.6602	71.1536	68.5626	61.3222	60.1344	62.7435	63.6872	71.5758	76.8086	86.1526	(65)

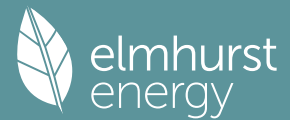
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	99.1128	109.7320	99.1128	102.4166	99.1128	102.4166	99.1128	99.1128	102.4166	99.1128	102.4166	99.1128	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	196.5022	198.5413	193.4029	182.4638	168.6552	155.6771	147.0069	144.9678	150.1062	161.0453	174.8539	187.8320	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	(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)	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	(71)
Water heating gains (Table 5)	117.2037	114.6905	109.7583	98.8245	92.1541	85.1697	80.8258	84.3327	88.4545	96.2040	106.6786	115.7964	(72)
Total internal gains	472.3864	482.5315	461.8416	443.2725	419.4898	399.8310	383.5131	384.9810	397.5449	415.9298	443.5167	462.3089	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North					4.6300	10.6334	0.4000	0.7000	0.7700	9.5531 (74)			
Northwest					12.6500	11.2829	0.4000	0.7000	0.7700	27.6952 (81)			
Solar gains	37.2483	74.6308	132.5908	216.6344	291.3434	310.8999	290.7074	231.4977	161.0617	90.6258	46.6327	30.5812	(83)
Total gains	509.6347	557.1623	594.4324	659.9070	710.8332	710.7309	674.2205	616.4787	558.6065	506.5556	490.1494	492.8901	(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	76.6118	76.8423	77.0742	78.2552	78.4958	79.7210	79.7210	79.9707	79.2264	78.4958	78.0161	77.5423
alpha	6.1075	6.1228	6.1383	6.2170	6.2331	6.3147	6.3147	6.3314	6.2818	6.2331	6.2011	6.1695
util living area	0.9927	0.9862	0.9689	0.8977	0.7361	0.5239	0.3824	0.4352	0.6991	0.9323	0.9843	0.9940 (86)
MIT	20.1444	20.2825	20.4931	20.7812	20.9481	20.9947	20.9994	20.9987	20.9717	20.7533	20.4137	20.1263 (87)
Th 2	20.1875	20.1897	20.1920	20.2032	20.2055	20.2168	20.2168	20.2190	20.2123	20.2055	20.2010	20.1965 (88)
util rest of house	0.9906	0.9822	0.9599	0.8714	0.6859	0.4618	0.3146	0.3620	0.6307	0.9085	0.9791	0.9922 (89)
MIT 2	19.4128	19.5507	19.7579	20.0351	20.1731	20.2145	20.2166	20.2187	20.1979	20.0178	19.6905	19.4022 (90)
Living area fraction	19.7405	19.8785	20.0872	20.3692	20.5203	20.5639	20.5672	20.5680	20.5445	20.3473	20.0144	19.4479 (91)
MIT	19.7405	19.8785	20.0872	20.3692	20.5203	20.5639	20.5672	20.5680	20.5445	20.3473	20.0144	19.7265 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.5905	19.7285	19.9372	20.2192	20.3703	20.4139	20.4172	20.4180	20.3945	20.1973	19.8644	19.5765 (93)

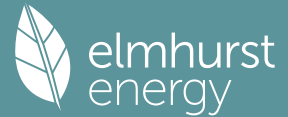
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9886	0.9794	0.9565	0.8720	0.6967	0.4776	0.3320	0.3807	0.6472	0.9082	0.9764	0.9904 (94)
Useful gains	503.8185	545.6799	568.5975	575.4242	495.2325	339.4161	223.8425	234.7067	361.5126	460.0603	478.5639	488.1689 (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	933.6212	902.6959	815.5387	676.6267	516.6915	341.1462	223.9847	235.0314	371.6523	571.9349	765.3525	927.6089 (97)
Space heating kWh	319.7732	239.9147	183.7242	72.8658	15.9655	0.0000	0.0000	0.0000	0.0000	83.2347	206.4878	326.9434 (98a)
Space heating requirement - total per year (kWh/year)												1448.9092
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	319.7732	239.9147	183.7242	72.8658	15.9655	0.0000	0.0000	0.0000	0.0000	83.2347	206.4878	326.9434 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1448.9092
Space heating per m2										(98c) / (4) =		20.7997 (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 %)												88.9000 (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	319.7732	239.9147	183.7242	72.8658	15.9655	0.0000	0.0000	0.0000	0.0000	83.2347	206.4878	326.9434 (98)
Space heating efficiency (main heating system 1)	88.9000	88.9000	88.9000	88.9000	88.9000	0.0000	0.0000	0.0000	0.0000	88.9000	88.9000	88.9000 (210)
Space heating fuel (main heating system)	359.6999	269.8703	206.6639	81.9638	17.9589	0.0000	0.0000	0.0000	0.0000	93.6273	232.2697	367.7653 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	236.3632	209.1352	222.5511	196.6814	191.3073	173.0975	171.4096	177.8563	179.3941	199.1652	210.6757	233.9279 (64)
Efficiency of water heater (217)m	85.0296	84.6764	83.9735	82.4563	80.9028	80.3000	80.3000	80.3000	80.3000	82.6568	84.3384	80.3000 (216)
Fuel for water heating, kWh/month	277.9775	246.9815	265.0252	238.5281	236.4655	215.5635	213.4615	221.4898	223.4048	240.9546	249.7980	85.0988 (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 (219)
Pumps and Fa	21.1986	19.1471	21.1986	20.5148	21.1986	20.5148	21.1986	21.1986	20.5148	21.1986	20.5148	21.1986 (231)
Lighting	21.9786	17.6321	15.8757	11.6312	8.9843	7.3403	8.1958	10.6532	13.8374	18.1555	20.5066	22.5895 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1629.8191 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												2904.5399 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7700)												
mechanical ventilation fans (SFP = 0.7700)												163.5965 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												249.5965 (231)
Electricity for lighting (calculated in Appendix L)												177.3801 (232)

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

PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4961.3357 (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	1629.8191	0.2100	342.2620 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2904.5399	0.2100	609.9534 (264)
Space and water heating			952.2154 (265)
Pumps, fans and electric keep-hot	249.5965	0.1387	34.6221 (267)
Energy for lighting	177.3801	0.1443	25.6014 (268)
Total CO2, kg/year			1012.4390 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			14.5300 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1629.8191	1.1300	1841.6956 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2904.5399	1.1300	3282.1301 (278)
Space and water heating			5123.8258 (279)
Pumps, fans and electric keep-hot	249.5965	1.5128	377.5896 (281)
Energy for lighting	177.3801	1.5338	272.0716 (282)
Total Primary energy kWh/year			5773.4869 (286)
Dwelling Primary energy Rate (DPER)			82.8800 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	69.6600 (1b)	x 2.5000 (2b)	= 174.1500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.1500 (5)

2. Ventilation rate

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

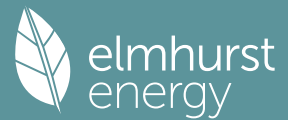
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1148 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000 (17)	
Infiltration rate		0.3648 (18)	
Number of sides sheltered		2 (19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)	
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3101 (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	0.3954	0.3876	0.3799	0.3411	0.3334	0.2946	0.2946	0.2869	0.3101	0.3334	0.3489	0.3644 (22b)
Effective ac	0.5782	0.5751	0.5722	0.5582	0.5556	0.5434	0.5434	0.5411	0.5481	0.5556	0.5609	0.5664 (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)

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TER Opening Type			15.5300	1.1450	17.7824	(27)
Ground Floor			69.6600	0.1300	9.0558	(28a)
External Wall	40.4300	15.5300	24.9000	0.1800	4.4820	(29a)
Communal Wall	18.1700	1.8900	16.2800	0.1800	2.9304	(29a)
Total net area of external elements Aum(A, m2)			128.2600			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	36.1406		(33)
Main dwelling						
Party Wall			28.9800	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 241.7488 (35)

List of Thermal Bridges						
K1 Element			Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)			9.9500	0.0500	0.4975	
E3 Sill			3.6200	0.0500	0.1810	
E4 Jamb			23.3000	0.0500	1.1650	
E5 Ground floor (normal)			23.4400	0.1600	3.7504	
E7 Party floor between dwellings (in blocks of flats)			23.4400	0.0700	1.6408	
E16 Corner (normal)			2.5000	0.0900	0.2250	
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			11.5900	0.0800	0.9272	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)			11.5900	0.0000	0.0000	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.9869 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 45.1275 (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 33.2272 33.0527 32.8817 32.0786 31.9283 31.2288 31.2288 31.0993 31.4982 31.9283 32.2323 32.5501 (38)
Heat transfer coeff 78.3547 78.1803 78.0093 77.2061 77.0559 76.3563 76.3563 76.2268 76.6258 77.0559 77.3598 77.6776 (39)
Average = Sum(39)m / 12 = 77.2054

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1248	1.1223	1.1199	1.1083	1.1062	1.0961	1.0961	1.0943	1.1000	1.1062	1.1105	1.1151	(40)
HLP (average)												1.1083	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2378 (42)
Hot water usage for mixer showers	61.7409	60.8131	59.4610	56.8741	54.9650	52.8360	51.6259	52.9677	54.4386	56.7245	59.3670	61.5043	(42a)
Hot water usage for baths	26.6738	26.2777	25.7198	24.6913	23.9211	23.0670	22.6057	23.1597	23.7629	24.6767	25.7264	26.5837	(42b)
Hot water usage for other uses	37.5477	36.1824	34.8170	33.4516	32.0863	30.7209	30.7209	32.0863	33.4516	34.8170	36.1824	37.5477	(42c)
Average daily hot water use (litres/day)													115.7882 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	125.9625	123.2731	119.9978	115.0170	110.9723	106.6240	104.9525	108.2137	111.6531	116.2182	121.2758	125.6357	(44)
Energy content (annual)	199.4938	175.5393	184.4322	157.4525	149.3901	131.1066	126.9310	133.9912	137.6794	157.7070	172.7796	196.7152	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1923.2178	
Water storage loss (or HIU loss):	29.9241	26.3309	27.6648	23.6179	22.4085	19.6660	19.0397	20.0987	20.6519	23.6560	25.9169	29.5073	(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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	250.4527	221.5667	235.3911	206.7676	200.3490	180.4217	177.8899	184.9501	186.9945	208.6659	222.0947	247.6741	(62)
WWHRS	-28.2254	-24.9627	-26.1395	-21.6446	-20.1720	-17.2613	-16.1797	-17.2055	-17.8592	-21.0540	-23.8517	-27.7027	(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	222.2273	196.6039	209.2516	185.1230	180.1770	163.1604	161.7102	167.7446	169.1353	187.6119	198.2430	219.9714	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2260.9596	(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)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													
Heat gains from water heating, kWh/month	79.0714	69.8737	74.0634	64.6817	62.4119	55.9217	54.9443	57.2918	58.1072	65.1773	69.7780	78.1475	(65)

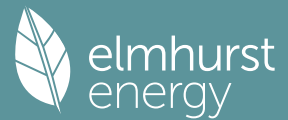
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	99.1129	109.7322	99.1129	102.4167	99.1129	102.4167	99.1129	99.1129	102.4167	99.1129	102.4167	99.1129	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	196.5022	198.5413	193.4029	182.4638	168.6552	155.6771	147.0069	144.9678	150.1062	161.0453	174.8539	187.8320	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	(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)	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	(71)
Water heating gains (Table 5)	106.2788	103.9787	99.5476	89.8357	83.8870	77.6690	73.8498	77.0051	80.7044	87.6039	96.9139	105.0370	(72)
Total internal gains	461.4616	471.8198	451.6311	434.2839	411.2228	392.3305	376.5373	377.6535	389.7950	407.3297	433.7521	451.5496	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
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	m2		Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		factor Table 6d		W	
North	4.1600		10.6334		0.6300		0.7000		0.7700		13.5188	(74)
Northwest	11.3700		11.2829		0.6300		0.7000		0.7700		39.2062	(81)

Solar gains	52.7250	105.6404	187.6839	306.6491	412.4007	440.0830	411.5004	327.6884	227.9849	128.2817	66.0087	43.2877	(83)
Total gains	514.1865	577.4602	639.3150	740.9330	823.6235	832.4135	788.0377	705.3418	617.7799	535.6114	499.7608	494.8373	(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	59.7008	59.8340	59.9652	60.5890	60.7071	61.2633	61.2633	61.3674	61.0478	60.7071	60.4686	60.2212	
alpha	4.9801	4.9889	4.9977	5.0393	5.0471	5.0842	5.0842	5.0912	5.0699	5.0471	5.0312	5.0147	
util living area	0.9942	0.9888	0.9740	0.9146	0.7717	0.5702	0.4231	0.4899	0.7642	0.9524	0.9886	0.9952	(86)
MIT	19.7342	19.9077	20.1921	20.5915	20.8709	20.9777	20.9959	20.9919	20.9097	20.5360	20.0747	19.7077	(87)
Th 2	19.9806	19.9827	19.9846	19.9940	19.9958	20.0040	20.0040	20.0055	20.0008	19.9958	19.9922	19.9885	(88)
util rest of house	0.9924	0.9853	0.9657	0.8886	0.7145	0.4885	0.3290	0.3877	0.6844	0.9322	0.9843	0.9937	(89)
MIT 2	18.5172	18.7390	19.0986	19.5891	19.8920	19.9918	20.0027	20.0027	19.9408	19.5364	18.9599	18.4891	(90)
Living area fraction	19.0623	19.2625	19.5884	20.0381	20.3304	20.4334	20.4476	20.4457	20.3748	19.9841	19.4592	19.0349	(91)
MIT	19.0623	19.2625	19.5884	20.0381	20.3304	20.4334	20.4476	20.4457	20.3748	19.9841	19.4592	19.0349	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0623	19.2625	19.5884	20.0381	20.3304	20.4334	20.4476	20.4457	20.3748	19.9841	19.4592	19.0349	(93)

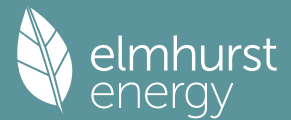
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9901	0.9821	0.9617	0.8899	0.7346	0.5245	0.3713	0.4336	0.7163	0.9319	0.9814	0.9917	(94)
Useful gains	509.1080	567.1026	614.8064	659.3353	605.0668	436.5997	292.5628	305.8041	442.5382	499.1422	490.4540	490.7402	(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	1156.6919	1122.8611	1021.0146	859.9264	665.0225	445.4135	293.7870	308.3925	480.8086	723.1022	956.1062	1152.3392	(97)
Space heating kWh	481.8024	373.4697	302.2189	144.4256	44.6071	0.0000	0.0000	0.0000	0.0000	166.6262	335.2696	492.2297	(98a)
Space heating requirement - total per year (kWh/year)												2340.6492	
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	481.8024	373.4697	302.2189	144.4256	44.6071	0.0000	0.0000	0.0000	0.0000	166.6262	335.2696	492.2297	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2340.6492	
Space heating per m2										(98c) / (4) =		33.6010	(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 %)												92.4000	(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	481.8024	373.4697	302.2189	144.4256	44.6071	0.0000	0.0000	0.0000	0.0000	166.6262	335.2696	492.2297	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	521.4312	404.1880	327.0768	156.3048	48.2761	0.0000	0.0000	0.0000	0.0000	180.3314	362.8459	532.7161	(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	222.2273	196.6039	209.2516	185.1230	180.1770	163.1604	161.7102	167.7446	169.1353	187.6119	198.2430	219.9714	(64)
Efficiency of water heater (217)m	85.9930	85.7334	85.1683	83.8551	81.8717	80.3000	80.3000	80.3000	80.3000	84.1281	85.4976	86.0535	(216)
Fuel for water heating, kWh/month	258.4250	229.3201	245.6919	220.7653	220.0724	203.1885	201.3826	208.8973	210.6293	223.0073	231.8698	255.6218	(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	20.5937	16.5210	14.8754	10.8983	8.4182	6.8777	7.6793	9.9819	12.9655	17.0115	19.2144	21.1661	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-18.6714	-27.6673	-41.7781	-49.4283	-55.4607	-52.5627	-51.9235	-47.9435	-41.3038	-32.7074	-20.9996	-15.9897	(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)	-6.8276	-14.6694	-29.7347	-45.5188	-61.0343	-61.6333	-60.9064	-51.1788	-37.0042	-21.2560	-9.2042	-5.3764	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2533.1701	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

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Efficiency of water heater	80.3000	
Water heating fuel used	2708.8714	(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)	166.2031	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-860.7801	(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	4633.4645	(238)

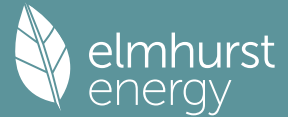
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2533.1701	0.2100	531.9657 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2708.8714	0.2100	568.8630 (264)
Space and water heating			1100.8287 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	166.2031	0.1443	23.9882 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-456.4360	0.1335	-60.9565
PV Unit electricity exported	-404.3441	0.1253	-50.6814
Total			-111.6379 (269)
Total CO2, kg/year			1025.1083 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.7200 (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	2533.1701	1.1300	2862.4822 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2708.8714	1.1300	3061.0246 (278)
Space and water heating			5923.5069 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	166.2031	1.5338	254.9278 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-456.4360	1.4935	-681.6942
PV Unit electricity exported	-404.3441	0.4601	-186.0248
Total			-867.7189 (283)
Total Primary energy kWh/year			5440.8166 (286)
Target Primary Energy Rate (TPER)			78.1100 (287)

Full SAP Calculation Printout



Plot Reference	B3.1-3.3 2B4P Mid				Issued on Date	19/12/2025	
Assessment Reference	2B4P			Plot Type Ref	2B4P		
Plot Address					SAP Version	10.2	
SAP Rating	85 B	DER	12.38	TER	12.53		
Environmental	90 B	% DER < TER				1.20	
CO ₂ Emissions (t/year)	0.79	DFEE	28.31	TFEE	29.83		
Compliance Check	See BREL	% DFEE < TFEE				5.10	
% DPER < TPER	-7.43	DPER	71.27	TPER	66.34		
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	69.6600 (1b)	2.5000 (2b)	174.1500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	174.1500 (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

