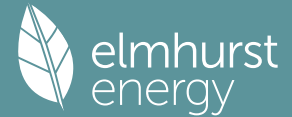


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E4 Jamb	41.2000	0.0400	1.6480
E7 Party floor between dwellings (in blocks of flats)	38.7000	0.0500	1.9350
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	0.4500	1.0000	0.4500
E16 Corner (normal)	5.3000	0.0900	0.4770
E17 Corner (inverted - internal area greater than external area)	2.6500	-0.0900	-0.2385
E18 Party wall between dwellings	7.9500	0.0600	0.4770
E25 Staggered party wall between dwellings	2.6500	0.1200	0.3180
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.7942 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 31.4569 (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	16.1109	15.9149	15.7190	14.7392	14.5432	13.5634	13.5634	13.3675	13.9554	14.5432	14.9352	15.3271 (38)
Average = Sum(39)m / 12 =	47.5678	47.3718	47.1759	46.1961	46.0001	45.0203	45.0203	44.8244	45.4122	46.0001	46.3920	46.7839 (39)
												46.1471

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.6766	0.6739	0.6711	0.6571	0.6543	0.6404	0.6404	0.6376	0.6460	0.6543	0.6599	0.6655 (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 2.2534 (42)

Hot water usage for mixer showers

62.0015	61.0698	59.7120	57.1142	55.1970	53.0591	51.8438	53.1913	54.6684	56.9640	59.6176	61.7640 (42a)
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Hot water usage for baths

26.7859	26.3881	25.8279	24.7950	24.0216	23.1640	22.7007	23.2570	23.8627	24.7804	25.8345	26.6954 (42b)
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Hot water usage for other uses

37.7069	36.3358	34.9646	33.5934	32.2223	30.8511	30.8511	32.2223	33.5934	34.9646	36.3358	37.7069 (42c)
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Average daily hot water use (litres/day) 116.2771 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	126.4944	123.7936	120.5045	115.5026	111.4409	107.0742	105.3957	108.6706	112.1246	116.7089	121.7879	126.1663 (44)
Energy content (annual)	200.3362	176.2805	185.2109	158.1173	150.0209	131.6602	127.4670	134.5569	138.2608	158.3729	173.5092	197.5459 (45)
Distribution loss (46)m = 0.15 x (45)m	30.0504	26.4421	27.7816	23.7176	22.5031	19.7490	19.1200	20.1835	20.7391	23.7559	26.0264	29.6319 (46)
Water storage loss:												210.0000 (47)
Store volume												1.2300 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.6642 (55)
Enter (49) or (54) in (55)												
Total storage loss	20.5902	18.5976	20.5902	19.9260	20.5902	19.9260	20.5902	20.5902	19.9260	20.5902	19.9260	20.5902 (56)
If cylinder contains dedicated solar storage	20.5902	18.5976	20.5902	19.9260	20.5902	19.9260	20.5902	20.5902	19.9260	20.5902	19.9260	20.5902 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	244.1888	215.8893	229.0635	200.5553	193.8735	174.0982	171.3196	178.4095	180.6988	202.2255	215.9472	241.3985 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	244.1888	215.8893	229.0635	200.5553	193.8735	174.0982	171.3196	178.4095	180.6988	202.2255	215.9472	241.3985 (64)
Total per year (kWh/year) = Sum(64)m =												2447.6676 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	101.6939	90.3003	96.6647	86.5244	84.9640	77.7274	77.4648	79.8223	79.9221	87.7411	91.6422	100.7661 (65)