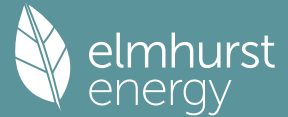
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			17.2800	0.9615	16.6154		(27)
External Wall	40.4300	17.2800	23.1500	0.1600	3.7040	14.0000	324.1000 (29a)
Communal Wall	18.1700	1.8900	16.2800	0.2100	3.4188	14.0000	227.9200 (29a)
Total net area of external elements Aum(A, m ²)			58.6000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	25.6282	(33)
Main dwelling							
Party Wall			28.9800	0.0000	0.0000	20.0000	579.6000 (32)
Party Floor			69.6600			80.0000	5572.8000 (32d)
Party Ceiling			69.6600			100.0000	6966.0000 (32b)
Stud			120.0000			9.0000	1080.0000 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	14750.4200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		211.7488 (35)
List of Thermal Bridges		

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)

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	84.4118	84.7315	85.0537	86.7022	87.0396	88.7667	88.7667	89.1204	88.0677	87.0396	86.3674	85.7055	21.0000 (85)
alpha	6.6275	6.6488	6.6702	6.7801	6.8026	6.9178	6.9178	6.9414	6.8712	6.8026	6.7578	6.7137	
util living area	0.9824	0.9667	0.9285	0.8014	0.6069	0.4151	0.3012	0.3429	0.5692	0.8565	0.9616	0.9851	(86)
MIT	20.4011	20.5361	20.7164	20.9166	20.9876	20.9992	20.9999	20.9998	20.9940	20.8918	20.6352	20.3849	(87)
Th 2	20.3437	20.3460	20.3483	20.3599	20.3623	20.3740	20.3740	20.3763	20.3693	20.3623	20.3576	20.3530	(88)
util rest of house													
	0.9783	0.9595	0.9140	0.7716	0.5680	0.3747	0.2584	0.2965	0.5193	0.8257	0.9522	0.9817	(89)
MIT 2	19.8024	19.9355	20.1089	20.2971	20.3545	20.3736	20.3739	20.3762	20.3661	20.2821	20.0430	19.7945	(90)
Living area fraction													
MIT	20.0705	20.2045	20.3810	20.5746	20.6381	20.6538	20.6543	20.6555	20.6474	20.5552	20.3083	20.0589	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.9205	20.0545	20.2310	20.4246	20.4881	20.5038	20.5043	20.5055	20.4974	20.4052	20.1583	19.9089	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9752	0.9558	0.9112	0.7747	0.5758	0.3831	0.2673	0.3061	0.5295	0.8279	0.9488	0.9788	(94)
Useful gains	497.0174	532.5414	541.6321	511.2472	409.2770	272.2894	180.2031	188.7185	295.7852	419.3745	465.0453	482.4608	(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	758.2197	732.8235	661.4694	544.6231	413.6933	272.5110	180.2174	188.7539	297.6367	461.5738	619.4946	750.9983	(97)
Space heating kWh	194.3345	134.5896	89.1590	24.0307	3.2857	0.0000	0.0000	0.0000	0.0000	31.3963	111.2035	199.7919	(98a)
Space heating requirement - total per year (kWh/year)												787.7911	
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	194.3345	134.5896	89.1590	24.0307	3.2857	0.0000	0.0000	0.0000	0.0000	31.3963	111.2035	199.7919	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												787.7911	
Space heating per m2										(98c) / (4) =		11.3091	(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 %)													88.9000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	194.3345	134.5896	89.1590	24.0307	3.2857	0.0000	0.0000	0.0000	0.0000	31.3963	111.2035	199.7919	(98)
Space heating efficiency (main heating system 1)	88.9000	88.9000	88.9000	88.9000	88.9000	0.0000	0.0000	0.0000	0.0000	88.9000	88.9000	88.9000	(210)
Space heating fuel (main heating system)	218.5990	151.3943	100.2913	27.0311	3.6959	0.0000	0.0000	0.0000	0.0000	35.3164	125.0883	224.7378	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	236.3632	209.1352	222.5511	196.6814	191.3073	173.0975	171.4096	177.8563	179.3941	199.1652	210.6757	233.9279	(64)
Efficiency of water heater (217)m	83.9650	83.4614	82.5851	81.1548	80.4314	80.3000	80.3000	80.3000	80.3000	81.3719	83.0765	84.0452	(216)
Fuel for water heating, kWh/month	281.5021	250.5771	269.4808	242.3535	237.8516	215.5635	213.4615	221.4898	223.4048	244.7592	253.5923	278.3357	(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 (217)m	21.1986	19.1471	21.1986	20.5148	21.1986	20.5148	21.1986	21.1986	20.5148	21.1986	20.5148	21.1986	(231)
Lighting (233a)m	21.9786	17.6321	15.8757	11.6312	8.9843	7.3403	8.1958	10.6532	13.8374	18.1555	20.5066	22.5895	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												886.1542	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2932.3719	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7700)													
mechanical ventilation fans (SFP = 0.7700)													163.5965 (230a)
central heating pump													41.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													249.5965 (231)
Electricity for lighting (calculated in Appendix L)													177.3801 (232)

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

PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4245.5028 (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	886.1542	0.2100	186.0924 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2932.3719	0.2100	615.7981 (264)
Space and water heating			801.8905 (265)
Pumps, fans and electric keep-hot	249.5965	0.1387	34.6221 (267)
Energy for lighting	177.3801	0.1443	25.6014 (268)
Total CO2, kg/year			862.1140 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.3800 (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	886.1542	1.1300	1001.3543 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2932.3719	1.1300	3313.5802 (278)
Space and water heating			4314.9345 (279)
Pumps, fans and electric keep-hot	249.5965	1.5128	377.5896 (281)
Energy for lighting	177.3801	1.5338	272.0716 (282)
Total Primary energy kWh/year			4964.5957 (286)
Dwelling Primary energy Rate (DPER)			71.2700 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	69.6600 (1b)	x 2.5000 (2b)	= 174.1500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.1500 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	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) =	0.1148 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3648	(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) =		0.3101 (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	0.3954	0.3876	0.3799	0.3411	0.3334	0.2946	0.2946	0.2869	0.3101	0.3334	0.3489	0.3644 (22b)
Effective ac	0.5782	0.5751	0.5722	0.5582	0.5556	0.5434	0.5434	0.5411	0.5481	0.5556	0.5609	0.5664 (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			15.5300	1.1450	17.7824		(27)

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External Wall	40.4300	15.5300	24.9000	0.1800	4.4820	(29a)
Communal Wall	18.1700	1.8900	16.2800	0.1800	2.9304	(29a)
Total net area of external elements Aum(A, m2)			58.6000			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.0848	(33)
Main dwelling						(32)
Party Wall			28.9800	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 211.7488 (35)

List of Thermal Bridges						
K1 Element	Length	Psi-value	Total			
E2 Other lintels (including other steel lintels)	9.9500	0.0500	0.4975			
E3 Sill	3.6200	0.0500	0.1810			
E4 Jamb	23.3000	0.0500	1.1650			
E7 Party floor between dwellings (in blocks of flats)	38.3500	0.0700	2.6845			
E16 Corner (normal)	2.5000	0.0900	0.2250			
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)	23.1800	0.0000	0.0000			
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.5300	0.0200	0.1706			

Thermal bridges (Sum(L x Psi) calculated using Appendix K)						5.5236 (36)
Point Thermal Bridges					(36a) =	0.0000
Total fabric heat loss					(33) + (36) + (36a) =	32.6084 (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	33.2272	33.0527	32.8817	32.0786	31.9283	31.2288	31.2288	31.0993	31.4982	31.9283	32.2323	32.5501	(38)
Average = Sum(39)m / 12 =	65.8356	65.6612	65.4902	64.6870	64.5368	63.8372	63.8372	63.7077	64.1067	64.5368	64.8407	65.1585	(39)
												64.6863	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9451	0.9426	0.9401	0.9286	0.9265	0.9164	0.9164	0.9146	0.9203	0.9265	0.9308	0.9354	(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													2.2378 (42)
Hot water usage for mixer showers	61.7409	60.8131	59.4610	56.8741	54.9650	52.8360	51.6259	52.9677	54.4386	56.7245	59.3670	61.5043	(42a)
Hot water usage for baths	26.6738	26.2777	25.7198	24.6913	23.9211	23.0670	22.6057	23.1597	23.7629	24.6767	25.7264	26.5837	(42b)
Hot water usage for other uses	37.5477	36.1824	34.8170	33.4516	32.0863	30.7209	30.7209	32.0863	33.4516	34.8170	36.1824	37.5477	(42c)
Average daily hot water use (litres/day)													115.7882 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	125.9625	123.2731	119.9978	115.0170	110.9723	106.6240	104.9525	108.2137	111.6531	116.2182	121.2758	125.6357	(44)
Energy conte	199.4938	175.5393	184.4322	157.4525	149.3901	131.1066	126.9310	133.9912	137.6794	157.7070	172.7796	196.7152	(45)
Energy content (annual)										Total =	Sum(45)m =	1923.2178	
Distribution loss (46)m = 0.15 x (45)m													
29.9241	26.3309	27.6648	23.6179	22.4085	19.6660	19.0397	20.0987	20.6519	23.6560	25.9169	29.5073	(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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
250.4527	221.5667	235.3911	206.7676	200.3490	180.4217	177.8899	184.9501	186.9945	208.6659	222.0947	247.6741	(62)	
WWHRS	-28.2254	-24.9627	-26.1395	-21.6446	-20.1720	-17.2613	-16.1797	-17.2055	-17.8592	-21.0540	-23.8517	-27.7027	(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													
222.2273	196.6039	209.2516	185.1230	180.1770	163.1604	161.7102	167.7446	169.1353	187.6119	198.2430	219.9714	(64)	
12Total per year (kWh/year)										Total per year (kWh/year) =	Sum(64)m =	2260.9596	(64)
Electric shower(s)												2261	(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) =												0.0000	(64a)
Sum(64a)m =													
Heat gains from water heating, kWh/month													
79.0714	69.8737	74.0634	64.6817	62.4119	55.9217	54.9443	57.2918	58.1072	65.1773	69.7780	78.1475	(65)	

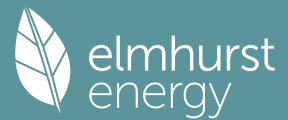
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	99.1129	109.7322	99.1129	102.4167	99.1129	102.4167	99.1129	99.1129	102.4167	99.1129	102.4167	99.1129	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	196.5022	198.5413	193.4029	182.4638	168.6552	155.6771	147.0069	144.9678	150.1062	161.0453	174.8539	187.8320	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	(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)													
	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	(71)
Water heating gains (Table 5)													
	106.2788	103.9787	99.5476	89.8357	83.8870	77.6690	73.8498	77.0051	80.7044	87.6039	96.9139	105.0370	(72)
Total internal gains													
	461.4616	471.8198	451.6311	434.2839	411.2228	392.3305	376.5373	377.6535	389.7950	407.3297	433.7521	451.5496	(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
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North	4.1600	10.6334	0.6300	0.7000	0.7700	13.5188 (74)
Northwest	11.3700	11.2829	0.6300	0.7000	0.7700	39.2062 (81)

Solar gains	52.7250	105.6404	187.6839	306.6491	412.4007	440.0830	411.5004	327.6884	227.9849	128.2817	66.0087	43.2877 (83)
Total gains	514.1865	577.4602	639.3150	740.9330	823.6235	832.4135	788.0377	705.3418	617.7799	535.6114	499.7608	494.8373 (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	62.2359	62.4013	62.5642	63.3410	63.4885	64.1841	64.1841	64.3146	63.9144	63.4885	63.1908	62.8826
alpha	5.1491	5.1601	5.1709	5.2227	5.2326	5.2789	5.2789	5.2876	5.2610	5.2326	5.2127	5.1922
util living area	0.9893	0.9795	0.9537	0.8614	0.6849	0.4849	0.3554	0.4131	0.6760	0.9178	0.9789	0.9911 (86)
MIT	19.9199	20.1009	20.3780	20.7349	20.9337	20.9910	20.9986	20.9970	20.9546	20.6704	20.2443	19.8930 (87)
Th 2	20.1293	20.1314	20.1335	20.1432	20.1451	20.1536	20.1536	20.1551	20.1503	20.1451	20.1414	20.1375 (88)
util rest of house	0.9865	0.9743	0.9422	0.8314	0.6338	0.4232	0.2876	0.3384	0.6065	0.8921	0.9726	0.9887 (89)
MIT 2	18.8745	19.1045	19.4512	19.8813	20.0909	20.1482	20.1530	20.1539	20.1192	19.8195	19.2953	18.8464 (90)
Living area fraction									fLA = Living area / (4) =			0.4479 (91)
MIT	19.3427	19.5508	19.8663	20.2636	20.4684	20.5257	20.5317	20.5315	20.4933	20.2006	19.7203	19.3151 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3427	19.5508	19.8663	20.2636	20.4684	20.5257	20.5317	20.5315	20.4933	20.2006	19.7203	19.3151 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9833	0.9700	0.9380	0.8360	0.6537	0.4506	0.3180	0.3719	0.6355	0.8940	0.9688	0.9858 (94)
Useful gains	505.5745	560.1340	599.6625	619.3837	538.3859	375.0468	250.5837	262.3079	392.6059	478.8231	484.1485	487.8320 (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	990.3469	961.9872	875.3614	735.0779	565.8828	378.2795	250.9915	263.2088	409.8564	619.5926	818.3109	984.8810 (97)
Space heating kWh	360.6707	270.0453	205.1200	83.2998	20.4578	0.0000	0.0000	0.0000	0.0000	104.7325	240.5969	369.8045 (98a)
Space heating requirement - total per year (kWh/year)												1654.7275
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	360.6707	270.0453	205.1200	83.2998	20.4578	0.0000	0.0000	0.0000	0.0000	104.7325	240.5969	369.8045 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1654.7275
Space heating per m2										(98c) / (4) =		23.7543 (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 %)												92.4000 (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	360.6707	270.0453	205.1200	83.2998	20.4578	0.0000	0.0000	0.0000	0.0000	104.7325	240.5969	369.8045 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	390.3362	292.2569	221.9913	90.1513	22.1404	0.0000	0.0000	0.0000	0.0000	113.3469	260.3862	400.2213 (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 requirement	222.2273	196.6039	209.2516	185.1230	180.1770	163.1604	161.7102	167.7446	169.1353	187.6119	198.2430	219.9714 (64)
Efficiency of water heater (217)m	85.4125	85.0619	84.3387	82.7853	81.1000	80.3000	80.3000	80.3000	80.3000	83.1828	84.7974	85.4853 (216)
Fuel for water heating, kWh/month	260.1811	231.1305	248.1086	223.6182	222.1666	203.1885	201.3826	208.8973	210.6293	225.5416	233.7843	257.3208 (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	20.5937	16.5210	14.8754	10.8983	8.4182	6.8777	7.6793	9.9819	12.9655	17.0115	19.2144	21.1661 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-18.6714	-27.6673	-41.7781	-49.4283	-55.4607	-52.5627	-51.9235	-47.9435	-41.3038	-32.7074	-20.9996	-15.9897 (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	-6.8276	-14.6694	-29.7347	-45.5188	-61.0343	-61.6333	-60.9064	-51.1788	-37.0042	-21.2560	-9.2042	-5.3764 (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												1790.8306 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												2725.9494 (219)
Space cooling fuel												0.0000 (221)

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Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	166.2031 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-860.7801 (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	3908.2030 (238)

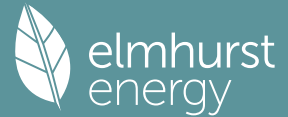
----- 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP -----

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1790.8306	0.2100	376.0744 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2725.9494	0.2100	572.4494 (264)
Space and water heating			948.5238 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	166.2031	0.1443	23.9882 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-456.4360	0.1335	-60.9565
PV Unit electricity exported	-404.3441	0.1253	-50.6814
Total			-111.6379 (269)
Total CO2, kg/year			872.8034 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.5300 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1790.8306	1.1300	2023.6386 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2725.9494	1.1300	3080.3228 (278)
Space and water heating			5103.9614 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	166.2031	1.5338	254.9278 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-456.4360	1.4935	-681.6942
PV Unit electricity exported	-404.3441	0.4601	-186.0248
Total			-867.7189 (283)
Total Primary energy kWh/year			4621.2711 (286)
Target Primary Energy Rate (TPER)			66.3400 (287)

Full SAP Calculation Printout



Plot Reference	B3.1-3.3 2B4P Top				Issued on Date	19/12/2025
Assessment Reference	2B4P	Plot Type Ref	2B4P			
Plot Address					SAP Version	10.2
SAP Rating	83 B	DER	15.74	TER	15.24	
Environmental	88 B	% DER < TER				-3.28
CO ₂ Emissions (t/year)	0.99	DFEE	41.86	TFEE	42.10	
Compliance Check	See BREL	% DFEE < TFEE				0.56
% DPER < TPER	-10.43	DPER	89.35	TPER	80.91	
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	69.6600 (1b)	2.5000 (2b)	174.1500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	174.1500 (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			17.2800	0.9615	16.6154		(27)
External Wall	40.4300	17.2800	23.1500	0.1600	3.7040	14.0000	324.1000 (29a)
Communal Wall	18.1700	1.8900	16.2800	0.2100	3.4188	14.0000	227.9200 (29a)
Roof	69.6600		69.6600	0.1300	9.0558	9.0000	626.9400 (30)
Total net area of external elements Aum(A, m ²)			128.2600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.6840		(33)
Main dwelling							
Party Wall			28.9800	0.0000	0.0000	20.0000	579.6000 (32)
Party Floor			69.6600			80.0000	5572.8000 (32d)
Stud			120.0000			9.0000	1080.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	8411.3600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							120.7488 (35)
List of Thermal Bridges							

elmhurst
energy

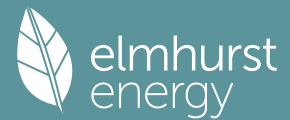
Ventilation heat loss calculated monthly (39)m = 0.33 x (25)m x (5)												
(39)m	Jan 17.3881	Feb 17.2049	Mar 17.0217	Apr 16.1058	May 15.9226	Jun 15.0067	Jul 15.0067	Aug 14.8235	Sep 15.3731	Oct 15.9226	Nov 16.2890	Dec 16.6554 (38)
Heat transfer coeff	66.6917	66.5085	66.3253	65.4094	65.2262	64.3103	64.3103	64.1271	64.6767	65.2262	65.5926	65.9590 (39)
Average = Sum(39)m / 12 =	65.3636											
HLP	Jan 0.9574	Feb 0.9548	Mar 0.9521	Apr 0.9390	May 0.9364	Jun 0.9232	Jul 0.9232	Aug 0.9206	Sep 0.9285	Oct 0.9364	Nov 0.9416	Dec 0.9469 (40)
HLP (average)	0.9383											
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