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

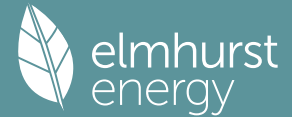
Metabolic gains (Table 5), Watts

(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	99.8767	110.5777	99.8767	103.2059	99.8767	103.2059	99.8767	99.8767	103.2059	99.8767	103.2059	99.8767 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.9962	200.0508	194.8733	183.8511	169.9375	156.8607	148.1246	146.0700	151.2475	162.2697	176.1833	189.2601 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669 (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)	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354 (71)
Water heating gains (Table 5)	136.6853	134.3754	129.9257	120.1728	114.1990	107.9547	104.1194	107.2880	111.0029	117.9316	127.2808	135.4383 (72)
Total internal gains	494.3590	504.8048	484.4765	467.0306	443.8139	424.8221	408.9214	410.0354	422.2571	439.8787	466.4708	484.3759 (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	4.5900	10.6334	0.4000	0.8000	0.7700	10.8235 (74)						
Northeast	6.0000	11.2829	0.4000	0.8000	0.7700	15.0126 (75)						
East	3.0600	19.6403	0.4000	0.8000	0.7700	13.3276 (76)						
Solar gains	39.1637	77.3145	133.1408	209.4954	274.3359	289.5515	272.0198	221.1857	159.2832	92.9032	48.8599	32.2430 (83)
Total gains	533.5227	582.1193	617.6173	676.5259	718.1498	714.3736	680.9413	631.2212	581.5403	532.7819	515.3307	516.6189 (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	41.1687	41.3390	41.5108	42.3912	42.5718	43.4983	43.4983	43.6884	43.1229	42.5718	42.2121	41.8585
alpha	3.7446	3.7559	3.7674	3.8261	3.8381	3.8999	3.8999	3.9126	3.8749	3.8381	3.8141	3.7906
util living area	0.9129	0.8814	0.8286	0.7113	0.5598	0.3963	0.2892	0.3239	0.5150	0.7486	0.8706	0.9194 (86)
MIT	19.9357	20.1346	20.4020	20.7286	20.9099	20.9823	20.9960	20.9938	20.9515	20.7219	20.3159	19.9180 (87)
Th 2	20.3615	20.3640	20.3665	20.3789	20.3813	20.3938	20.3938	20.3963	20.3888	20.3813	20.3764	20.3714 (88)
util rest of house	0.9039	0.8697	0.8123	0.6873	0.5285	0.3605	0.2500	0.2823	0.4747	0.7216	0.8564	0.9110 (89)
MIT 2	19.1095	19.3574	19.6875	20.0864	20.2926	20.3790	20.3911	20.3921	20.3459	20.0877	19.5952	19.0951 (90)
Living area fraction									FLA = Living area / (4) =			
MIT	19.6113	19.8295	20.1215	20.4765	20.6675	20.7454	20.7585	20.7576	20.7137	20.4729	20.0330	19.5949 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.4613	19.6795	19.9715	20.3265	20.5175	20.5954	20.6085	20.6076	20.5637	20.3229	19.8830	19.4449 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8893	0.8558	0.8014	0.6852	0.5355	0.3725	0.2639	0.2969	0.4864	0.7189	0.8439	0.8968 (94)
Useful gains	474.4855	498.1764	494.9492	463.5558	384.5781	266.1106	179.7166	187.4274	282.8722	383.0304	434.9090	463.3018 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	721.1903	700.1301	635.5281	527.8578	405.6063	269.9157	180.4651	188.6020	293.5312	447.2553	593.0282	713.2177 (97)
Space heating kWh	183.5484	135.7129	104.5906	46.2974	15.6450	0.0000	0.0000	0.0000	0.0000	47.7833	113.8458	185.9374 (98a)
Space heating requirement - total per year (kWh/year)												833.3609
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	183.5484	135.7129	104.5906	46.2974	15.6450	0.0000	0.0000	0.0000	0.0000	47.7833	113.8458	185.9374 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												833.3609
Space heating per m2										(98c) / (4) =		11.8544 (99)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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 %)												88.7000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	183.5484	135.7129	104.5906	46.2974	15.6450	0.0000	0.0000	0.0000	0.0000	47.7833	113.8458	185.9374 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	206.9317	153.0021	117.9151	52.1955	17.6381	0.0000	0.0000	0.0000	0.0000	53.8707	128.3493	209.6250 (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	244.1888	215.8893	229.0635	200.5553	193.8735	174.0982	171.3196	178.4095	180.6988	202.2255	215.9472	241.3985 (64)
Efficiency of water heater (217)m	83.3281	82.9486	82.3183	81.2461	80.3085	79.7000	79.7000	79.7000	79.7000	81.2762	82.5929	79.7000 (216)
Fuel for water heating, kWh/month	293.0448	260.2687	278.2658	246.8491	241.4110	218.4419	214.9555	223.8514	226.7237	248.8128	261.4597	289.5120 (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	19.8319	17.9127	19.8319	19.1922	19.8319	19.1922	19.8319	19.8319	19.1922	19.8319	19.1922	19.8319 (231)
Lighting	21.4327	17.1941	15.4814	11.3423	8.7611	7.1579	7.9922	10.3886	13.4937	17.7045	19.9972	22.0284 (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												939.5275 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.7000
Water heating fuel used												3003.5964 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6490)												
mechanical ventilation fans (SFP = 0.6490)												147.5047 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												233.5047 (231)

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Electricity for lighting (calculated in Appendix L)	172.9741 (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	4349.6026 (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	939.5275	0.2100	197.3008 (261)
Total CO2 associated with community systems			0.0000 (273)
Water heating (other fuel)	3003.5964	0.2100	630.7552 (264)
Space and water heating			828.0560 (265)
Pumps, fans and electric keep-hot	233.5047	0.1387	32.3900 (267)
Energy for lighting	172.9741	0.1443	24.9655 (268)
Total CO2, kg/year			885.4115 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.5900 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	939.5275	1.1300	1061.6661 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3003.5964	1.1300	3394.0639 (278)
Space and water heating			4455.7300 (279)
Pumps, fans and electric keep-hot	233.5047	1.5128	353.2458 (281)
Energy for lighting	172.9741	1.5338	265.3134 (282)
Total Primary energy kWh/year			5074.2893 (286)
Dwelling Primary energy Rate (DPER)			72.1800 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	70.3000 (1b)	x 2.6500 (2b)	= 186.2950 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 186.2950 (5)

2. Ventilation rate

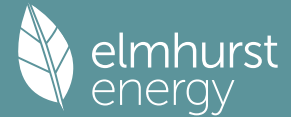
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.1610 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4110 (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) = 0.3494 (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 infltr rate	0.4455	0.4367	0.4280	0.3843	0.3756	0.3319	0.3319	0.3232	0.3494	0.3756	0.3931	0.4105 (22b)
Effective ac	0.5992	0.5954	0.5916	0.5739	0.5705	0.5551	0.5551	0.5522	0.5610	0.5705	0.5772	0.5843 (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
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TER Opaque door			1.8900	1.0000	1.8900							(26)
TER Opening Type (Uw = 1.20)			13.6500	1.1450	15.6298							(27)
External Wall 1	44.0000		13.6500	30.3500	0.1800	5.4630						(29a)
Corridor Wall 2	13.2500		1.8900	11.3600	0.1800	2.0448						(29a)
Total net area of external elements Aum(A, m ²)				57.2500								(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	25.0276							(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 110.2831 (35)

List of Thermal Bridges												
K1 Element												
E2 Other lintels (including other steel lintels)						Length	Psi-value	Total				
E3 Sill						9.5300	0.0500	0.4765				
E4 Jamb						8.6300	0.0500	0.4315				
E7 Party floor between dwellings (in blocks of flats)						41.2000	0.0500	2.0600				
E23 Balcony within or between dwellings, balcony support penetrates wall insulation						38.7000	0.0700	2.7090				
E16 Corner (normal)						0.4500	0.0200	0.0090				
E17 Corner (inverted - internal area greater than external area)						5.3000	0.0900	0.4770				
E18 Party wall between dwellings						2.6500	-0.0900	-0.2385				
E25 Staggered party wall between dwellings						7.9500	0.0600	0.4770				
						2.6500	0.0600	0.1590				

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5605 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 31.5881 (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
	36.8383	36.6014	36.3692	35.2788	35.0748	34.1250	34.1250	33.9491	34.4908	35.0748	35.4875	35.9190
Heat transfer coeff												
	68.4263	68.1895	67.9573	66.8668	66.6628	65.7131	65.7131	65.5372	66.0789	66.6628	67.0756	67.5071
Average = Sum(39)m / 12 =												66.8659

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9733	0.9700	0.9667	0.9512	0.9483	0.9348	0.9348	0.9323	0.9400	0.9483	0.9541	0.9603
HLP (average)												0.9512
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