Assumed occupancy													2.2378 (42)
Hot water usage for mixer showers													
77.1761	76.0163	74.3262	71.0926	68.7063	66.0450	64.5324	66.2097	68.0483	70.9056	74.2087	76.8804	(42a)	
Hot water usage for baths													
26.6738	26.2777	25.7198	24.6913	23.9211	23.0670	22.6057	23.1597	23.7629	24.6767	25.7264	26.5837	(42b)	
Hot water usage for other uses													
37.5477	36.1824	34.8170	33.4516	32.0863	30.7209	30.7209	32.0863	33.4516	34.8170	36.1824	37.5477	(42c)	
Average daily hot water use (litres/day)												130.0190 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
141.3977	138.4764	134.8631	129.2355	124.7136	119.8330	117.8590	121.4556	125.2628	130.3993	136.1175	141.0118	(44)	
Energy conte	223.9394	197.1885	207.2795	176.9169	167.8885	147.3486	142.5403	150.3874	154.4615	176.9506	193.9244	220.7904 (45)	
Energy content (annual)										Total = Sum(45)m =	2159.6161		
Distribution loss (46)m = 0.15 x (45)m													
33.5909	29.5783	31.0919	26.5375	25.1833	22.1023	21.3810	22.5581	23.1692	26.5426	29.0887	33.1186	(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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)	
Total heat required for water heating calculated for each month													
274.8983	243.2159	258.2384	226.2320	218.8474	196.6637	193.4992	201.3463	203.7766	227.9095	243.2395	271.7494 (62)		
WWHRS	-38.5351	-34.0807	-35.6874	-29.5506	-27.5401	-23.5662	-22.0896	-23.4900	-24.3825	-28.7443	-32.5638	-37.8214 (63a)	
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
Output from w/h													
236.3632	209.1352	222.5511	196.6814	191.3073	173.0975	171.4096	177.8563	179.3941	199.1652	210.6757	233.9279 (64)		
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =										2401.5645 (64a)		
Electric shower(s)											2402 (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													
87.1996	77.0720	81.6602											

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	99.1128	109.7320	99.1128	102.4166	99.1128	102.4166	99.1128	99.1128	102.4166	99.1128	102.4166	99.1128 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	196.5022	198.5413	193.4029	182.4638	168.6552	155.6771	147.0069	144.9678	150.1062	161.0453	174.8539	187.8320 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892 (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)	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137 (71)
Water heating gains (Table 5)	117.2037	114.6905	109.7583	98.8245	92.1541	85.1697	80.8258	84.3327	88.4545	96.2040	106.6786	115.7964 (72)
Total internal gains	472.3864	482.5315	461.8416	443.2725	419.4898	399.8310	383.5131	384.9810	397.5449	415.9298	443.5167	462.3089 (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							
North	4.6300				10.6334		0.4000		0.7000		0.7700		9.5531		(74)					
Northwest	12.6500				11.2829		0.4000		0.7000		0.7700		27.6952		(81)					
Solar gains	37.2483	74.6308	132.5908	216.6344	291.3434	310.8999	290.7074	231.4977	161.0617	90.6258	46.6327	30.5812	(83)							
Total gains	509.6347	557.1623	594.4324	659.9070	710.8332	710.7309	674.2205	616.4787	558.6065	506.5556	490.1494	492.8901	(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	35.0342	35.1307	35.2277	35.7210	35.8213	36.3315	36.3315	36.4353	36.1257	35.8213	35.6212	35.4234
alpha	3.3356	3.3420	3.3485	3.3814	3.3881	3.4221	3.4221	3.4290	3.4084	3.3881	3.3747	3.3616
util living area	0.9586	0.9426	0.9130	0.8363	0.7075	0.5378	0.4069	0.4578	0.6799	0.8697	0.9390	0.9624 (86)
MIT	19.2702	19.4892	19.8387	20.3331	20.7112	20.9179	20.9759	20.9642	20.8144	20.3374	19.7444	19.2406 (87)
Th 2	20.1190	20.1212	20.1234	20.1345	20.1367	20.1478	20.1478	20.1500	20.1434	20.1367	20.1323	20.1278 (88)
util rest of house	0.9523	0.9339	0.8996	0.8114	0.6653	0.4772	0.3329	0.3805	0.6212	0.8441	0.9284	0.9567 (89)
MIT 2	18.5429	18.7589	19.1012	19.5794	19.9212	20.0985	20.1374	20.1335	20.0209	19.5950	19.0205	18.5203 (90)
Living area fraction	fLA = Living area / (4) = 0.4479 (91)											
MIT	18.8687	19.0860	19.4315	19.9170	20.2750	20.4655	20.5130	20.5056	20.3763	19.9275	19.3447	18.8429 (92)
Temperature adjustment	-0.1500											
adjusted MIT	18.7187	18.9360	19.2815	19.7670	20.1250	20.3155	20.3630	20.3556	20.2263	19.7775	19.1947	18.6929 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9396	0.9196	0.8842	0.7995	0.6647	0.4895	0.3519	0.3997	0.6273	0.8318	0.9143	0.9447 (94)
Useful gains	478.8576	512.3690	525.6230	527.6252	472.4896	347.9167	237.2915	246.4131	350.4276	421.3771	448.1571	465.6160 (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	961.6060	933.5105	847.7381	710.8038	549.5304	367.5648	241.9971	253.6601	396.2302	598.6156	793.3260	955.9372 (97)
Space heating kWh	359.1648	283.0071	239.6536	131.8886	57.3183	0.0000	0.0000	0.0000	0.0000	131.8654	248.5217	364.7990 (98a)
Space heating requirement - total per year (kWh/year)	1816.2185											
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	359.1648	283.0071	239.6536	131.8886	57.3183	0.0000	0.0000	0.0000	0.0000	131.8654	248.5217	364.7990 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1816.2185											
Space heating per m2	(98c) / (4) = 26.0726 (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 %)												88.9000 (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	359.1648	283.0071	239.6536	131.8886	57.3183	0.0000	0.0000	0.0000	0.0000	131.8654	248.5217	364.7990 (98)
Space heating efficiency (main heating system 1)	88.9000	88.9000	88.9000	88.9000	88.9000	0.0000	0.0000	0.0000	0.0000	88.9000	88.9000	88.9000 (210)
Space heating fuel (main heating system)	404.0099	318.3432	269.5766	148.3562	64.4751	0.0000	0.0000	0.0000	0.0000	148.3301	279.5519	410.3476 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	236.3632	209.1352	222.5511	196.6814	191.3073	173.0975	171.4096	177.8563	179.3941	199.1652	210.6757	233.9279 (64)
Efficiency of water heater	85.2752	85.0302	84.5404	83.5441	82.1317	80.3000	80.3000	80.3000	80.3000	83.5184	84.7364	80.3000 (216)
Fuel for water heating, kWh/month	277.1770	245.9541	263.2481	235.4224	232.9275	215.5635	213.4615	221.4898	223.4048	238.4687	248.6247	85.3294 (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	21.1986	19.1471	21.1986	20.5148	21.1986	20.5148	21.1986	21.1986	20.5148	21.1986	20.5148	21.1986 (231)
Lighting	21.9786	17.6321	15.8757	11.6312	8.9843	7.3403	8.1958	10.6532	13.8374	18.1555	20.5066	22.5895 (232)
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 (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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1	2042.9905 (211)											
Space heating fuel - main system 2	0.0000 (213)											
Space heating fuel - secondary	0.0000 (215)											
Efficiency of water heater	80.3000											
Water heating fuel used	2889.8887 (219)											
Space cooling fuel	0.0000 (221)											
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7700)												
mechanical ventilation fans (SFP = 0.7700)												163.5965 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)

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Total electricity for the above, kWh/year	249.5965	(231)
Electricity for lighting (calculated in Appendix L)	177.3801	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5359.8558	(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	2042.9905	0.2100	429.0280 (261)
Total CO2 associated with community systems			0.0000 (273)
Water heating (other fuel)	2889.8887	0.2100	606.8766 (264)
Space and water heating			1035.9046 (265)
Pumps, fans and electric keep-hot	249.5965	0.1387	34.6221 (267)
Energy for lighting	177.3801	0.1443	25.6014 (268)
Total CO2, kg/year			1096.1282 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			15.7400 (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	2042.9905	1.1300	2308.5792 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2889.8887	1.1300	3265.5742 (278)
Space and water heating			5574.1535 (279)
Pumps, fans and electric keep-hot	249.5965	1.5128	377.5896 (281)
Energy for lighting	177.3801	1.5338	272.0716 (282)
Total Primary energy kWh/year			6223.8146 (286)
Dwelling Primary energy Rate (DPER)			89.3500 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	69.6600	2.5000	174.1500
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.6600		
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	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) = 0.1148 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3648 (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) = 0.3101 (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	0.3954	0.3876	0.3799	0.3411	0.3334	0.2946	0.2946	0.2869	0.3101	0.3334	0.3489	0.3644 (22b)
Effective ac	0.5782	0.5751	0.5722	0.5582	0.5556	0.5434	0.5434	0.5411	0.5481	0.5556	0.5609	0.5664 (25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K
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Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K						
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type			15.5300	1.1450	17.7824			(27)					
External Wall	40.4300	15.5300	24.9000	0.1800	4.4820			(29a)					
Communal Wall	18.1700	1.8900	16.2800	0.1800	2.9304			(29a)					
Roof	69.6600		69.6600	0.1100	7.6626			(30)					
Total net area of external elements Aum(A, m2)			128.2600					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)... (30) + (32) =	34.7474			(33)					
Main dwelling													
Party Wall			28.9800	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							120.7488	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
E2 Other lintels (including other steel lintels)				9.9500	0.0500	0.4975							
E3 Sill				3.6200	0.0500	0.1810							
E4 Jamb				23.3000	0.0500	1.1650							
E7 Party floor between dwellings (in blocks of flats)				14.9100	0.0700	1.0437							
E16 Corner (normal)				2.5000	0.0900	0.2250							
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)				11.5900	0.0000	0.0000							
E23 Balcony within or between dwellings, balcony support penetrates wall insulation				8.5300	0.0200	0.1706							
E15 Flat roof with parapet				16.1700	0.5600	9.0552							
P4 Party wall - Roof (insulation at ceiling level)				11.5900	0.1200	1.3908							
R7 Flat ceiling (inverted)				7.2700	0.0400	0.2908							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.6196	(36)					
Point Thermal bridges							0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	49.3670	(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	33.2272	33.0527	32.8817	32.0786	31.9283	31.2288	31.2288	31.0993	31.4982	31.9283	32.2323	32.5501	(38)
Average = Sum(39)m / 12 =	82.5942	82.4198	82.2488	81.4456	81.2954	80.5958	80.5958	80.4663	80.8653	81.2954	81.5993	81.9171	(39)
												81.4449	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1857	1.1832	1.1807	1.1692	1.1670	1.1570	1.1570	1.1551	1.1609	1.1670	1.1714	1.1760	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
												1.1692	
												31	

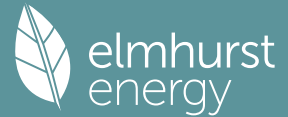
4. Water heating energy requirements (kWh/year)													

Assumed occupancy													2.2378 (42)
Hot water usage for mixer showers													
	61.7409	60.8131	59.4610	56.8741	54.9650	52.8360	51.6259	52.9677	54.4386	56.7245	59.3670	61.5043	(42a)
Hot water usage for baths													
	26.6738	26.2777	25.7198	24.6913	23.9211	23.0670	22.6057	23.1597	23.7629	24.6767	25.7264	26.5837	(42b)
Hot water usage for other uses													
	37.5477	36.1824	34.8170	33.4516	32.0863	30.7209	30.7209	32.0863	33.4516	34.8170	36.1824	37.5477	(42c)
Average daily hot water use (litres/day)													115.7882 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	125.9625	123.2731	119.9978	115.0170	110.9723	106.6240	104.9525	108.2137	111.6531	116.2182	121.2758	125.6357	(44)
Energy conte	199.4938	175.5393	184.4322	157.4525	149.3901	131.1066	126.9310	133.9912	137.6794	157.7070	172.7796	196.7152	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
	29.9241	26.3309	27.6648	23.6179	22.4085	19.6660	19.0397	20.0987	20.6519	23.6560	25.9169	29.5073	(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													
	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	250.4527	221.5667	235.3911	206.7676	200.3490	180.4217	177.8899	184.9501	186.9945	208.6659	222.0947	247.6741	(62)
WWHRS	-28.2254	-24.9627	-26.1395	-21.6446	-20.1720	-17.2613	-16.1797	-17.2055	-17.8592	-21.0540	-23.8517	-27.7027	(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													
	222.2273	196.6039	209.2516	185.1230	180.1770	163.1604	161.7102	167.7446	169.1353	187.6119	198.2430	219.9714	(64)
12Total per year (kWh/year)													
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													
	79.0714	69.8737	74.0634	64.6817	62.4119	55.9217	54.9443	57.2918	58.1072	65.1773	69.7780	78.1475	(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	
	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	99.1129	109.7322	99.1129	102.4167	99.1129	102.4167	99.1129	99.1129	102.4167	99.1129	102.4167	99.1129	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	196.5022	198.5413	193.4029	182.4638	168.6552	155.6771	147.0069	144.9678	150.1062	161.0453	174.8539	187.8320	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	(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)													
	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	(71)
Water heating gains (Table 5)													
	106.2788	103.9787	99.5476	89.8357	83.8870	77.6690	73.8498	77.0051	80.7044	87.6039	96.9139	105.0370	(72)
Total internal gains													
	461.4616	471.8198	451.6311	434.2839	411.2228	392.3305	376.5373	377.6535	389.7950	407.3297	433.7521	451.5496	(73)

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6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W	
North					4.1600	10.6334	0.6300		0.7000	0.7700	13.5188 (74)	
Northwest					11.3700	11.2829	0.6300		0.7000	0.7700	39.2062 (81)	
Solar gains	52.7250	105.6404	187.6839	306.6491	412.4007	440.0830	411.5004	327.6884	227.9849	128.2817	66.0087	43.2877 (83)
Total gains	514.1865	577.4602	639.3150	740.9330	823.6235	832.4135	788.0377	705.3418	617.7799	535.6114	499.7608	494.8373 (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	28.2888	28.3487	28.4076	28.6877	28.7407	28.9902	28.9902	29.0369	28.8936	28.7407	28.6337	28.5226
alpha	2.8859	2.8899	2.8938	2.9125	2.9160	2.9327	2.9327	2.9358	2.9262	2.9160	2.9089	2.9015
util living area	0.9628	0.9469	0.9163	0.8392	0.7120	0.5513	0.4251	0.4840	0.7062	0.8837	0.9463	0.9665 (86)
MIT	18.7237	18.9901	19.4355	20.0590	20.5607	20.8523	20.9491	20.9252	20.6844	20.0365	19.2901	18.6815 (87)
Th 2	19.9315	19.9335	19.9355	19.9447	19.9465	19.9546	19.9546	19.9561	19.9514	19.9465	19.9430	19.9393 (88)
util rest of house	0.9566	0.9380	0.9019	0.8116	0.6638	0.4791	0.3332	0.3881	0.6393	0.8573	0.9358	0.9608 (89)
MIT 2	17.2915	17.6281	18.1871	18.9546	19.5357	19.8455	19.9285	19.9148	19.6911	18.9476	18.0176	17.2428 (90)
Living area fraction	17.9329	18.2381	18.7462	19.4493	19.9948	20.2964	20.3856	20.3673	fLA = Living area / (4) =	19.4353	18.5876	17.8872 (91)
MIT	17.9329	18.2381	18.7462	19.4493	19.9948	20.2964	20.3856	20.3673	20.1360	19.4353	18.5876	17.8872 (92)
Temperature adjustment												0.0000
adjusted MIT	17.9329	18.2381	18.7462	19.4493	19.9948	20.2964	20.3856	20.3673	20.1360	19.4353	18.5876	17.8872 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9406	0.9196	0.8819	0.7967	0.6662	0.5037	0.3721	0.4273	0.6522	0.8418	0.9181	0.9457 (94)
Useful gains	483.6415	531.0139	563.7814	590.2688	548.7067	419.3203	293.2529	301.4024	402.9001	450.8668	458.8148	467.9743 (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	1126.0022	1099.3255	1007.2380	859.1903	674.3275	459.1079	305.1041	319.2378	488.1027	718.2718	937.3771	1121.2158 (97)
Space heating kWh	477.9163	381.9054	329.9317	193.6235	93.4619	0.0000	0.0000	0.0000	0.0000	198.9493	344.5648	486.0117 (98a)
Space heating requirement - total per year (kWh/year)												2506.3647
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	477.9163	381.9054	329.9317	193.6235	93.4619	0.0000	0.0000	0.0000	0.0000	198.9493	344.5648	486.0117 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2506.3647
Space heating per m2										(98c) / (4) =		35.9800 (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 %)												92.4000 (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	477.9163	381.9054	329.9317	193.6235	93.4619	0.0000	0.0000	0.0000	0.0000	198.9493	344.5648	486.0117 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	517.2255	413.3176	357.0690	209.5492	101.1492	0.0000	0.0000	0.0000	0.0000	215.3131	372.9056	525.9867 (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	222.2273	196.6039	209.2516	185.1230	180.1770	163.1604	161.7102	167.7446	169.1353	187.6119	198.2430	219.9714 (64)
Efficiency of water heater (217)m	85.9773	85.7779	85.3524	84.4778	83.0439	80.3000	80.3000	80.3000	80.3000	84.5074	85.5536	80.3000 (216)
Fuel for water heating, kWh/month	258.4719	229.2010	245.1618	219.1380	216.9661	203.1885	201.3826	208.8973	210.6293	222.0064	231.7178	255.6939 (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	20.5937	16.5210	14.8754	10.8983	8.4182	6.8777	7.6793	9.9819	12.9655	17.0115	19.2144	21.1661 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-18.6714	-27.6673	-41.7781	-49.4283	-55.4607	-52.5627	-51.9235	-47.9435	-41.3038	-32.7074	-20.9996	-15.9897 (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	-6.8276	-14.6694	-29.7347	-45.5188	-61.0343	-61.6333	-60.9064	-51.1788	-37.0042	-21.2560	-9.2042	-5.3764 (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)

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Annual totals kWh/year		
Space heating fuel - main system 1	2712.5159	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2702.4546	(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)	166.2031	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-860.7801	(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	4806.3935	(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	2712.5159	0.2100	569.6283 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2702.4546	0.2100	567.5155 (264)
Space and water heating			1137.1438 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	166.2031	0.1443	23.9882 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-456.4360	0.1335	-60.9565
PV Unit electricity exported	-404.3441	0.1253	-50.6814
Total			-111.6379 (269)
Total CO2, kg/year			1061.4234 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.2400 (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	2712.5159	1.1300	3065.1429 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2702.4546	1.1300	3053.7737 (278)
Space and water heating			6118.9167 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	166.2031	1.5338	254.9278 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-456.4360	1.4935	-681.6942
PV Unit electricity exported	-404.3441	0.4601	-186.0248
Total			-867.7189 (283)
Total Primary energy kWh/year			5636.2263 (286)
Target Primary Energy Rate (TPER)			80.9100 (287)

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Plot Reference	B3.1-3.3 3B5P MID EXP			Issued on Date	19/12/2025
Assessment Reference	3B5P	Plot Type Ref	3B5P		
Plot Address				SAP Version	10.2
SAP Rating	84 B	DER	13.10	TER	12.58
Environmental	89 B	% DER < TER			-4.13
CO ₂ Emissions (t/year)	1.05	DFEE	35.86	TFEE	36.20
Compliance Check	See BREL	% DFEE < TFEE			0.94
% DPER < TPER	-13.28	DPER	75.31	TPER	66.48
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	88.5500 (1b)	2.5000 (2b)	221.3750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	221.3750 (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)

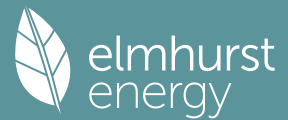
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.1626	0.1594	0.1562	0.1403	0.1371	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			21.5000	0.9615	20.6731		(27)
Exposed Floor			88.5000	0.1200	10.6200	0.0000	0.0000 (28b)
External Wall	47.4000	21.5000	25.9000	0.1600	4.1440	14.0000	362.6000 (29a)
Communal Wall	34.0500	1.8900	32.1600	0.2100	6.7536	14.0000	450.2400 (29a)
Total net area of external elements Aum(A, m ²)			169.9500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.0807		(33)
Main dwelling							
Party Wall			20.1300	0.0000	0.0000	20.0000	402.6000 (32)
Party Ceiling			88.5000			100.0000	8850.0000 (32b)
Stud			160.0000			9.0000	1440.0000 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		11505.4400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							129.9316 (35)
List of Thermal Bridges							

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			
Southeast					16.8700	36.7938	0.4000	0.7000		0.7700		120.4429	(77)		
Southwest					4.6300	36.7938	0.4000	0.7000		0.7700		33.0558	(79)		
Solar gains	153.4987	261.4651	357.7480	443.2671		496.4961	492.9057	475.2137	435.5024	387.3654	288.9746	183.8561	131.3629	(83)	
Total gains	701.3875	821.8170	893.7192	958.0281		983.3351	957.4252	920.5515	882.2446	848.7965	771.1139	698.1012	667.2740	(84)	

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	39.8387	39.9547	40.0713	40.6649	40.7858	41.4009	41.4009	41.5262	41.1527	40.7858	40.5448	40.3067	21.0000 (85)
alpha	3.6559	3.6636	3.6714	3.7110	3.7191	3.7601	3.7601	3.7684	3.7435	3.7191	3.7030	3.6871	
util living area	0.9530	0.9204	0.8740	0.7848	0.6579	0.4943	0.3634	0.3935	0.5844	0.8093	0.9223	0.9594	(86)
MIT	19.5888	19.8819	20.2096	20.5790	20.8269	20.9559	20.9892	20.9854	20.9156	20.5961	20.0455	19.5406	(87)
Th 2	20.1624	20.1647	20.1669	20.1781	20.1803	20.1916	20.1916	20.1938	20.1871	20.1803	20.1759	20.1714	(88)
util rest of house	0.9458	0.9090	0.8563	0.7561	0.6152	0.4382	0.2989	0.3275	0.5275	0.7774	0.9092	0.9531	(89)
MIT 2	18.8819	19.1674	19.4831	19.8355	20.0544	20.1658	20.1870	20.1873	20.1341	19.8603	19.3393	18.8418	(90)
Living area fraction									fLA = Living area / (4) =				0.4054 (91)
MIT	19.1685	19.4571	19.7776	20.1370	20.3676	20.4861	20.5122	20.5109	20.4509	20.1586	19.6256	19.1251	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.0185	19.3071	19.6276	19.9870	20.2176	20.3361	20.3622	20.3609	20.3009	20.0086	19.4756	18.9751	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9337	0.8952	0.8433	0.7489	0.6173	0.4484	0.3127	0.3414	0.5358	0.7700	0.8961	0.9418	(94)
Useful gains	654.8579	735.7081	753.7143	717.4577	606.9805	429.3552	287.8185	301.1783	454.7821	593.7956	625.5568	628.4499	(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	1180.7505	1152.4179	1047.0177	871.3502	667.4319	442.8002	290.4269	304.8385	481.5689	737.2518	975.5090	1171.5321	(97)
Space heating kWh	391.2641	280.0290	218.2177	110.8026	44.9758	0.0000	0.0000	0.0000	0.0000	106.7314	251.9656	404.0531	(98a)
Space heating requirement - total per year (kWh/year)												1808.0394	
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	391.2641	280.0290	218.2177	110.8026	44.9758	0.0000	0.0000	0.0000	0.0000	106.7314	251.9656	404.0531	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1808.0394	
Space heating per m2										(98c) / (4) =		20.4183	(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 %)													88.9000 (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	391.2641	280.0290	218.2177	110.8026	44.9758	0.0000	0.0000	0.0000	0.0000	106.7314	251.9656	404.0531	(98)
Space heating efficiency (main heating system 1)	88.9000	88.9000	88.9000	88.9000	88.9000	0.0000	0.0000	0.0000	0.0000	88.9000	88.9000	88.9000	(210)
Space heating fuel (main heating system)	440.1171	314.9933	245.4643	124.6373	50.5915	0.0000	0.0000	0.0000	0.0000	120.0578	283.4259	454.5030	(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	254.8735	225.4190	239.6815	211.3934	205.3184	185.4547	183.4345	190.5251	192.3808	213.9618	226.7854	252.1951	(64)
Efficiency of water heater (217)m	85.2966	84.8474	84.1809	83.0633	81.7205	80.3000	80.3000	80.3000	80.3000	82.9713	84.6076	80.3000	(216)
Fuel for water heating, kWh/month	298.8086	265.6758	284.7220	254.4966	251.2446	230.9523	228.4365	237.2666	239.5775	257.8743	268.0437	295.3598	(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	28.1778	25.4509	28.1778	27.2688	28.1778	27.2688	28.1778	28.1778	27.2688	28.1778	27.2688	28.1778	(231)
Lighting	28.3716	22.7608	20.4936	15.0145	11.5976	9.4753	10.5797	13.7519	17.8624	23.4364	26.4714	29.1602	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2033.7901	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												3112.4584	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9100)													
mechanical ventilation fans (SFP = 0.9100)												245.7705	(230a)
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												331.7705	(231)

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Electricity for lighting (calculated in Appendix L)	228.9753	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5706.9944	(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	2033.7901	0.2100	427.0959 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3112.4584	0.2100	653.6163 (264)
Space and water heating			1080.7122 (265)
Pumps, fans and electric keep-hot	331.7705	0.1387	46.0207 (267)
Energy for lighting	228.9753	0.1443	33.0482 (268)
Total CO2, kg/year			1159.7811 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.1000 (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	2033.7901	1.1300	2298.1829 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3112.4584	1.1300	3517.0780 (278)
Space and water heating			5815.2608 (279)
Pumps, fans and electric keep-hot	331.7705	1.5128	501.9025 (281)
Energy for lighting	228.9753	1.5338	351.2100 (282)
Total Primary energy kWh/year			6668.3733 (286)
Dwelling Primary energy Rate (DPER)			75.3100 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	88.5500	2.5000	221.3750
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5500		
Dwelling volume			

2. Ventilation rate

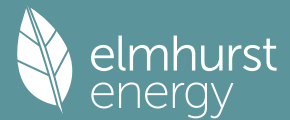
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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 = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1355 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3855 (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) = 0.3277 (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	0.4178	0.4096	0.4014	0.3605	0.3523	0.3113	0.3113	0.3031	0.3277	0.3523	0.3687	0.3850 (22b)
Effective ac	0.5873	0.5839	0.5806	0.5650	0.5620	0.5485	0.5485	0.5459	0.5537	0.5620	0.5680	0.5741 (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							

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TER Opaque door	1.8900	1.0000	1.8900	(26)									
TER Opening Type	20.2500	1.1450	23.1870	(27)									
Exposed Floor	88.5000	0.1300	11.5050	(28b)									
External Wall	47.4000	20.2500	27.1500	0.1800	4.8870	(29a)							
Communal Wall	34.0500	1.8900	32.1600	0.1800	5.7888	(29a)							
Total net area of external elements Aum(A, m2)	169.9500					(31)							
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	47.2578				(33)							
Main dwelling													
Party Wall	20.1300	0.0000	0.0000			(32)							
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K						129.9316 (35)							
List of Thermal Bridges													
K1 Element		Length	Psi-value	Total									
E2 Other lintels (including other steel lintels)		11.7600	0.0500	0.5880									
E3 Sill		3.6200	0.0500	0.1810									
E4 Jamb		27.9600	0.0500	1.3980									
E7 Party floor between dwellings (in blocks of flats)		32.5800	0.0700	2.2806									
E16 Corner (normal)		7.5000	0.0900	0.6750									
E18 Party wall between dwellings		2.5000	0.0600	0.1500									
E25 Staggered party wall between dwellings		2.5000	0.0600	0.1500									
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)		8.0500	0.0000	0.0000									
E23 Balcony within or between dwellings, balcony support penetrates wall insulation		11.3000	0.0200	0.2260									
E20 Exposed floor (normal)		21.2800	0.3200	6.8096									
P7 Party Wall - Exposed floor (normal)		8.0500	0.1600	1.2880									
Thermal bridges (Sum(L x Psi) calculated using Appendix K)						13.7462 (36)							
Point Thermal bridges					(36a) =	0.0000							
Total fabric heat loss				(33) + (36) + (36a) =		61.0040 (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	(38)
Heat transfer coeff	42.9030	42.6554	42.4127	41.2728	41.0595	40.0667	40.0667	39.8829	40.4491	41.0595	41.4910	41.9421	(38)
Average = Sum(39)m / 12 =	103.9070	103.6594	103.4167	102.2768	102.0636	101.0707	101.0707	100.8869	101.4532	102.0636	102.4950	102.9461	(39)
												102.2758	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(40)
HLP (average)	1.1734	1.1706	1.1679	1.1550	1.1526	1.1414	1.1414	1.1393	1.1457	1.1526	1.1575	1.1626	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

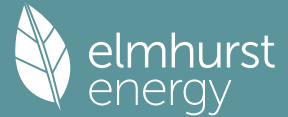
Assumed occupancy													2.6053 (42)
Hot water usage for mixer showers													
Hot water usage for baths	67.9029	66.8824	65.3954	62.5503	60.4507	58.1093	56.7784	58.2541	59.8718	62.3858	65.2920	67.6427	(42a)
Hot water usage for other uses	29.3237	28.8882	28.2749	27.1442	26.2974	25.3586	24.8515	25.4604	26.1235	27.1281	28.2822	29.2245	(42b)
Average daily hot water use (litres/day)	41.3114	39.8091	38.3069	36.8047	35.3024	33.8002	33.8002	35.3024	36.8047	38.3069	39.8091	41.3114	(42c)
												127.3477	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	138.5379	135.5798	131.9773	126.4992	122.0506	117.2681	115.4301	119.0170	122.8000	127.8209	133.3834	138.1786	(44)
Energy content (annual)	219.4102	193.0638	202.8441	173.1710	164.3036	144.1948	139.6027	147.3679	151.4247	173.4517	190.0290	216.3544	(45)
Distribution loss (46)m = 0.15 x (45)m	32.9115	28.9596	30.4266	25.9757	24.6455	21.6292	20.9404	22.1052	22.7137	26.0178	28.5044	32.4532	(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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	270.3691	239.0912	253.8030	222.4861	215.2625	193.5099	190.5616	198.3268	200.7398	224.4106	239.3441	267.3133	(62)
WWHRS	-31.0424	-27.4541	-28.7484	-23.8048	-22.1852	-18.9840	-17.7945	-18.9227	-19.6416	-23.1553	-26.2321	-30.4675	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	239.3268	211.6370	225.0547	198.6813	193.0773	174.5258	172.7671	179.4042	181.0981	201.2553	213.1120	236.8458	(64)
12Total per year (kWh/year)													
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	85.6936	75.7006	80.1854	69.9081	67.3707	60.2735	59.1576	61.7396	62.6775	70.4124	75.5134	84.6775	(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	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	119.2289	132.0035	119.2289	123.2032	119.2289	123.2032	119.2289	119.2289	123.2032	119.2289	123.2032	119.2289	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	236.3847	238.8376	232.6563	219.4970	202.8858	187.2736	176.8437	174.3907	180.5720	193.7313	210.3425	225.9548	(68)
Pumps, fans	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	(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)	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	(71)
Total internal gains	115.1796	112.6496	107.7761	97.0946	90.5520	83.7132	79.5129	82.9833	87.0520	94.6403	104.8798	113.8139	(72)
	535.8734	548.5709	524.7415	504.8751	477.7469	456.2703	437.6657	438.6832	452.9075	472.6808	503.5058	524.0778	(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
Southeast	15.8900				36.7938	0.6300		0.7000		0.7700		178.6779 (77)
Southwest	4.3600				36.7938	0.6300		0.7000		0.7700		49.0268 (79)
Solar gains	227.7046	387.8652	530.6941	657.5558	736.5173	731.1912	704.9463	646.0375	574.6295	428.6737	272.7377	194.8677 (83)
Total gains	763.5781	936.4362	1055.4357	1162.4309	1214.2642	1187.4614	1142.6120	1084.7206	1027.5371	901.3545	776.2434	718.9455 (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	30.7578	30.8313	30.9037	31.2481	31.3134	31.6210	31.6210	31.6786	31.5018	31.3134	31.1816	31.0449
alpha	3.0505	3.0554	3.0602	3.0832	3.0876	3.1081	3.1081	3.1119	3.1001	3.0876	3.0788	3.0697
util living area	0.9525	0.9169	0.8669	0.7782	0.6560	0.5038	0.3763	0.4099	0.5979	0.8132	0.9234	0.9594 (86)
MIT	19.0464	19.4283	19.8652	20.3512	20.7023	20.9049	20.9711	20.9618	20.8327	20.3595	19.6215	18.9784 (87)
Th 2	19.9413	19.9436	19.9458	19.9562	19.9581	19.9672	19.9672	19.9688	19.9637	19.9581	19.9542	19.9501 (88)
util rest of house	0.9445	0.9037	0.8461	0.7446	0.6054	0.4342	0.2930	0.3247	0.5288	0.7768	0.9089	0.9524 (89)
MIT 2	17.6928	18.1685	18.7065	19.2929	19.6885	19.8997	19.9532	19.9491	19.8346	19.3201	18.4250	17.6131 (90)
Living area fraction	fLA = Living area / (4) = 0.4054 (91)											
MIT	18.2416	18.6793	19.1763	19.7219	20.0996	20.3072	20.3659	20.3597	20.2392	19.7415	18.9101	18.1666 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.2416	18.6793	19.1763	19.7219	20.0996	20.3072	20.3659	20.3597	20.2392	19.7415	18.9101	18.1666 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9275	0.8843	0.8285	0.7363	0.6127	0.4578	0.3257	0.3577	0.5481	0.7682	0.8908	0.9367 (94)
Useful gains	708.2444	828.1088	874.4108	855.8831	743.9402	543.6766	372.1946	388.0193	563.2260	692.4496	691.4981	673.4120 (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	1448.6326	1428.3502	1310.9367	1106.8326	857.2882	576.8340	380.6182	399.4798	622.8420	933.0127	1210.4767	1437.8061 (97)
Space heating kWh	550.8488	403.3622	324.7753	180.6836	84.3310	0.0000	0.0000	0.0000	0.0000	178.9790	373.6646	568.7092 (98a)
Space heating requirement - total per year (kWh/year)						0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	2665.3536
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	550.8488	403.3622	324.7753	180.6836	84.3310	0.0000	0.0000	0.0000	0.0000	178.9790	373.6646	568.7092 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2665.3536
Space heating per m2	(98c) / (4) = 30.1000 (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 %)												92.4000 (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	550.8488	403.3622	324.7753	180.6836	84.3310	0.0000	0.0000	0.0000	0.0000	178.9790	373.6646	568.7092 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	596.1567	436.5392	351.4884	195.5451	91.2673	0.0000	0.0000	0.0000	0.0000	193.7002	404.3989	615.4861 (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	239.3268	211.6370	225.0547	198.6813	193.0773	174.5258	172.7671	179.4042	181.0981	201.2553	213.1120	236.8458 (64)
Water heating requirement	86.1069	85.7400	85.1665	84.1785	82.7330	80.3000	80.3000	80.3000	80.3000	84.1309	85.5715	86.1861 (217)
Efficiency of water heater (217)m	277.9415	246.8358	264.2525	236.0240	233.3740	217.3422	215.1520	223.4174	225.5269	239.2168	249.0455	274.8073 (219)
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 (221)
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 (231)
Pumps and Fa	24.7734	19.8742	17.8945	13.1103	10.1267	8.2736	9.2380	12.0078	15.5970	20.4641	23.1142	25.4619 (232)
Lighting	-23.4742	-34.6442	-52.0992	-61.3675	-68.6030	-64.9056	-64.0952	-59.2939	-51.2635	-40.8188	-26.3459	-20.1168 (233a)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
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	-8.9395	-19.1731	-38.8060	-59.3268	-79.4824	-80.2573	-79.3312	-66.7079	-48.2796	-27.7782	-12.0484	-7.0433 (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												2884.5819 (211)
Space heating fuel - main system 1												

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Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2902.9358	(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)	199.9357	(232)

Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1094.2014	(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	4979.2519	(238)