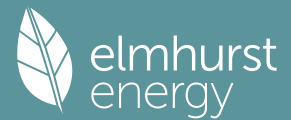
Assumed occupancy												2.2534 (42)
Hot water usage for mixer showers												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	62.0015	61.0698	59.7120	57.1142	55.1970	53.0591	51.8438	53.1913	54.6684	56.9640	59.6176	61.7640
Hot water usage for baths												
	26.7859	26.3881	25.8279	24.7950	24.0216	23.1640	22.7007	23.2570	23.8627	24.7804	25.8345	26.6954
Hot water usage for other uses												
	37.7069	36.3358	34.9646	33.5934	32.2223	30.8511	30.8511	32.2223	33.5934	34.9646	36.3358	37.7069
Average daily hot water use (litres/day)												116.2771
Daily hot water use												
	126.4944	123.7936	120.5045	115.5026	111.4409	107.0742	105.3957	108.6706	112.1246	116.7089	121.7879	126.1663
Energy conte	200.3362	176.2805	185.2109	158.1173	150.0209	131.6602	127.4670	134.5569	138.2608	158.3729	173.5092	197.5459
Energy content (annual)										Total = Sum(45)m =		1931.3386
Distribution loss (46)m = 0.15 x (45)m												
	30.0504	26.4421	27.7816	23.7176	22.5031	19.7490	19.1200	20.1835	20.7391	23.7559	26.0264	29.6319
Water storage loss:												
Store volume												210.0000
a) If manufacturer declared loss factor is known (kWh/day):												1.7016
Temperature factor from Table 2b												0.5400
Enter (49) or (54) in (55)												0.9188
Total storage loss												
	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842
If cylinder contains dedicated solar storage												
	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624
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
Total heat required for water heating calculated for each month												
	252.0827	223.0193	236.9575	208.1947	201.7675	181.7375	179.2136	186.3035	188.3382	210.1195	223.5865	249.2925
WWHRS	-28.3445	-25.0681	-26.2499	-21.7359	-20.2571	-17.3342	-16.2480	-17.2781	-17.9346	-21.1429	-23.9523	-27.8196
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
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Output from w/h	223.7382	197.9512	210.7077	186.4587	181.5103	164.4034	162.9655	169.0254	170.4036	188.9766	199.6342	221.4728
12Total per year (kWh/year)												
												2277.2477
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
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000
Heat gains from water heating, kWh/month												
	108.0090	96.0043	102.9799	92.6359	91.2792	83.8389	83.7800	86.1375	86.0336	94.0563	97.7537	107.0813

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
	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	100.9081	111.7197	100.9081	104.2717	100.9081	104.2717	100.9081	100.9081	104.2717	100.9081	104.2717	100.9081
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	197.9962	200.0508	194.8733	183.8511	169.9375	156.8607	148.1246	146.0700	151.2475	162.2697	176.1833	189.2601
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000
Losses e.g. evaporation (negative values) (Table 5)												
	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354	-90.1354
Water heating gains (Table 5)												
	145.1734	142.8636	138.4139	128.6609	122.6871	116.4429	112.6076	115.7761	119.4911	126.4197	135.7690	143.9264
Total internal gains	503.8786	514.4349	493.9961	476.5845	453.3335	434.3761	418.4410	419.5550	431.8111	449.3983	476.0248	493.8954

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				4.5900	10.6334	0.6300	0.7000	0.7700	14.9161 (74)
Northeast				6.0000	11.2829	0.6300	0.7000	0.7700	20.6893 (75)
East				3.0600	19.6403	0.6300	0.7000	0.7700	18.3671 (76)