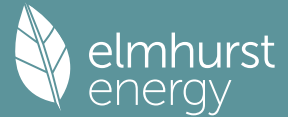
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2884.5819	0.2100	605.7622 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2902.9358	0.2100	609.6165 (264)
Space and water heating			1215.3787 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	199.9357	0.1443	28.8569 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-567.0278	0.1336	-75.7786
PV Unit electricity exported	-527.1737	0.1254	-66.0937
Total			-141.8724 (269)
Total CO2, kg/year			1114.2925 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.5800 (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	2884.5819	1.1300	3259.5775 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2902.9358	1.1300	3280.3175 (278)
Space and water heating			6539.8950 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	199.9357	1.5338	306.6680 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-567.0278	1.4939	-847.0623
PV Unit electricity exported	-527.1737	0.4602	-242.5960
Total			-1089.6584 (283)
Total Primary energy kWh/year			5887.0054 (286)
Target Primary Energy Rate (TPER)			66.4800 (287)

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Plot Reference	B3.1-3.3 3B5P MID				Issued on Date	19/12/2025	
Assessment Reference	3B5P			Plot Type Ref	3B5P		
Plot Address					SAP Version	10.2	
SAP Rating	86 B	DER	10.62	TER	10.16		
Environmental	91 B	% DER < TER				-4.53	
CO ₂ Emissions (t/year)	0.86	DFEE	25.21	TFEE	25.22		
Compliance Check	See BREL	% DFEE < TFEE				0.03	
% DPER < TPER	-15.90	DPER	61.96	TPER	53.46		
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	88.5500 (1b)	2.5000 (2b)	221.3750 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5500		221.3750 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 221.3750 (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)

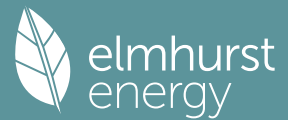
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.1626	0.1594	0.1562	0.1403	0.1371	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			21.5000	0.9615	20.6731		(27)
External Wall	47.4000	21.5000	25.9000	0.1600	4.1440	14.0000	362.6000 (29a)
Communal Wall	34.0500	1.8900	32.1600	0.2100	6.7536	14.0000	450.2400 (29a)
Total net area of external elements Aum(A, m ²)			81.4500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 33.4607		(33)
Main dwelling							
Party Wall			20.1300	0.0000	0.0000	20.0000	402.6000 (32)
Party Floor			88.5000			80.0000	7080.0000 (32d)
Party Ceiling			88.5000			100.0000	8850.0000 (32b)
Stud			160.0000			9.0000	1440.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	18585.4400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							209.8864 (35)
List of Thermal Bridges							

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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	81.9536	82.2577	82.5640	84.1306	84.4510	86.0907	86.0907	86.4263	85.4272	84.4510	83.8125	83.1836
alpha	6.4636	6.4838	6.5043	6.6087	6.6301	6.7394	6.7394	6.7618	6.6951	6.6301	6.5875	6.5456
util living area	0.9745	0.9379	0.8729	0.7372	0.5716	0.4003	0.2866	0.3114	0.4891	0.7723	0.9389	0.9799 (86)
MIT	20.4376	20.6340	20.8066	20.9445	20.9901	20.9993	20.9999	20.9999	20.9972	20.9382	20.6925	20.4053 (87)
Th 2	20.3308	20.3331	20.3354	20.3470	20.3494	20.3610	20.3610	20.3633	20.3563	20.3494	20.3447	20.3401 (88)
util rest of house	0.9690	0.9262	0.8522	0.7054	0.5336	0.3606	0.2450	0.2683	0.4443	0.7359	0.9255	0.9755 (89)
MIT 2	19.8269	20.0164	20.1773	20.3062	20.3432	20.3607	20.3610	20.3633	20.3549	20.3056	20.0847	19.8034 (90)
Living area fraction									fLA = Living area / (4) =			0.4054 (91)
MIT	20.0745	20.2668	20.4325	20.5650	20.6055	20.6196	20.6200	20.6214	20.6153	20.5621	20.3311	20.0474 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.9245	20.1168	20.2825	20.4150	20.4555	20.4696	20.4700	20.4714	20.4653	20.4121	20.1811	19.8974 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9650	0.9220	0.8505	0.7088	0.5399	0.3674	0.2521	0.2756	0.4520	0.7396	0.9217	0.9719 (94)
Useful gains	676.8734	757.7082	760.0796	679.0911	530.8691	351.7187	232.0589	243.1729	383.6204	570.2858	643.4235	648.5397 (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	984.2552	955.0274	861.8003	706.6114	535.2348	351.9810	232.0750	243.2019	384.6741	599.8284	805.7604	974.2291 (97)
Space heating kWh	228.6921	132.5985	75.6802	19.8146	3.2480	0.0000	0.0000	0.0000	0.0000	21.9797	116.8826	242.3129 (98a)
Space heating requirement - total per year (kWh/year)												841.2087
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	228.6921	132.5985	75.6802	19.8146	3.2480	0.0000	0.0000	0.0000	0.0000	21.9797	116.8826	242.3129 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												841.2087
Space heating per m2										(98c) / (4) =		9.4998 (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 %)

88.9000 (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	228.6921	132.5985	75.6802	19.8146	3.2480	0.0000	0.0000	0.0000	0.0000	21.9797	116.8826	242.3129 (98)
Space heating efficiency (main heating system 1)	88.9000	88.9000	88.9000	88.9000	88.9000	0.0000	0.0000	0.0000	0.0000	88.9000	88.9000	88.9000 (210)
Space heating fuel (main heating system)	257.2464	149.1547	85.1296	22.2887	3.6536	0.0000	0.0000	0.0000	0.0000	24.7241	131.4765	272.5679 (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	254.8735	225.4190	239.6815	211.3934	205.3184	185.4547	183.4345	190.5251	192.3808	213.9618	226.7854	252.1951 (64)
Efficiency of water heater (217)m	84.1499	83.2840	82.2085	80.9713	80.4212	80.3000	80.3000	80.3000	80.3000	81.0302	83.0318	80.3000 (216)
Fuel for water heating, kWh/month	302.8805	270.6632	291.5533	261.0720	255.3040	230.9523	228.4365	237.2666	239.5775	264.0518	273.1308	299.1787 (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	28.1778	25.4509	28.1778	27.2688	28.1778	27.2688	28.1778	28.1778	27.2688	28.1778	27.2688	28.1778 (231)
Lighting	28.3716	22.7608	20.4936	15.0145	11.5976	9.4753	10.5797	13.7519	17.8624	23.4364	26.4714	29.1602 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												946.2415 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												3154.0671 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9100)

mechanical ventilation fans (SFP = 0.9100)

245.7705 (230a)

central heating pump

41.0000 (230c)

main heating flue fan

45.0000 (230e)

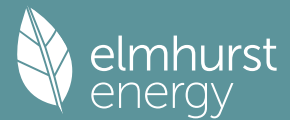
Total electricity for the above, kWh/year

331.7705 (231)

Electricity for lighting (calculated in Appendix L)

228.9753 (232)

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Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4661.0544 (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	946.2415	0.2100	198.7107 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3154.0671	0.2100	662.3541 (264)
Space and water heating			861.0648 (265)
Pumps, fans and electric keep-hot	331.7705	0.1387	46.0207 (267)
Energy for lighting	228.9753	0.1443	33.0482 (268)
Total CO2, kg/year			940.1337 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.6200 (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	946.2415	1.1300	1069.2529 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3154.0671	1.1300	3564.0958 (278)
Space and water heating			4633.3487 (279)
Pumps, fans and electric keep-hot	331.7705	1.5128	501.9025 (281)
Energy for lighting	228.9753	1.5338	351.2100 (282)
Total Primary energy kWh/year			5486.4611 (286)
Dwelling Primary energy Rate (DPER)			61.9600 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	88.5500 (1b)	x 2.5000 (2b)	= 221.3750 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5500		(3a) + (3b) + (3c) + (3d) + (3e) ... (3n) = 221.3750 (5)
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 = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1355 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3855 (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) = 0.3277 (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	0.4178	0.4096	0.4014	0.3605	0.3523	0.3113	0.3113	0.3031	0.3277	0.3523	0.3687	0.3850 (22b)
Effective ac	0.5873	0.5839	0.5806	0.5650	0.5620	0.5485	0.5485	0.5459	0.5537	0.5620	0.5680	0.5741 (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			20.2500	1.1450	23.1870		(27)

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External Wall	47.4000	20.2500	27.1500	0.1800	4.8870	(29a)
Communal Wall	34.0500	1.8900	32.1600	0.1800	5.7888	(29a)
Total net area of external elements Aum(A, m2)			81.4500			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		35.7528	(33)
Main dwelling						
Party Wall			20.1300	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 209.8864 (35)

List of Thermal Bridges						
K1 Element						
E2 Other lintels (including other steel lintels)			Length	Psi-value	Total	
E3 Sill			11.7600	0.0500	0.5880	
E4 Jamb			3.6200	0.0500	0.1810	
E7 Party floor between dwellings (in blocks of flats)			27.9600	0.0500	1.3980	
E16 Corner (normal)			53.8600	0.0700	3.7702	
E18 Party wall between dwellings			7.5000	0.0900	0.6750	
E25 Staggered party wall between dwellings			2.5000	0.0600	0.1500	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)			2.5000	0.0600	0.1500	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation			16.1100	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.3000	0.0200	0.2260	

Point Thermal bridges					(36a) =	7.1382 (36)
Total fabric heat loss					(33) + (36) + (36a) =	42.8910 (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	42.9030	42.6554	42.4127	41.2728	41.0595	40.0667	40.0667	39.8829	40.4491	41.0595	41.4910	41.9421	(38)
Average = Sum(39)m / 12 =	85.7940	85.5464	85.3037	84.1638	83.9506	82.9577	82.9577	82.7739	83.3402	83.9506	84.3820	84.8331	(39)
												84.1628	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9689	0.9661	0.9633	0.9505	0.9481	0.9368	0.9368	0.9348	0.9412	0.9481	0.9529	0.9580	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

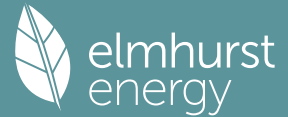
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.6053 (42)
Hot water usage for mixer showers	67.9029	66.8824	65.3954	62.5503	60.4507	58.1093	56.7784	58.2541	59.8718	62.3858	65.2920	67.6427 (42a)
Hot water usage for baths	29.3237	28.8882	28.2749	27.1442	26.2974	25.3586	24.8515	25.4604	26.1235	27.1281	28.2822	29.2245 (42b)
Hot water usage for other uses	41.3114	39.8091	38.3069	36.8047	35.3024	33.8002	33.8002	35.3024	36.8047	38.3069	39.8091	41.3114 (42c)
Average daily hot water use (litres/day)												127.3477 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	138.5379	135.5798	131.9773	126.4992	122.0506	117.2681	115.4301	119.0170	122.8000	127.8209	133.3834	138.1786 (44)
Distribution loss (46)m = 0.15 x (45)m	219.4102	193.0638	202.8441	173.1710	164.3036	144.1948	139.6027	147.3679	151.4247	173.4517	190.0290	216.3544 (45)
Water storage loss (or HIU loss):	Total = Sum(45)m =											2115.2180
Total storage loss	32.9115	28.9596	30.4266	25.9757	24.6455	21.6292	20.9404	22.1052	22.7137	26.0178	28.5044	32.4532 (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 (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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (59)
Total heat required for water heating calculated for each month	270.3691	239.0912	253.8030	222.4861	215.2625	193.5099	190.5616	198.3268	200.7398	224.4106	239.3441	267.3133 (62)
WWHRS	-31.0424	-27.4541	-28.7484	-23.8048	-22.1852	-18.9840	-17.7945	-18.9227	-19.6416	-23.1553	-26.2321	-30.4675 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	239.3268	211.6370	225.0547	198.6813	193.0773	174.5258	172.7671	179.4042	181.0981	201.2553	213.1120	236.8458 (64)
Total per year (kWh/year) = Sum(64)m =												2426.7853 (64)
12Total per year (kWh/year)												2427 (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												
	85.6936	75.7006	80.1854	69.9081	67.3707	60.2735	59.1576	61.7396	62.6775	70.4124	75.5134	84.6775 (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	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.2289	132.0035	119.2289	123.2032	119.2289	123.2032	119.2289	119.2289	123.2032	119.2289	123.2032	119.2289 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.3847	238.8376	232.6563	219.4970	202.8858	187.2736	176.8437	174.3907	180.5720	193.7313	210.3425	225.9548 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267 (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)	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139 (71)
Water heating gains (Table 5)	115.1796	112.6496	107.7761	97.0946	90.5520	83.7132	79.5129	82.9833	87.0520	94.6403	104.8798	113.8139 (72)
Total internal gains	535.8734	548.5709	524.7415	504.8751	477.7469	456.2703	437.6657	438.6832	452.9075	472.6808	503.5058	524.0778 (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							

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Southeast			15.8900		36.7938		0.6300		0.7000		0.7700		178.6779 (77)
Southwest			4.3600		36.7938		0.6300		0.7000		0.7700		49.0268 (79)

Solar gains	227.7046	387.8652	530.6941	657.5558	736.5173	731.1912	704.9463	646.0375	574.6295	428.6737	272.7377	194.8677 (83)
Total gains	763.5781	936.4362	1055.4357	1162.4309	1214.2642	1187.4614	1142.6120	1084.7206	1027.5371	901.3545	776.2434	718.9455 (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	60.1746	60.3488	60.5205	61.3401	61.4960	62.2320	62.2320	62.3702	61.9464	61.4960	61.1815	60.8562	
alpha	5.0116	5.0233	5.0347	5.0893	5.0997	5.1488	5.1488	5.1580	5.1298	5.0997	5.0788	5.0571	
util living area	0.9796	0.9489	0.8929	0.7760	0.6171	0.4432	0.3188	0.3500	0.5467	0.8225	0.9548	0.9842 (86)	
MIT	20.0133	20.2954	20.5751	20.8317	20.9545	20.9932	20.9990	20.9984	20.9808	20.8093	20.3757	19.9635 (87)	
Th 2	20.1094	20.1117	20.1140	20.1248	20.1268	20.1363	20.1363	20.1380	20.1327	20.1268	20.1227	20.1185 (88)	
util rest of house	0.9747	0.9377	0.8715	0.7388	0.5665	0.3850	0.2566	0.2849	0.4828	0.7823	0.9428	0.9803 (89)	
MIT 2	18.9776	19.3288	19.6669	19.9654	20.0906	20.1323	20.1359	20.1374	20.1203	19.9511	19.4418	18.9219 (90)	
Living area fraction									fLA = Living area / (4) =			0.4054 (91)	
MIT	19.3975	19.7207	20.0351	20.3166	20.4409	20.4814	20.4858	20.4865	20.4691	20.2990	19.8204	19.3442 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.3975	19.7207	20.0351	20.3166	20.4409	20.4814	20.4858	20.4865	20.4691	20.2990	19.8204	19.3442 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9697	0.9320	0.8694	0.7474	0.5851	0.4084	0.2818	0.3113	0.5080	0.7908	0.9380	0.9759 (94)	
Useful gains	740.4337	872.7397	917.5716	868.7729	710.4634	484.9425	322.0167	337.6810	521.9875	712.8170	728.0975	701.6209 (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	1295.2750	1267.8551	1154.5940	960.8659	733.7995	487.9037	322.3595	338.2524	530.8054	814.2397	1073.3752	1284.7289 (97)	
Space heating kWh	412.8019	265.5176	176.3447	66.3070	17.3621	0.0000	0.0000	0.0000	0.0000	75.4584	248.6000	433.8324 (98a)	
Space heating requirement - total per year (kWh/year)												1696.2240	
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	412.8019	265.5176	176.3447	66.3070	17.3621	0.0000	0.0000	0.0000	0.0000	75.4584	248.6000	433.8324 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1696.2240	
Space heating per m2										(98c) / (4) =		19.1556 (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 %)													92.4000 (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	412.8019	265.5176	176.3447	66.3070	17.3621	0.0000	0.0000	0.0000	0.0000	75.4584	248.6000	433.8324 (98)	
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)	
Space heating fuel (main heating system)	446.7553	287.3567	190.8492	71.7608	18.7902	0.0000	0.0000	0.0000	0.0000	81.6650	269.0476	469.5156 (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	239.3268	211.6370	225.0547	198.6813	193.0773	174.5258	172.7671	179.4042	181.0981	201.2553	213.1120	236.8458 (64)	
Efficiency of water heater (217)m	85.5380	84.8685	83.8642	82.2920	80.9461	80.3000	80.3000	80.3000	80.3000	82.4757	84.7124	85.6602 (216)	
Fuel for water heating, kWh/month	279.7901	249.3704	268.3562	241.4346	238.5259	217.3422	215.1520	223.4174	225.5269	244.0177	251.5712	276.4944 (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	24.7734	19.8742	17.8945	13.1103	10.1267	8.2736	9.2380	12.0078	15.5970	20.4641	23.1142	25.4619 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.4742	-34.6442	-52.0992	-61.3675	-68.6030	-64.9056	-64.0952	-59.2939	-51.2635	-40.8188	-26.3459	-20.1168 (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	-8.9395	-19.1731	-38.8060	-59.3268	-79.4824	-80.2573	-79.3312	-66.7079	-48.2796	-27.7782	-12.0484	-7.0433 (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												1835.7403 (211)	
Space heating fuel - main system 2												0.0000 (213)	
Space heating fuel - secondary												0.0000 (215)	
Efficiency of water heater												80.3000	
Water heating fuel used												2930.9990 (219)	
Space cooling fuel												0.0000 (221)	

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Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	199.9357 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1094.2014 (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	3958.4735 (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	1835.7403	0.2100	385.5055 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2930.9990	0.2100	615.5098 (264)
Space and water heating			1001.0153 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	199.9357	0.1443	28.8569 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-567.0278	0.1336	-75.7786
PV Unit electricity exported	-527.1737	0.1254	-66.0937
Total			-141.8724 (269)
Total CO2, kg/year			899.9291 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.1600 (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	1835.7403	1.1300	2074.3866 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2930.9990	1.1300	3312.0289 (278)
Space and water heating			5386.4154 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	199.9357	1.5338	306.6680 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-567.0278	1.4939	-847.0623
PV Unit electricity exported	-527.1737	0.4602	-242.5960
Total			-1089.6584 (283)
Total Primary energy kWh/year			4733.5258 (286)
Target Primary Energy Rate (TPER)			53.4600 (287)

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Plot Reference	B3.1-3.3 3B5P TOP			Issued on Date	19/12/2025
Assessment Reference	3B5P	Plot Type Ref	3B5P		
Plot Address				SAP Version	10.2
SAP Rating	84 B	DER	13.68	TER	12.77
Environmental	88 B	% DER < TER			-7.13
CO ₂ Emissions (t/year)	1.09	DFEE	38.17	TFEE	37.11
Compliance Check	See BREL	% DFEE < TFEE			-2.84
% DPER < TPER	-16.23	DPER	78.45	TPER	67.50
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	88.5500 (1b)	2.5000 (2b)	221.3750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	221.3750 (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)

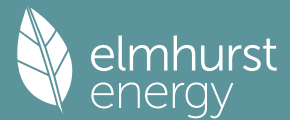
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.1626	0.1594	0.1562	0.1403	0.1371	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			21.5000	0.9615	20.6731		(27)
External Wall	47.4000	21.5000	25.9000	0.1600	4.1440	14.0000	362.6000 (29a)
Communal Wall	34.0500	1.8900	32.1600	0.2100	6.7536	14.0000	450.2400 (29a)
Roof	88.5000		88.5000	0.1300	11.5050	9.0000	796.5000 (30)
Total net area of external elements Aum(A, m ²)			169.9500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.9657		(33)
Main dwelling							
Party Wall			20.1300	0.0000	0.0000	20.0000	402.6000 (32)
Party Floor			88.5000			80.0000	7080.0000 (32d)
Stud			160.0000			9.0000	1440.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	10531.9400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							118.9378 (35)
List of Thermal Bridges							

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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	34.6845	34.7805	34.8770	35.3680	35.4678	35.9756	35.9756	36.0789	35.7708	35.4678	35.2687	35.0718
alpha	3.3123	3.3187	3.3251	3.3579	3.3645	3.3984	3.3984	3.4053	3.3847	3.3645	3.3512	3.3381
util living area	0.9476	0.9153	0.8707	0.7871	0.6677	0.5100	0.3790	0.4095	0.5977	0.8101	0.9173	0.9542 (86)
MIT	19.3612	19.6727	20.0333	20.4530	20.7548	20.9284	20.9800	20.9738	20.8732	20.4828	19.8648	19.3097 (87)
Th 2	20.1231	20.1253	20.1275	20.1386	20.1408	20.1519	20.1519	20.1542	20.1475	20.1408	20.1364	20.1319 (88)
util rest of house	0.9399	0.9036	0.8531	0.7588	0.6249	0.4515	0.3096	0.3390	0.5396	0.7787	0.9039	0.9474 (89)
MIT 2	18.6354	18.9391	19.2875	19.6894	19.9595	20.1090	20.1433	20.1422	20.0661	19.7271	19.1392	18.5918 (90)
Living area fraction	fLA = Living area / (4) = 0.4054 (91)											
MIT	18.9297	19.2365	19.5899	19.9990	20.2819	20.4412	20.4825	20.4793	20.3933	20.0335	19.4334	18.8828 (92)
Temperature adjustment	-0.1500											
adjusted MIT	18.7797	19.0865	19.4399	19.8490	20.1319	20.2912	20.3325	20.3293	20.2433	19.8835	19.2834	18.7328 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9254	0.8872	0.8372	0.7484	0.6245	0.4614	0.3246	0.3539	0.5464	0.7682	0.8881	0.9338 (94)
Useful gains	649.0396	729.0910	748.2193	717.0060	614.0451	441.7340	298.8054	312.2015	463.8016	592.3521	620.0021	623.0756 (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	1221.3200	1193.2887	1085.4164	905.6697	695.5027	462.8115	303.5289	318.6193	502.4334	765.7407	1010.6120	1212.2687 (97)
Space heating kWh	425.7766	311.9409	250.8746	135.8379	60.6045	0.0000	0.0000	0.0000	0.0000	129.0011	281.2391	438.3597 (98a)
Space heating requirement - total per year (kWh/year)	2033.6344											
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	425.7766	311.9409	250.8746	135.8379	60.6045	0.0000	0.0000	0.0000	0.0000	129.0011	281.2391	438.3597 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2033.6344											
Space heating per m2	(98c) / (4) = 22.9659 (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 %)												88.9000 (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	425.7766	311.9409	250.8746	135.8379	60.6045	0.0000	0.0000	0.0000	0.0000	129.0011	281.2391	438.3597 (98)
Space heating efficiency (main heating system 1)	88.9000	88.9000	88.9000	88.9000	88.9000	0.0000	0.0000	0.0000	0.0000	88.9000	88.9000	88.9000 (210)
Space heating fuel (main heating system)	478.9388	350.8896	282.1987	152.7985	68.1715	0.0000	0.0000	0.0000	0.0000	145.1081	316.3545	493.0930 (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	254.8735	225.4190	239.6815	211.3934	205.3184	185.4547	183.4345	190.5251	192.3808	213.9618	226.7854	252.1951 (64)
Efficiency of water heater	85.4723	85.0777	84.4794	83.4584	82.1103	80.3000	80.3000	80.3000	80.3000	83.3322	84.8437	85.5537 (216)
Fuel for water heating, kWh/month	298.1945	264.9566	283.7159	253.2919	250.0521	230.9523	228.4365	237.2666	239.5775	256.7577	267.2980	294.7798 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
(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	28.1778	25.4509	28.1778	27.2688	28.1778	27.2688	28.1778	28.1778	27.2688	28.1778	27.2688	28.1778 (231)
Lighting	28.3716	22.7608	20.4936	15.0145	11.5976	9.4753	10.5797	13.7519	17.8624	23.4364	26.4714	29.1602 (232)
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 (233a)
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	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)
(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)	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)
(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)	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)
(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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	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)
(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)	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)
(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)	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)
(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	2287.5527 (211)											
Space heating fuel - main system 2	0.0000 (213)											
Space heating fuel - secondary	0.0000 (215)											
Efficiency of water heater	80.3000											
Water heating fuel used	3105.2792 (219)											
Space cooling fuel	0.0000 (221)											
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9100)												
mechanical ventilation fans (SFP = 0.9100)												245.7705 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)

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Total electricity for the above, kWh/year	331.7705	(231)
Electricity for lighting (calculated in Appendix L)	228.9753	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	5953.5778	(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	2287.5527	0.2100	480.3861 (261)
Total CO2 associated with community systems			0.0000 (273)
Water heating (other fuel)	3105.2792	0.2100	652.1086 (264)
Space and water heating			1132.4947 (265)
Pumps, fans and electric keep-hot	331.7705	0.1387	46.0207 (267)
Energy for lighting	228.9753	0.1443	33.0482 (268)
Total CO2, kg/year			1211.5636 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.6800 (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	2287.5527	1.1300	2584.9346 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3105.2792	1.1300	3508.9655 (278)
Space and water heating			6093.9001 (279)
Pumps, fans and electric keep-hot	331.7705	1.5128	501.9025 (281)
Energy for lighting	228.9753	1.5338	351.2100 (282)
Total Primary energy kWh/year			6947.0125 (286)
Dwelling Primary energy Rate (DPER)			78.4500 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	88.5500	2.5000	221.3750
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5500		
Dwelling volume			

2. Ventilation rate

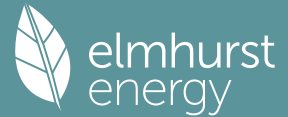
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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 = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1355 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3855 (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) = 0.3277 (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	0.4178	0.4096	0.4014	0.3605	0.3523	0.3113	0.3113	0.3031	0.3277	0.3523	0.3687	0.3850 (22b)
Effective ac	0.5873	0.5839	0.5806	0.5650	0.5620	0.5485	0.5485	0.5459	0.5537	0.5620	0.5680	0.5741 (25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K
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Full SAP Calculation Printout

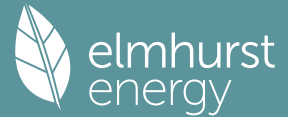


Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K						
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type			20.2500	1.1450	23.1870			(27)					
External Wall	47.4000	20.2500	27.1500	0.1800	4.8870			(29a)					
Communal Wall	34.0500	1.8900	32.1600	0.1800	5.7888			(29a)					
Roof	88.5000		88.5000	0.1100	9.7350			(30)					
Total net area of external elements Aum(A, m2)			169.9500					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		45.4878			(33)					
Main dwelling													
Party Wall			20.1300	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							118.9378	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
E2 Other lintels (including other steel lintels)				11.7600	0.0500	0.5880							
E3 Sill				3.6200	0.0500	0.1810							
E4 Jamb				27.9600	0.0500	1.3980							
E7 Party floor between dwellings (in blocks of flats)				21.2800	0.0700	1.4896							
E16 Corner (normal)				7.5000	0.0900	0.6750							
E18 Party wall between dwellings				2.5000	0.0600	0.1500							
E25 Staggered party wall between dwellings				2.5000	0.0600	0.1500							
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				8.0500	0.0000	0.0000							
E23 Balcony within or between dwellings, balcony support penetrates wall insulation				11.3000	0.0200	0.2260							
E15 Flat roof with parapet				18.9600	0.5600	10.6176							
P4 Party wall - Roof (insulation at ceiling level)				8.0500	0.1200	0.9660							
R7 Flat ceiling (inverted)				13.6200	0.0400	0.5448							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.9860	(36)					
Point Thermal bridges							0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	62.4738	(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	42.9030	42.6554	42.4127	41.2728	41.0595	40.0667	40.0667	39.8829	40.4491	41.0595	41.4910	41.9421	(38)
Average = Sum(39)m / 12 =	105.3768	105.1292	104.8865	103.7466	103.5334	102.5405	102.5405	102.3567	102.9230	103.5334	103.9648	104.4159	(39)
												103.7456	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1900	1.1872	1.1845	1.1716	1.1692	1.1580	1.1580	1.1559	1.1623	1.1692	1.1741	1.1792	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
												1.1716	
												31	

4. Water heating energy requirements (kWh/year)													
Assumed occupancy													2.6053 (42)
Hot water usage for mixer showers													
	67.9029	66.8824	65.3954	62.5503	60.4507	58.1093	56.7784	58.2541	59.8718	62.3858	65.2920	67.6427	(42a)
Hot water usage for baths													
	29.3237	28.8882	28.2749	27.1442	26.2974	25.3586	24.8515	25.4604	26.1235	27.1281	28.2822	29.2245	(42b)
Hot water usage for other uses													
	41.3114	39.8091	38.3069	36.8047	35.3024	33.8002	33.8002	35.3024	36.8047	38.3069	39.8091	41.3114	(42c)
Average daily hot water use (litres/day)													127.3477 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	138.5379	135.5798	131.9773	126.4992	122.0506	117.2681	115.4301	119.0170	122.8000	127.8209	133.3834	138.1786	(44)
Energy conte	219.4102	193.0638	202.8441	173.1710	164.3036	144.1948	139.6027	147.3679	151.4247	173.4517	190.0290	216.3544	(45)
Energy content (annual)										Total = Sum(45)m =		2115.2180	
Distribution loss (46)m = 0.15 x (45)m													
	32.9115	28.9596	30.4266	25.9757	24.6455	21.6292	20.9404	22.1052	22.7137	26.0178	28.5044	32.4532	(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	
Combi loss													(61)
	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	
Total heat required for water heating calculated for each month													
	270.3691	239.0912	253.8030	222.4861	215.2625	193.5099	190.5616	198.3268	200.7398	224.4106	239.3441	267.3133	(62)
WWHRS	-31.0424	-27.4541	-28.7484	-23.8048	-22.1852	-18.9840	-17.7945	-18.9227	-19.6416	-23.1553	-26.2321	-30.4675	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	239.3268	211.6370	225.0547	198.6813	193.0773	174.5258	172.7671	179.4042	181.0981	201.2553	213.1120	236.8458	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2426.7853	(64)
Electric shower(s)												2427	(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)
Heat gains from water heating, kWh/month													
	85.6936	75.7006	80.1854	69.9081	67.3707	60.2735	59.1576	61.7396	62.6775	70.4124	75.5134	84.6775	(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	(66)
	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	119.2289	132.0035	119.2289	123.2032	119.2289	123.2032	119.2289	119.2289	123.2032	119.2289	123.2032	119.2289	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	236.3847	238.8376	232.6563	219.4970	202.8858	187.2736	176.8437	174.3907	180.5720	193.7313	210.3425	225.9548	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	(69)
Pumps, fans													(70)
	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	
Losses e.g. evaporation (negative values) (Table 5)													
	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	(71)
Water heating gains (Table 5)													
	115.1796	112.6496	107.7761	97.0946	90.5520	83.7132	79.5129	82.9833	87.0520	94.6403	104.8798	113.8139	(72)
Total internal gains													
	535.8734	548.5709	524.7415	504.8751	477.7469	456.2703	437.6657	438.6832	452.9075	472.6808	503.5058	524.0778	(73)

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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
Southeast	15.8900				36.7938	0.6300	0.7000	0.7000	0.7700	178.6779 (77)
Southwest	4.3600				36.7938	0.6300	0.7000	0.7000	0.7700	49.0268 (79)
Solar gains	227.7046	387.8652	530.6941	657.5558	736.5173	731.1912	704.9463	646.0375	574.6295	194.8677 (83)
Total gains	763.5781	936.4362	1055.4357	1162.4309	1214.2642	1187.4614	1142.6120	1084.7206	1027.5371	718.9455 (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	27.7626	27.8280	27.8924	28.1989	28.2570	28.5306	28.5818	28.4246	28.2570	28.1397	28.0181
alpha	2.8508	2.8552	2.8595	2.8799	2.8838	2.9020	2.9020	2.9055	2.8838	2.8760	2.8679
util living area	0.9454	0.9082	0.8576	0.7701	0.6513	0.5036	0.3783	0.4115	0.5951	0.8044	0.9528 (86)
MIT	18.8807	19.2790	19.7405	20.2603	20.6466	20.8798	20.9610	20.9494	20.7968	20.2772	19.4919
Th 2	19.9280	19.9302	19.9324	19.9428	19.9447	19.9538	19.9538	19.9554	19.9503	19.9447	19.9408
util rest of house	0.9368	0.8945	0.8366	0.7368	0.6016	0.4344	0.2945	0.3260	0.5270	0.7682	0.8997
MIT 2	17.4872	17.9831	18.5520	19.1809	19.6202	19.8662	19.9341	19.9282	19.7901	19.2193	18.2646
Living area fraction	18.0521	18.5085	19.0338	19.6185	20.0363	20.2771	20.3504	20.3422	fLA = Living area / (4) =	18.7622	17.9734 (92)
Temperature adjustment	18.0521	18.5085	19.0338	19.6185	20.0363	20.2771	20.3504	20.3422	20.1982	19.6482	18.7622
adjusted MIT	18.0521	18.5085	19.0338	19.6185	20.0363	20.2771	20.3504	20.3422	20.1982	19.6482	18.7622

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9168	0.8720	0.8159	0.7256	0.6062	0.4566	0.3270	0.3585	0.5440	0.7567	0.8787	0.9265 (94)
Useful gains	700.0442	816.5840	861.1260	843.4427	736.0946	542.1690	373.5889	388.8828	558.9469	682.0174	682.0671	666.1028 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1449.1549	1430.6485	1314.6297	1112.0113	863.0855	582.1365	384.5680	403.5138	627.6449	936.7914	1212.4547	1438.1658 (97)
Space heating kWh	557.3384	412.6513	337.4067	193.3694	94.4812	0.0000	0.0000	0.0000	0.0000	189.5519	381.8790	574.4149 (98a)
Space heating requirement - total per year (kWh/year)												2741.0929
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	557.3384	412.6513	337.4067	193.3694	94.4812	0.0000	0.0000	0.0000	0.0000	189.5519	381.8790	574.4149 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2741.0929
Space heating per m2										(98c) / (4) =		30.9553 (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 %)												92.4000 (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	557.3384	412.6513	337.4067	193.3694	94.4812	0.0000	0.0000	0.0000	0.0000	189.5519	381.8790	574.4149 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	603.1801	446.5923	365.1588	209.2742	102.2524	0.0000	0.0000	0.0000	0.0000	205.1428	413.2890	621.6611 (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	239.3268	211.6370	225.0547	198.6813	193.0773	174.5258	172.7671	179.4042	181.0981	201.2553	213.1120	236.8458 (64)
Efficiency of water heater	86.1289	85.7854	85.2469	84.3234	82.9361	80.3000	80.3000	80.3000	80.3000	84.2532	85.6158	80.3000 (216)
Fuel for water heating, kWh/month	277.8704	246.7052	264.0032	235.6183	232.8025	217.3422	215.1520	223.4174	225.5269	238.8696	248.9167	86.2046 (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 (221)
Lighting	24.7734	19.8742	17.8945	13.1103	10.1267	8.2736	9.2380	12.0078	15.5970	20.4641	23.1142	25.4619 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-23.4742	-34.6442	-52.0992	-61.3675	-68.6030	-64.9056	-64.0952	-59.2939	-51.2635	-40.8188	-26.3459	-20.1168 (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)	-8.9395	-19.1731	-38.8060	-59.3268	-79.4824	-80.2573	-79.3312	-66.7079	-48.2796	-27.7782	-12.0484	-7.0433 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

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Annual totals kWh/year		
Space heating fuel - main system 1	2966.5507	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2900.9729	(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)	199.9357	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1094.2014	(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	5059.2579	(238)