Solar gains	53.9725	106.5491	183.4847	288.7108	378.0692	399.0382	374.8773	304.8216	219.5122	128.0322	67.3351	44.4349 (83)
Total gains	557.8511	620.9840	677.4808	765.2953	831.4027	833.4143	793.3183	724.3766	651.3232	577.4305	543.3598	538.3304 (84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	31.4730	31.5823	31.6902	32.2070	32.3056	32.7725	32.7725	32.8605	32.5911	32.3056	32.1068	31.9016
alpha	3.0982	3.1055	3.1127	3.1471	3.1537	3.1848	3.1848	3.1907	3.1727	3.1537	3.1405	3.1268
util living area	0.9414	0.9181	0.8761	0.7795	0.6390	0.4746	0.3550	0.4010	0.6125	0.8236	0.9143	0.9464 (86)
MIT	19.2098	19.4684	19.8615	20.3792	20.7406	20.9265	20.9780	20.9676	20.8329	20.3633	19.7289	19.1810 (87)
Th 2	20.1056	20.1084	20.1112	20.1242	20.1267	20.1381	20.1381	20.1402	20.1337	20.1267	20.1217	20.1166 (88)
util rest of house	0.9333	0.9071	0.8594	0.7514	0.5965	0.4185	0.2889	0.3313	0.5547	0.7941	0.9010	0.9390 (89)
MIT 2	18.0193	18.3440	18.8334	19.4665	19.8797	20.0811	20.1256	20.1207	19.9929	19.4642	18.6843	17.9904 (90)
Living area fraction	18.7424	19.0270	19.4579	20.0209	20.4026	20.5946	20.6433	20.6351	20.5031	20.0103	19.3188	18.7136 (91)
MIT	18.7424	19.0270	19.4579	20.0209	20.4026	20.5946	20.6433	20.6351	20.5031	20.0103	19.3188	18.7136 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7424	19.0270	19.4579	20.0209	20.4026	20.5946	20.6433	20.6351	20.5031	20.0103	19.3188	18.7136 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9181	0.8912	0.8455	0.7479	0.6104	0.4487	0.3280	0.3719	0.5802	0.7897	0.8866	0.9243 (94)
Useful gains	512.1502	553.4025	572.7802	572.3314	507.4772	373.9557	260.2191	269.3891	377.9164	456.0076	481.7570	497.5989 (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	988.2401	963.3101	880.5808	743.6175	580.1391	393.9215	265.6990	277.5568	423.1096	627.3163	819.5817	979.7695 (97)
Space heating kWh	354.2109	275.4579	229.0037	123.3260	54.0604	0.0000	0.0000	0.0000	0.0000	127.4536	243.2337	358.7349 (98a)
Space heating requirement - total per year (kWh/year)												1765.4812
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	354.2109	275.4579	229.0037	123.3260	54.0604	0.0000	0.0000	0.0000	0.0000	127.4536	243.2337	358.7349 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1765.4812
Space heating per m2												25.1135 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 92.3000 (206)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	354.2109	275.4579	229.0037	123.3260	54.0604	0.0000	0.0000	0.0000	0.0000	127.4536	243.2337	358.7349 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	383.7605	298.4376	248.1080	133.6143	58.5703	0.0000	0.0000	0.0000	0.0000	138.0863	263.5252	388.6619 (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	223.7382	197.9512	210.7077	186.4587	181.5103	164.4034	162.9655	169.0254	170.4036	188.9766	199.6342	221.4728 (64)
Efficiency of water heater (217)m	85.0851	84.8009	84.2469	83.1552	81.7003	79.8000	79.8000	79.8000	79.8000	83.1963	84.5039	85.1349 (217)
Fuel for water heating, kWh/month	262.9581	233.4306	250.1073	224.2299	222.1662	206.0192	204.2175	211.8113	213.5383	227.1454	236.2426	260.1434 (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	20.9667	16.8203	15.1448	11.0957	8.5707	7.0023	7.8184	10.1627	13.2003	17.3196	19.5624	21.5494 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-7.1799	-11.1714	-17.7001	-22.0027	-25.6524	-24.6659	-24.3681	-22.0254	-18.2834	-13.6402	-8.2568	-6.0915 (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	-1.3979	-3.0705	-6.3565	-9.9371	-13.5360	-13.7491	-13.5874	-11.3189	-8.0591	-4.5129	-1.9037	-1.0960 (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												1912.7640 (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	79.8000	
Water heating fuel used	2752.0097	(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)	169.2134	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-289.5628	(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	4630.4243	(238)

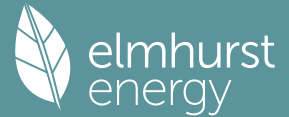
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1912.7640	0.2100	401.6804 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2752.0097	0.2100	577.9220 (264)
Space and water heating			979.6025 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	169.2134	0.1443	24.4227 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-201.0377	0.1326	-26.6553
PV Unit electricity exported	-88.5251	0.1247	-11.0433
Total			-37.6986 (269)
Total CO2, kg/year			978.2559 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.9200 (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	1912.7640	1.1300	2161.4234 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2752.0097	1.1300	3109.7710 (278)
Space and water heating			5271.1943 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	169.2134	1.5338	259.5451 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-201.0377	1.4899	-299.5280
PV Unit electricity exported	-88.5251	0.4579	-40.5315
Total			-340.0594 (283)
Total Primary energy kWh/year			5320.7808 (286)
Target Primary Energy Rate (TPER)			75.6900 (287)

Full SAP Calculation Printout



Property Reference	Unit 2		Issued on Date	25/01/2024	
Assessment Reference	Be Lean_Copy_Copy	Prop Type Ref	Unit 2		
Property					
SAP Rating	87 B	DER	9.69	TER	11.23
Environmental	92 A	% DER < TER			13.71
CO ₂ Emissions (t/year)	0.82	DFEE	23.96	TFEE	24.63
Compliance Check	See BREL	% DFEE < TFEE			2.70
% DPER < TPER	8.05	DPER	56.13	TPER	61.05
Assessor Details	Dr. Alan Harries			Assessor ID	BC24-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	91.2000	2.6500	241.6800
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.2000		241.6800
Dwelling volume			241.6800

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		3 (19)

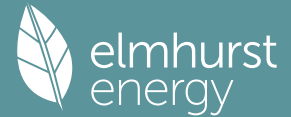
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												81.0000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2432	0.2403	0.2374	0.2229	0.2200	0.2054	0.2054	0.2025	0.2112	0.2200	0.2258	0.2316 (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
Window (Uw = 1.20)			12.1200	1.1450	13.8779		(27)
Door			1.8900	1.0000	1.8900		(26)
External Wall 1	35.8000	12.1200	23.6800	0.1500	3.5520	14.0000	331.5200 (29a)
Corridor Wall 2	29.1500	1.8900	27.2600	0.1400	3.8164	150.0000	4089.0000 (29a)
Total net area of external elements Aum(A, m ²)			64.9500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	23.1363	(33)
Party Floor 1			91.2000			40.0000	3648.0000 (32a)
Party Ceiling 1			91.2000			30.0000	2736.0000 (32b)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	10804.5200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							118.4706 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)				44.1000	0.0500	2.2050	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation				0.4900	1.0000	0.4900	

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E17 Corner (inverted - internal area greater than external area)	0.0000	0.0000	0.0000
E18 Party wall between dwellings	10.6000	0.0600	0.6360
E2 Other lintels (including other steel lintels)	6.9000	0.2500	1.7250
E3 Sill	6.0000	0.0400	0.2400
E4 Jamb	27.8000	0.0400	1.1120
E10 Eaves (insulation at ceiling level)	0.0000	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.4080 (36)
Point Thermal bridges			0.0000
Total fabric heat loss	(33) + (36) + (36a) =		29.5443 (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	19.3978	19.1660	18.9342	17.7753	17.5435	16.3845	16.3845	16.1528	16.8481	17.5435	18.0070	18.4706 (38)
Average = Sum(39)m / 12 =	48.9420	48.7102	48.4785	47.3195	47.0877	45.9288	45.9288	45.6970	46.3924	47.0877	47.5513	48.0149 (39)
HLP	0.5366	0.5341	0.5316	0.5189	0.5163	0.5036	0.5036	0.5011	0.5087	0.5163	0.5214	0.5265 (40)
HLP (average)												0.5182
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6418 (42)
Hot water usage for mixer showers	68.5139	67.4843	65.9839	63.1132	60.9947	58.6322	57.2893	58.7783	60.4106	62.9472	65.8796	68.2514 (42a)
Hot water usage for baths	29.5865	29.1471	28.5283	27.3874	26.5331	25.5858	25.0742	25.6886	26.3576	27.3712	28.5356	29.4864 (42b)
Hot water usage for other uses	41.6846	40.1688	38.6530	37.1372	35.6214	34.1056	34.1056	35.6214	37.1372	38.6530	40.1688	41.6846 (42c)
Average daily hot water use (litres/day)												128.4939 (43)
Daily hot water use	139.7850	136.8001	133.1652	127.6378	123.1492	118.3236	116.4691	120.0883	123.9054	128.9714	134.5840	139.4224 (44)
Energy content (annual)	221.3852	194.8016	204.6699	174.7298	165.7825	145.4927	140.8592	148.6944	152.7877	175.0130	191.7396	218.3018 (45)
Distribution loss (46)m = 0.15 x (45)m	33.2078	29.2202	30.7005	26.2095	24.8674	21.8239	21.1289	22.3042	22.9182	26.2520	28.7609	32.7453 (46)
Water storage loss:												210.0000 (47)
Store volume												1.2300 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.6642 (55)
Enter (49) or (54) in (55)												
Total storage loss	20.5902	18.5976	20.5902	19.9260	20.5902	19.9260	20.5902	20.5902	19.9260	20.5902	19.9260	20.5902 (56)
If cylinder contains dedicated solar storage	20.5902	18.5976	20.5902	19.9260	20.5902	19.9260	20.5902	20.5902	19.9260	20.5902	19.9260	20.5902 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	265.2378	234.4104	248.5225	217.1678	209.6351	187.9307	184.7118	192.5470	195.2257	218.8656	234.1776	262.1544 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	265.2378	234.4104	248.5225	217.1678	209.6351	187.9307	184.7118	192.5470	195.2257	218.8656	234.1776	262.1544 (64)
Total per year (kWh/year)												2650.5864 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	108.6927	96.4586	103.1348	92.0480	90.2048	82.3267	81.9178	84.5230	84.7523	93.2739	97.7038	107.6674 (65)