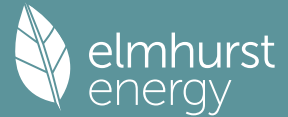
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2966.5507	0.2100	622.9757 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2900.9729	0.2100	609.2043 (264)
Space and water heating			1232.1800 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	199.9357	0.1443	28.8569 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-567.0278	0.1336	-75.7786
PV Unit electricity exported	-527.1737	0.1254	-66.0937
Total			-141.8724 (269)
Total CO2, kg/year			1131.0938 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.7700 (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	2966.5507	1.1300	3352.2023 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2900.9729	1.1300	3278.0994 (278)
Space and water heating			6630.3017 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	199.9357	1.5338	306.6680 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-567.0278	1.4939	-847.0623
PV Unit electricity exported	-527.1737	0.4602	-242.5960
Total			-1089.6584 (283)
Total Primary energy kWh/year			5977.4121 (286)
Target Primary Energy Rate (TPER)			67.5000 (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	84 B	DER	13.91		TER	13.53	
Environmental	90 B	% DER < TER				-2.81	
CO ₂ Emissions (t/year)	0.7	DFEE	26.56		TFEE	27.05	
Compliance Check	See BREL	% DFEE < TFEE				1.83	
% DPER < TPER	-10.85	DPER	79.85		TPER	72.03	
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							

elmhurst
energy

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

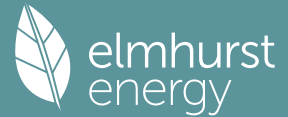
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												
Hot water usage for mixer showers												1.8045 (42)
68.0933	67.0700	65.5788	62.7257	60.6202	58.2722	56.9376	58.4175	60.0397	62.5608	65.4751	67.8324	(42a)
Hot water usage for baths												
23.5491	23.1994	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)												114.7131 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use												
124.7520	122.1750	118.9873	114.0222	110.0327	105.7267	103.9848	107.1578	110.5165	115.0483	120.0934	124.4115	(44)
Energy conte	197.5766	173.9755	182.8790	156.0906	148.1252	130.0033	125.7607	132.6837	136.2779	156.1195	171.0951	194.7983 (45)
Energy content (annual)										Total = Sum(45)m =		1905.3854
Distribution loss	(46)m = 0.15 x (45)m											
29.6365	26.0963	27.4319	23.4136	22.2188	19.5005	18.8641	19.9026	20.4417	23.4179	25.6643	29.2197	(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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month												
248.5356	220.0029	233.8379	205.4057	199.0841	179.3184	176.7196	183.6426	185.5929	207.0784	220.4102	245.7572	(62)
WWHRS	-33.9999	-30.0698	-31.4873	-26.0727	-24.2989	-20.7927	-19.4899	-20.7255	-21.5129	-25.3614	-28.7314	-33.3702 (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												
214.5357	189.9331	202.3506	179.3330	174.7852	158.5257	157.2297	162.9171	164.0800	181.7170	191.6788	212.3870	(64)
Total per year (kWh/year) = Sum(64)m =												2189.4728 (64)
12Total per year (kWh/year)												2189 (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												
78.4340	69.3537	73.5470	64.2289	61.9913	55.5549	54.5551	56.8571	57.6412	64.6494	69.2179	77.5102	(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	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)	-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)	105.4220	103.2049	98.8535	89.2068	83.3217	77.1596	73.3268	76.4208	80.0572	86.8944	96.1360	104.1803 (72)
Total internal gains	398.9255	407.2487	389.8761	374.2444	354.5345	337.7551	324.2107	325.6724	336.1933	352.0156	375.0820	390.7436 (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 (84)
Total gains	475.4006	532.4951	549.4178	554.5611	542.4357	518.5844	500.8919	497.2544	502.8535	487.1056	465.7310	456.8251 (83)

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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	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	0.9242	0.8834	0.8350	0.7465	0.6257	0.4617	0.3327	0.3487	0.5124	0.7347	0.8756	0.9326 (86)
MIT	20.2119	20.4106	20.5983	20.8024	20.9269	20.9861	20.9975	20.9969	20.9765	20.8424	20.5293	20.1819 (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												
	0.9141	0.8692	0.8156	0.7187	0.5880	0.4161	0.2830	0.2993	0.4665	0.7019	0.8585	0.9234 (89)
MIT 2	19.5971	19.7879	19.9664	20.1626	20.2712	20.3275	20.3346	20.3366	20.3165	20.2022	19.9137	19.5762 (90)
Living area fraction												
fLA = Living area / (4) =												0.3304 (91)
MIT	19.8002	19.9936	20.1752	20.3739	20.4878	20.5451	20.5536	20.5548	20.5345	20.4137	20.1170	19.7763 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.6502	19.8436	20.0252	20.2239	20.3378	20.3951	20.4036	20.4048	20.3845	20.2637	19.9670	19.6263 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9032	0.8587	0.8069	0.7145	0.5888	0.4203	0.2881	0.3043	0.4702	0.6988	0.8486	0.9128 (94)
Useful gains	429.3937	457.2364	443.3238	396.2459	319.3986	217.9409	144.3194	151.3013	236.4600	340.4002	395.2319	417.0125 (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	612.0285	593.6992	535.4294	440.2649	334.6068	220.3818	144.6489	151.7302	240.7757	374.3489	502.0826	606.3190 (97)
Space heating kWh	135.8803	91.7030	68.5266	31.6937	11.3149	0.0000	0.0000	0.0000	0.0000	25.2578	76.9325	140.8440 (98a)
Space heating requirement - total per year (kWh/year)												582.1528
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	135.8803	91.7030	68.5266	31.6937	11.3149	0.0000	0.0000	0.0000	0.0000	25.2578	76.9325	140.8440 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												582.1528
Space heating per m2										(98c) / (4) =		10.8046 (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 %)

88.9000 (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	135.8803	91.7030	68.5266	31.6937	11.3149	0.0000	0.0000	0.0000	0.0000	25.2578	76.9325	140.8440 (98)
Space heating efficiency (main heating system 1)	88.9000	88.9000	88.9000	88.9000	88.9000	0.0000	0.0000	0.0000	0.0000	88.9000	88.9000	88.9000 (210)
Space heating fuel (main heating system)	152.8463	103.1530	77.0827	35.6509	12.7277	0.0000	0.0000	0.0000	0.0000	28.4115	86.5382	158.4297 (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	214.5357	189.9331	202.3506	179.3330	174.7852	158.5257	157.2297	162.9171	164.0800	181.7170	191.6788	212.3870 (64)
Efficiency of water heater (217)m	83.4296	82.9116	82.3145	81.4839	80.7751	80.3000	80.3000	80.3000	80.3000	81.2593	82.5882	80.3000 (216)
Fuel for water heating, kWh/month	257.1457	229.0791	245.8263	220.0840	216.3850	197.4168	195.8029	202.8856	204.3337	223.6261	232.0897	254.2898 (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	18.0511	16.3042	18.0511	17.4688	18.0511	17.4688	18.0511	18.0511	17.4688	18.0511	17.4688	18.0511 (231)
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 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												654.8401 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												2678.9648 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7700)

mechanical ventilation fans (SFP = 0.7700)

126.5372 (230a)

central heating pump

41.0000 (230c)

main heating flue fan

45.0000 (230e)

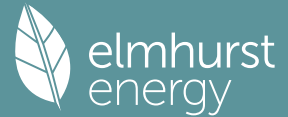
Total electricity for the above, kWh/year

212.5372 (231)

Electricity for lighting (calculated in Appendix L)

139.1199 (232)

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

PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3685.4620 (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	654.8401	0.2100	137.5164 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2678.9648	0.2100	562.5826 (264)
Space and water heating			700.0990 (265)
Pumps, fans and electric keep-hot	212.5372	0.1387	29.4815 (267)
Energy for lighting	139.1199	0.1443	20.0793 (268)
Total CO2, kg/year			749.6598 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.9100 (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	654.8401	1.1300	739.9693 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2678.9648	1.1300	3027.2302 (278)
Space and water heating			3767.1995 (279)
Pumps, fans and electric keep-hot	212.5372	1.5128	321.5262 (281)
Energy for lighting	139.1199	1.5338	213.3868 (282)
Total Primary energy kWh/year			4302.1125 (286)
Dwelling Primary energy Rate (DPER)			79.8500 (287)

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

1. Overall dwelling characteristics

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

2. Ventilation rate

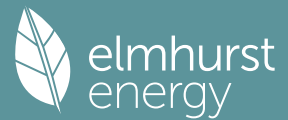
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	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) = 0.1485 (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)
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)

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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					0.0000	(36a) =
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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	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)
Average = Sum(39)m / 12 =	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)
												53.5228
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	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)
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												
Hot water usage for baths	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 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)
												102.1571 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	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										Total = Sum(45)m =		1696.8088
Water storage loss (or HIU loss):	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)
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	50.9589	46.0274	50.9589	49.3151	49.8932	46.3918	47.1866	48.6526	48.5795	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	226.9669	200.9016	213.6795	188.2320	181.6971	162.0647	159.1750	166.8697	170.0504	190.0995	201.7539	224.5154 (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	202.0634	178.8767	190.6163	169.1348	163.8991	146.8348	144.8995	151.6891	154.2931	171.5233	180.7094	200.0730 (64)
12Total per year (kWh/year)												2054.6126 (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	71.2624	63.0025	66.8443	58.5187	56.2981	50.0592	49.0328	51.4703	52.5340	59.0040	63.0147	70.4473 (65)

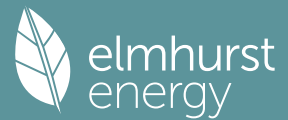
5. Internal gains (see Table 5 and 5a)

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)	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)	-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	95.7828	93.7537	89.8445	81.2759	75.6695	69.5266	65.9043	69.1806	72.9638	79.3064	87.5204	94.6872 (72)
	389.2863	397.7975	380.8671	366.3135	346.8822	330.1221	316.7882	318.4322	329.1000	344.4276	366.4664	381.2505 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W
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		W/m2		or Table 6b		or Table 6c		Table 6d				
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	509.7345	595.0606	632.1453	650.3123	642.8266	614.9283	595.0611	588.6738	591.5897	557.1943	509.2386	485.3288 (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	0.9388	0.9011	0.8562	0.7798	0.6719	0.5187	0.3819	0.4013	0.5712	0.7804	0.9015	0.9465 (86)
MIT	19.6137	19.9105	20.2123	20.5476	20.7919	20.9399	20.9846	20.9812	20.9105	20.6120	20.0770	19.5635 (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	0.9291	0.8865	0.8352	0.7482	0.6252	0.4548	0.3072	0.3269	0.5090	0.7432	0.8846	0.9379 (89)
MIT 2	18.4813	18.8483	19.2182	19.6247	19.9006	20.0575	20.0933	20.0929	20.0282	19.7082	19.0690	18.4258 (90)
Living area fraction	18.8554	19.1992	19.5466	19.9296	20.1951	20.3490	20.3877	20.3864	fLA = Living area / (4) =			0.3304 (91)
MIT	18.8554	19.1992	19.5466	19.9296	20.1951	20.3490	20.3877	20.3864	20.3197	20.0068	19.4020	18.8016 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8554	19.1992	19.5466	19.9296	20.1951	20.3490	20.3877	20.3864	20.3197	20.0068	19.4020	18.8016 (93)

8. Space heating requirement												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9134	0.8704	0.8217	0.7422	0.6309	0.4729	0.3314	0.3508	0.5249	0.7395	0.8697	0.9229 (94)
Useful gains	465.6004	517.9404	519.4037	482.6562	405.5325	290.7892	197.1772	206.5128	310.5303	412.0221	442.8674	447.9202 (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	794.4786	778.1967	707.9674	590.3431	453.5091	303.2007	199.7627	209.7627	329.5689	502.1807	660.1912	787.8831 (97)
Space heating kWh	244.6854	174.8922	140.2914	77.5346	35.6946	0.0000	0.0000	0.0000	0.0000	67.0780	156.4732	252.9324 (98a)
Space heating requirement - total per year (kWh/year)												1149.5819
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	244.6854	174.8922	140.2914	77.5346	35.6946	0.0000	0.0000	0.0000	0.0000	67.0780	156.4732	252.9324 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1149.5819
Space heating per m2										(98c) / (4) =		21.3360 (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 %)												92.4000 (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	244.6854	174.8922	140.2914	77.5346	35.6946	0.0000	0.0000	0.0000	0.0000	67.0780	156.4732	252.9324 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	264.8111	189.2773	151.8305	83.9119	38.6305	0.0000	0.0000	0.0000	0.0000	72.5952	169.3433	273.7364 (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	202.0634	178.8767	190.6163	169.1348	163.8991	146.8348	144.8995	151.6891	154.2931	171.5233	180.7094	200.0730 (64)
Efficiency of water heater (217)m	84.7926	84.3332	83.7342	82.8183	81.7137	80.3000	80.3000	80.3000	80.3000	82.5449	84.0743	84.8849 (216)
Fuel for water heating, kWh/month	238.3031	212.1072	227.6446	204.2240	200.5774	182.8578	180.4477	188.9030	192.1458	207.7940	214.9401	235.6993 (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)
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												1244.1362 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												2485.6439 (219)

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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	3289.4124 (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	1244.1362	0.2100	261.2686 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2485.6439	0.2100	521.9852 (264)
Space and water heating			783.2538 (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			728.9367 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.5300 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1244.1362	1.1300	1405.8739 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2485.6439	1.1300	2808.7776 (278)
Space and water heating			4214.6515 (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			3880.7987 (286)
Target Primary Energy Rate (TPER)			72.0300 (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	85 B	DER	12.31	TER	11.79
Environmental	91 B	% DER < TER			-4.41
CO ₂ Emissions (t/year)	0.62	DFEE	15.35	TFEE	16.30
Compliance Check	See BREL	% DFEE < TFEE			5.85
% DPER < TPER	-12.90	DPER	71.28	TPER	63.13
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)

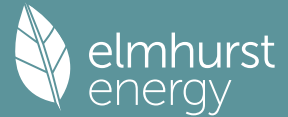
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (21)

	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

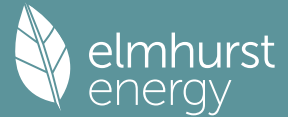
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												1.7290 (42)
Hot water usage for mixer showers												
	66.5116	65.5121	64.0556	61.2688	59.2122	56.9187	55.6151	57.0606	58.6451	61.1076	63.9543	66.2568 (42a)
Hot water usage for baths												
	23.0050	22.6633	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)												112.0478 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	121.8534	119.3363	116.2228	111.3730	107.4763	103.2703	101.5689	104.6680	107.9486	112.3752	117.3031	121.5208 (44)
Energy conte	192.9860	169.9333	178.6301	152.4641	144.6837	126.9829	122.8387	129.6009	133.1115	152.4920	167.1197	190.2722 (45)
Energy content (annual)										Total = Sum(45)m =		1861.1150
Distribution loss (46)m = 0.15 x (45)m												
	28.9479	25.4900	26.7945	22.8696	21.7026	19.0474	18.4258	19.4401	19.9667	22.8738	25.0680	28.5408 (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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
	243.9449	215.9607	229.5890	201.7791	195.6426	176.2980	173.7976	180.5598	182.4265	203.4509	216.4348	241.2311 (62)
WWHRS	-33.2101	-29.3713	-30.7559	-25.4671	-23.7345	-20.3097	-19.0371	-20.2441	-21.0132	-24.7723	-28.0640	-32.5951 (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	210.7347	186.5894	198.8330	176.3120	171.9081	155.9882	154.7605	160.3157	161.4133	178.6786	188.3708	208.6359 (64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				2152.5404 (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	76.9076	68.0097	72.1342	63.0231	60.8471	54.5506	53.5836	55.8320	56.5883	63.4433	67.8961	76.0052 (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	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 (71)
Water heating gains (Table 5)												
	103.3704	101.2049	96.9546	87.5320	81.7837	75.7647	72.0210	75.0430	78.5949	85.2733	94.3001	102.1576 (72)
Total internal gains	384.8437	392.6926	376.0516	360.8711	341.9062	325.5659	312.5454	314.0040	324.1248	339.5612	361.8045	376.9833 (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	461.3187	517.9390	535.5933	541.1878	529.8074	506.3952	489.2266	485.5860	490.7849	474.6511	452.4535	443.0647 (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	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	0.9001	0.8209	0.7347	0.6037	0.4738	0.3329	0.2369	0.2482	0.3740	0.5892	0.8013	0.9129 (86)
MIT	20.8565	20.9336	20.9736	20.9952	20.9994	21.0000	21.0000	21.0000	20.9999	20.9966	20.9555	20.8441 (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	0.8860	0.8018	0.7121	0.5793	0.4483	0.3073	0.2104	0.2218	0.3472	0.5615	0.7788	0.9000 (89)
MIT 2	20.3558	20.4259	20.4620	20.4909	20.4964	20.5087	20.5087	20.5111	20.5039	20.4945	20.4572	20.3537 (90)
Living area fraction									FLA = Living area / (4) =			0.3468 (91)
MIT	20.5295	20.6020	20.6394	20.6658	20.6709	20.6791	20.6791	20.6807	20.6759	20.6687	20.6300	20.5238 (92)
Temperature adjustment												-0.1500
adjusted MIT	20.3795	20.4520	20.4894	20.5158	20.5209	20.5291	20.5291	20.5307	20.5259	20.5187	20.4800	20.3738 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8832	0.8008	0.7124	0.5803	0.4495	0.3084	0.2115	0.2229	0.3484	0.5627	0.7782	0.8970 (94)
Useful gains	407.4196	414.7479	381.5585	314.0636	238.1451	156.1596	103.4865	108.2381	170.9721	267.0869	352.1161	397.4225 (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	451.7166	434.8002	389.2260	315.3478	238.2788	156.1630	103.4866	108.2382	170.9832	267.9340	365.0468	445.6364 (97)
Space heating kWh	32.9569	13.4751	5.7046	0.9246	0.0995	0.0000	0.0000	0.0000	0.0000	0.6303	9.3102	35.8711 (98a)
Space heating requirement - total per year (kWh/year)												98.9723
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	32.9569	13.4751	5.7046	0.9246	0.0995	0.0000	0.0000	0.0000	0.0000	0.6303	9.3102	35.8711 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												98.9723
Space heating per m2										(98c) / (4) =		1.9285 (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 %)												88.9000 (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	32.9569	13.4751	5.7046	0.9246	0.0995	0.0000	0.0000	0.0000	0.0000	0.6303	9.3102	35.8711 (98)
Space heating efficiency (main heating system 1)	88.9000	88.9000	88.9000	88.9000	88.9000	0.0000	0.0000	0.0000	0.0000	88.9000	88.9000	88.9000 (210)
Space heating fuel (main heating system)	37.0719	15.1576	6.4169	1.0400	0.1119	0.0000	0.0000	0.0000	0.0000	0.7090	10.4726	40.3500 (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	210.7347	186.5894	198.8330	176.3120	171.9081	155.9882	154.7605	160.3157	161.4133	178.6786	188.3708	208.6359 (64)
Efficiency of water heater												80.3000 (216)
(217)m	81.3645	80.8266	80.5172	80.3405	80.3045	80.3000	80.3000	80.3000	80.3000	80.3273	80.6675	81.4560 (217)
Fuel for water heating, kWh/month	259.0009	230.8514	246.9447	219.4558	214.0704	194.2568	192.7279	199.6459	201.0128	222.4382	233.5150	256.1332 (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	17.5405	15.8430	17.5405	16.9747	17.5405	16.9747	17.5405	17.5405	16.9747	17.5405	16.9747	17.5405 (231)
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 (232)
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 (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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												111.3299 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												2670.0530 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7700)												
mechanical ventilation fans (SFP = 0.7700)												120.5250 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												206.5250 (231)
Electricity for lighting (calculated in Appendix L)												131.9833 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)