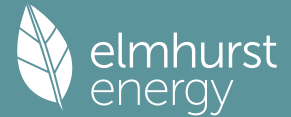
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	132.0896	132.0896	132.0896	132.0896	132.0896	132.0896	132.0896	132.0896	132.0896	132.0896	132.0896	132.0896 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	128.3065	142.0537	128.3065	132.5834	128.3065	132.5834	128.3065	128.3065	132.5834	128.3065	132.5834	128.3065 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	241.2682	243.7718	237.4628	224.0316	207.0772	191.1425	180.4971	177.9935	184.3025	197.7336	214.6880	230.6228 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.2090	36.2090	36.2090	36.2090	36.2090	36.2090	36.2090	36.2090	36.2090	36.2090	36.2090	36.2090 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-105.6717	-105.6717	-105.6717	-105.6717	-105.6717	-105.6717	-105.6717	-105.6717	-105.6717	-105.6717	-105.6717	-105.6717 (71)
Water heating gains (Table 5)	146.0923	143.5395	138.6221	127.8445	121.2430	114.3426	110.1045	113.6061	117.7115	125.3682	135.6997	144.7143 (72)
Total internal gains	581.2939	594.9919	570.0183	550.0864	522.2536	500.6954	481.5350	482.5330	497.2243	517.0352	548.5981	569.2705 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W						
East	6.1200	19.6403	0.4000	0.8000	0.7700	26.6552 (76)						
Southeast	6.0000	36.7938	0.4000	0.8000	0.7700	48.9564 (77)						
Solar gains	75.6116	135.5341	199.9715	266.6141	311.8371	314.3262	301.1482	267.3891	223.4183	154.0370	91.8744	63.8164 (83)
Total gains	656.9055	730.5259	769.9898	816.7005	834.0907	815.0216	782.6832	749.9222	720.6427	671.0722	640.4724	633.0869 (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	61.3227	61.6145	61.9091	63.4253	63.7375	65.3458	65.3458	65.6773	64.6929	63.7375	63.1161	62.5068	
alpha	5.0882	5.1076	5.1273	5.2284	5.2492	5.3564	5.3564	5.3785	5.3129	5.2492	5.2077	5.1671	
util living area	0.9122	0.8644	0.7964	0.6643	0.5164	0.3597	0.2581	0.2801	0.4409	0.6859	0.8518	0.9207	(86)
MIT	20.4573	20.6196	20.7764	20.9248	20.9820	20.9980	20.9997	20.9996	20.9940	20.9262	20.7112	20.4409	(87)
Th 2	20.4874	20.4897	20.4920	20.5036	20.5059	20.5175	20.5175	20.5199	20.5129	20.5059	20.5013	20.4966	(88)
util rest of house	0.9032	0.8520	0.7796	0.6421	0.4907	0.3328	0.2298	0.2509	0.4106	0.6601	0.8368	0.9124	(89)
MIT 2	19.8522	20.0520	20.2422	20.4243	20.4886	20.5159	20.5174	20.5196	20.5077	20.4303	20.1759	19.8399	(90)
Living area fraction									FLA = Living area / (4) =				0.7105 (91)
MIT	20.2822	20.4553	20.6218	20.7799	20.8391	20.8584	20.8601	20.8606	20.8532	20.7826	20.5562	20.2670	(92)
Temperature adjustment												-0.1500	
adjusted MIT	20.1322	20.3053	20.4718	20.6299	20.6891	20.7084	20.7101	20.7106	20.7032	20.6326	20.4062	20.1170	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8964	0.8473	0.7789	0.6479	0.5003	0.3435	0.2411	0.2625	0.4225	0.6668	0.8338	0.9056	(94)
Useful gains	588.8427	618.9606	599.7116	529.1056	417.2657	279.9444	188.7015	196.8740	304.4595	447.4801	534.0032	573.2973	(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	774.8576	750.3936	677.3296	555.0544	423.2778	280.5531	188.7719	196.9836	306.3386	472.4143	632.7277	764.2515	(97)
Space heating kWh	138.3951	88.3229	57.7478	18.6831	4.4730	0.0000	0.0000	0.0000	0.0000	18.5510	71.0816	142.0699	(98a)
Space heating requirement - total per year (kWh/year)												539.3244	
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	138.3951	88.3229	57.7478	18.6831	4.4730	0.0000	0.0000	0.0000	0.0000	18.5510	71.0816	142.0699	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												539.3244	
Space heating per m2										(98c) / (4) =		5.9136	(99)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 %)													88.7000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	138.3951	88.3229	57.7478	18.6831	4.4730	0.0000	0.0000	0.0000	0.0000	18.5510	71.0816	142.0699	(98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000	(210)
Space heating fuel (main heating system)	156.0260	99.5749	65.1047	21.0632	5.0428	0.0000	0.0000	0.0000	0.0000	20.9143	80.1371	160.1690	(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	265.2378	234.4104	248.5225	217.1678	209.6351	187.9307	184.7118	192.5470	195.2257	218.8656	234.1776	262.1544	(64)
Efficiency of water heater (217)m	82.5727	81.9763	81.2545	80.3458	79.8693	79.7000	79.7000	79.7000	79.7000	80.3369	81.6286	82.6473	(216)
Fuel for water heating, kWh/month	321.2173	285.9488	305.8569	270.2914	262.4727	235.7976	231.7589	241.5897	244.9507	272.4346	286.8816	317.1965	(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	21.9036	19.7839	21.9036	21.1970	21.9036	21.1970	21.9036	21.9036	21.1970	21.9036	21.1970	21.9036	(231)
Lighting	27.4593	22.0289	19.8345	14.5316	11.2247	9.1706	10.2395	13.3097	17.2880	22.6828	25.6201	28.2225	(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													608.0320 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													79.7000
Water heating fuel used													3276.3967 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.5830)													
mechanical ventilation fans (SFP = 0.5830)													171.8973 (230a)
central heating pump													41.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													257.8973 (231)
Electricity for lighting (calculated in Appendix L)													221.6122 (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	4363.9383 (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	608.0320	0.2100	127.6867 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3276.3967	0.2100	688.0433 (264)
Space and water heating			815.7300 (265)
Pumps, fans and electric keep-hot	257.8973	0.1387	35.7735 (267)
Energy for lighting	221.6122	0.1443	31.9855 (268)
Total CO2, kg/year			883.4891 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			9.6900 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	608.0320	1.1300	687.0762 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3276.3967	1.1300	3702.3283 (278)
Space and water heating			4389.4045 (279)
Pumps, fans and electric keep-hot	257.8973	1.5128	390.1471 (281)
Energy for lighting	221.6122	1.5338	339.9162 (282)
Total Primary energy kWh/year			5119.4678 (286)
Dwelling Primary energy Rate (DPER)			56.1300 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	91.2000 (1b)	x 2.6500 (2b)	= 241.6800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	241.6800 (5)