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Appendix Q - special features

Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3119.8912 (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	111.3299	0.2100	23.3793 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2670.0530	0.2100	560.7111 (264)
Space and water heating			584.0904 (265)
Pumps, fans and electric keep-hot	206.5250	0.1387	28.6476 (267)
Energy for lighting	131.9833	0.1443	19.0493 (268)
Total CO2, kg/year			631.7872 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.3100 (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	111.3299	1.1300	125.8028 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2670.0530	1.1300	3017.1599 (278)
Space and water heating			3142.9627 (279)
Pumps, fans and electric keep-hot	206.5250	1.5128	312.4310 (281)
Energy for lighting	131.9833	1.5338	202.4403 (282)
Total Primary energy kWh/year			3657.8341 (286)
Dwelling Primary energy Rate (DPER)			71.2800 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
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

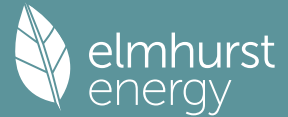
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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)

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)

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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)

	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)
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):												
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	50.9589	46.0274	50.9589	48.8807	48.7339	45.3139	46.0902	47.5222	47.4508	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	222.8773	197.3030	209.8988	184.5700	177.4755	158.2992	155.4766	162.9925	166.0992	186.8664	198.2119	220.4827 (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	198.5522	175.7897	187.3713	165.9164	160.0909	143.4232	141.5327	148.1645	150.7078	168.7217	177.6561	196.6080 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2014.5346 (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	69.9026	61.8060	65.5872	57.3369	54.9900	48.8961	47.8935	50.2744	51.3133	57.9290	61.8370	69.1064 (65)

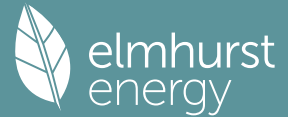
5. Internal gains (see Table 5 and 5a)

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	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 (71)
Water heating gains (Table 5)	93.9551	91.9732	88.1549	79.6345	73.9113	67.9112	64.3730	67.5731	71.2684	77.8615	85.8847	92.8849 (72)
Total internal gains	375.4284	383.4610	367.2519	352.9736	334.0339	317.7124	304.8974	306.5341	316.7984	332.1494	353.3890	367.7106 (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	495.8765	580.7240	618.5300	636.9724	629.9783	602.5186	583.1704	576.7758	579.2881	544.9161	496.1612	471.7889 (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	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	0.9592	0.9127	0.8490	0.7366	0.5958	0.4294	0.3059	0.3224	0.4829	0.7376	0.9122	0.9667 (86)
MIT	20.4192	20.6250	20.7873	20.9219	20.9802	20.9978	20.9998	20.9997	20.9953	20.9331	20.6887	20.3841 (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	0.9505	0.8967	0.8244	0.7012	0.5516	0.3805	0.2547	0.2709	0.4322	0.6962	0.8935	0.9595 (89)
MIT 2	19.5764	19.8264	20.0175	20.1759	20.2352	20.2603	20.2615	20.2635	20.2545	20.1919	19.9176	19.5418 (90)
Living area fraction									fLA = Living area / (4) =			0.3468 (91)
MIT	19.8687	20.1034	20.2845	20.4346	20.4936	20.5161	20.5176	20.5188	20.5114	20.4490	20.1850	19.8339 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8687	20.1034	20.2845	20.4346	20.4936	20.5161	20.5176	20.5188	20.5114	20.4490	20.1850	19.8339 (93)

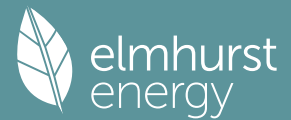
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9457	0.8938	0.8260	0.7102	0.5661	0.3974	0.2724	0.2887	0.4497	0.7075	0.8919	0.9549 (94)
Useful gains	468.9692	519.0269	510.9227	452.3950	356.6398	239.4623	158.8839	166.5430	260.4911	385.5530	442.5037	450.4935 (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	659.9570	642.0528	579.9822	476.8729	362.3456	240.0018	158.9269	166.6046	261.6727	405.8326	542.8042	653.0701 (97)
Space heating kWh	142.0949	82.6734	51.3803	17.6241	4.2451	0.0000	0.0000	0.0000	0.0000	15.0880	72.2164	150.7170 (98a)
Space heating requirement - total per year (kWh/year)												536.0392
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	142.0949	82.6734	51.3803	17.6241	4.2451	0.0000	0.0000	0.0000	0.0000	15.0880	72.2164	150.7170 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												536.0392
Space heating per m2										(98c) / (4) =		10.4450 (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 %)													92.4000 (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	142.0949	82.6734	51.3803	17.6241	4.2451	0.0000	0.0000	0.0000	0.0000	15.0880	72.2164	150.7170 (98)	
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)	
Space heating fuel (main heating system)	153.7824	89.4734	55.6064	19.0737	4.5943	0.0000	0.0000	0.0000	0.0000	16.3290	78.1563	163.1136 (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	198.5522	175.7897	187.3713	165.9164	160.0909	143.4232	141.5327	148.1645	150.7078	168.7217	177.6561	196.6080 (64)	
Efficiency of water heater (217)m	83.6766	82.8641	82.0073	81.0529	80.5012	80.3000	80.3000	80.3000	80.3000	80.9427	82.6096	80.3000 (216)	
Fuel for water heating, kWh/month	237.2853	212.1423	228.4814	204.7013	198.8678	178.6092	176.2549	184.5137	187.6810	208.4458	215.0550	234.5639 (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)	
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													580.1290 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													80.3000
Water heating fuel used													2466.6015 (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)

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Appendix Q - special features

Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	2757.6753 (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	580.1290	0.2100	121.8271 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2466.6015	0.2100	517.9863 (264)
Space and water heating			639.8134 (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			604.9664 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.7900 (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	580.1290	1.1300	655.5457 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2466.6015	1.1300	2787.2597 (278)
Space and water heating			3442.8055 (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			3239.7413 (286)
Target Primary Energy Rate (TPER)			63.1300 (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	84 B	DER	15.15	TER	14.81		
Environmental	89 B	% DER < TER				-2.30	
CO ₂ Emissions (t/year)	0.72	DFEE	30.79	TFEE	30.32		
Compliance Check	See BREL	% DFEE < TFEE				-1.54	
% DPER < TPER	-9.02	DPER	86.56	TPER	79.40		
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

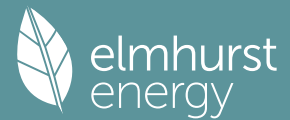
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												1.7290 (42)
Hot water usage for mixer showers												
	66.5116	65.5121	64.0556	61.2688	59.2122	56.9187	55.6151	57.0606	58.6451	61.1076	63.9543	66.2568 (42a)
Hot water usage for baths												
	23.0050	22.6633	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)												112.0478 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	121.8534	119.3363	116.2228	111.3730	107.4763	103.2703	101.5689	104.6680	107.9486	112.3752	117.3031	121.5208 (44)
Energy content (annual)	192.9860	169.9333	178.6301	152.4641	144.6837	126.9829	122.8387	129.6009	133.1115	152.4920	167.1197	190.2722 (45)
Distribution loss (46)m = 0.15 x (45)m												
	28.9479	25.4900	26.7945	22.8696	21.7026	19.0474	18.4258	19.4401	19.9667	22.8738	25.0680	28.5408 (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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
	243.9449	215.9607	229.5890	201.7791	195.6426	176.2980	173.7976	180.5598	182.4265	203.4509	216.4348	241.2311 (62)
WWHRS	-33.2101	-29.3713	-30.7559	-25.4671	-23.7345	-20.3097	-19.0371	-20.2441	-21.0132	-24.7723	-28.0640	-32.5951 (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	210.7347	186.5894	198.8330	176.3120	171.9081	155.9882	154.7605	160.3157	161.4133	178.6786	188.3708	208.6359 (64)
12Total per year (kWh/year)												2152.5404 (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	76.9076	68.0097	72.1342	63.0231	60.8471	54.5506	53.5836	55.8320	56.5883	63.4433	67.8961	76.0052 (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	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 (71)
Water heating gains (Table 5)	103.3704	101.2049	96.9546	87.5320	81.7837	75.7647	72.0210	75.0430	78.5949	85.2733	94.3001	102.1576 (72)
Total internal gains	384.8437	392.6926	376.0516	360.8711	341.9062	325.5659	312.5454	314.0040	324.1248	339.5612	361.8045	376.9833 (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	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	461.3187	517.9390	535.5933	541.1878	529.8074	506.3952	489.2266	485.5860	490.7849	474.6511	452.4535	443.0647 (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	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	0.9220	0.8848	0.8414	0.7633	0.6525	0.4942	0.3605	0.3777	0.5446	0.7536	0.8789	0.9300 (86)	
MIT	19.9256	20.1558	20.3914	20.6634	20.8543	20.9636	20.9917	20.9899	20.9439	20.7260	20.3116	19.8895 (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	0.9118	0.8708	0.8222	0.7354	0.6128	0.4424	0.3017	0.3193	0.4936	0.7205	0.8620	0.9207 (89)	
MIT 2	19.2636	19.4856	19.7113	19.9728	20.1425	20.2395	20.2578	20.2591	20.2213	20.0346	19.6480	19.2361 (90)	
Living area fraction									fLA = Living area / (4) =				0.3468 (91)
MIT	19.4932	19.7180	19.9472	20.2124	20.3894	20.4907	20.5124	20.5126	20.4719	20.2744	19.8781	19.4627 (92)	
Temperature adjustment												-0.1500	
adjusted MIT	19.3432	19.5680	19.7972	20.0624	20.2394	20.3407	20.3624	20.3626	20.3219	20.1244	19.7281	19.3127 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8980	0.8570	0.8101	0.7281	0.6123	0.4481	0.3099	0.3272	0.4981	0.7146	0.8490	0.9074 (94)
Useful gains	414.2590	443.8743	433.8867	394.0377	324.3755	226.9065	151.5886	158.8972	244.4832	339.1748	384.1164	402.0223 (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	636.7663	618.9079	559.2723	461.9491	352.2452	232.9266	152.6573	160.2461	254.1320	392.8786	524.3147	631.5532 (97)
Space heating kWh	165.5454	117.6226	93.2869	48.8963	20.7351	0.0000	0.0000	0.0000	0.0000	39.9556	100.9428	170.7710 (98a)
Space heating requirement - total per year (kWh/year)												757.7556
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	165.5454	117.6226	93.2869	48.8963	20.7351	0.0000	0.0000	0.0000	0.0000	39.9556	100.9428	170.7710 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												757.7556
Space heating per m2										(98c) / (4) =		14.7653 (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 %)												88.9000 (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	165.5454	117.6226	93.2869	48.8963	20.7351	0.0000	0.0000	0.0000	0.0000	39.9556	100.9428	170.7710 (98)
Space heating efficiency (main heating system 1)	88.9000	88.9000	88.9000	88.9000	88.9000	0.0000	0.0000	0.0000	0.0000	88.9000	88.9000	88.9000 (210)
Space heating fuel (main heating system)	186.2153	132.3088	104.9347	55.0014	23.3241	0.0000	0.0000	0.0000	0.0000	44.9444	113.5464	192.0934 (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	210.7347	186.5894	198.8330	176.3120	171.9081	155.9882	154.7605	160.3157	161.4133	178.6786	188.3708	208.6359 (64)
Efficiency of water heater	83.8695	83.4202	82.8598	82.0228	81.1449	80.3000	80.3000	80.3000	80.3000	81.7452	83.1050	80.3000 (216)
Fuel for water heating, kWh/month	251.2651	223.6741	239.9633	214.9550	211.8533	194.2568	192.7279	199.6459	201.0128	218.5801	226.6661	248.5076 (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	17.5405	15.8430	17.5405	16.9747	17.5405	16.9747	17.5405	17.5405	16.9747	17.5405	16.9747	17.5405 (231)
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 (232)
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 (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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												852.3685 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												2623.1079 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7700)												
mechanical ventilation fans (SFP = 0.7700)												120.5250 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												206.5250 (231)
Electricity for lighting (calculated in Appendix L)												131.9833 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)

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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	3813.9847 (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	852.3685	0.2100	178.9974 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2623.1079	0.2100	550.8527 (264)
Space and water heating			729.8501 (265)
Pumps, fans and electric keep-hot	206.5250	0.1387	28.6476 (267)
Energy for lighting	131.9833	0.1443	19.0493 (268)
Total CO2, kg/year			777.5469 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			15.1500 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	852.3685	1.1300	963.1765 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2623.1079	1.1300	2964.1119 (278)
Space and water heating			3927.2884 (279)
Pumps, fans and electric keep-hot	206.5250	1.5128	312.4310 (281)
Energy for lighting	131.9833	1.5338	202.4403 (282)
Total Primary energy kWh/year			4442.1597 (286)
Dwelling Primary energy Rate (DPER)			86.5600 (287)

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

1. Overall dwelling characteristics

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

2. Ventilation rate

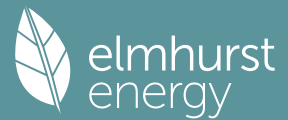
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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)

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)

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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 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
HLP (average) 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)
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)
Daily hot water use Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Energy conte 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 content (annual) 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)
Distribution loss (46)m = 0.15 x (45)m Total = Sum(45)m = 1657.3831
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):
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 50.9589 46.0274 50.9589 48.8807 48.7339 45.3139 46.0902 47.5222 47.4508 50.9589 49.3151 50.9589 (61)
Total heat required for water heating calculated for each month
222.8773 197.3030 209.8988 184.5700 177.4755 158.2992 155.4766 162.9925 166.0992 186.8664 198.2119 220.4827 (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 198.5522 175.7897 187.3713 165.9164 160.0909 143.4232 141.5327 148.1645 150.7078 168.7217 177.6561 196.6080 (64)
Total per year (kWh/year) = Sum(64)m = 2014.5346 (64)
2015 (64)
12Total per year (kWh/year)
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 69.9026 61.8060 65.5872 57.3369 54.9900 48.8961 47.8935 50.2744 51.3133 57.9290 61.8370 69.1064 (65)

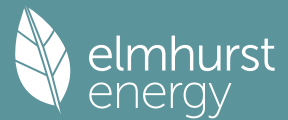
5. Internal gains (see Table 5 and 5a)

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) 93.9551 91.9732 88.1549 79.6345 73.9113 67.9112 64.3730 67.5731 71.2684 77.8615 85.8847 92.8849 (72)
Total internal gains 375.4284 383.4610 367.2519 352.9736 334.0339 317.7124 304.8974 306.5341 316.7984 332.1494 353.3890 367.7106 (73)

6. Solar gains

[Jan] Area Solar flux g FF Access Gains
m2 Table 6a Specific data Specific data Access factor W
or Table 6b or Table 6c Table 6d
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)

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Total gains 495.8765 580.7240 618.5300 636.9724 629.9783 602.5186 583.1704 576.7758 579.2881 544.9161 496.1612 471.7889 (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	0.9301	0.8917	0.8474	0.7746	0.6727	0.5267	0.3922	0.4116	0.5774	0.7757	0.8927	0.9381 (86)
MIT	19.3581	19.6821	20.0232	20.4107	20.7087	20.9046	20.9720	20.9666	20.8643	20.4932	19.8790	19.3034 (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	0.9196	0.8765	0.8260	0.7427	0.6255	0.4602	0.3121	0.3322	0.5135	0.7383	0.8750	0.9287 (89)
MIT 2	18.1311	18.5318	18.9510	19.4226	19.7635	19.9731	20.0292	20.0273	19.9330	19.5294	18.7915	18.0698 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.5567	18.9308	19.3229	19.7653	20.0913	20.2962	20.3562	20.3531	20.2560	19.8637	19.1687	18.4977 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.5567	18.9308	19.3229	19.7653	20.0913	20.2962	20.3562	20.3531	20.2560	19.8637	19.1687	18.4977 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9002	0.8565	0.8086	0.7332	0.6285	0.4784	0.3388	0.3584	0.5285	0.7311	0.8564	0.9101 (94)
Useful gains	446.3716	497.4188	500.1371	466.9969	395.9226	288.2296	197.6022	206.7125	306.1551	398.3855	424.8916	429.3792 (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	792.6708	777.8799	708.9143	592.7322	456.6214	306.3296	201.9996	212.1205	332.5678	504.0901	660.0701	786.1245 (97)
Space heating kWh	257.6466	188.4699	155.3302	90.5294	45.1599	0.0000	0.0000	0.0000	0.0000	78.6443	169.3285	265.4185 (98a)
Space heating requirement - total per year (kWh/year)	1250.5274											
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	257.6466	188.4699	155.3302	90.5294	45.1599	0.0000	0.0000	0.0000	0.0000	78.6443	169.3285	265.4185 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1250.5274											
Space heating per m2	(98c) / (4) = 24.3673 (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 %)												92.4000 (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	257.6466	188.4699	155.3302	90.5294	45.1599	0.0000	0.0000	0.0000	0.0000	78.6443	169.3285	265.4185 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	278.8383	203.9717	168.1063	97.9756	48.8743	0.0000	0.0000	0.0000	0.0000	85.1128	183.2560	287.2495 (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	198.5522	175.7897	187.3713	165.9164	160.0909	143.4232	141.5327	148.1645	150.7078	168.7217	177.6561	196.6080 (64)
Efficiency of water heater	84.9407	84.5310	83.9823	83.1392	82.0463	80.3000	80.3000	80.3000	80.3000	82.8480	84.2786	80.3000 (216)
Fuel for water heating, kWh/month	233.7539	207.9589	223.1080	199.5645	195.1226	178.6092	176.2549	184.5137	187.6810	203.6521	210.7962	231.2354 (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)
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	1353.3846 (211)											
Space heating fuel - main system 2	0.0000 (213)											
Space heating fuel - secondary	0.0000 (215)											
Efficiency of water heater	80.3000											
Water heating fuel used	2432.2503 (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)											

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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	3496.5797 (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	1353.3846	0.2100	284.2108 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2432.2503	0.2100	510.7726 (264)
Space and water heating			794.9833 (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			760.1363 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.8100 (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	1353.3846	1.1300	1529.3246 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2432.2503	1.1300	2748.4428 (278)
Space and water heating			4277.7674 (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			4074.7033 (286)
Target Primary Energy Rate (TPER)			79.4000 (287)