2. Ventilation rate

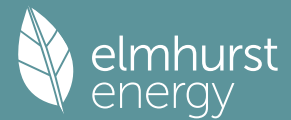
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.1241 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3741 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2900 (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	0.3697	0.3624	0.3552	0.3189	0.3117	0.2755	0.2755	0.2682	0.2900	0.3117	0.3262	0.3407 (22b)
Effective ac	0.5683	0.5657	0.5631	0.5509	0.5486	0.5379	0.5379	0.5360	0.5420	0.5486	0.5532	0.5580 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.20)			12.1200	1.1450	13.8779		(27)

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External Wall 1	35.8000	12.1200	23.6800	0.1800	4.2624	(29a)
Corridor Wall 2	29.1500	1.8900	27.2600	0.1800	4.9068	(29a)
Total net area of external elements Aum(A, m ²)			64.9500			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	24.9371		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 128.4706 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	44.1000	0.0700	3.0870
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	0.4900	0.0200	0.0098
E17 Corner (inverted - internal area greater than external area)	0.0000	-0.0900	-0.0000
E18 Party wall between dwellings	10.6000	0.0600	0.6360
E2 Other lintels (including other steel lintels)	6.9000	0.0500	0.3450
E3 Sill	6.0000	0.0500	0.3000
E4 Jamb	27.8000	0.0500	1.3900
E10 Eaves (insulation at ceiling level)	0.0000	0.0600	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.7678 (36)

Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 30.7049 (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	45.3272	45.1156	44.9081	43.9338	43.7515	42.9029	42.9029	42.7457	43.2298	43.7515	44.1203	44.5058 (38)
Average = Sum(39)m / 12 =	76.0321	75.8204	75.6130	74.6387	74.4564	73.6077	73.6077	73.4506	73.9346	74.4564	74.8251	75.2107 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8337	0.8314	0.8291	0.8184	0.8164	0.8071	0.8071	0.8054	0.8107	0.8164	0.8205	0.8247 (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													2.6418 (42)
Hot water usage for mixer showers	68.5139	67.4843	65.9839	63.1132	60.9947	58.6322	57.2893	58.7783	60.4106	62.9472	65.8796	68.2514 (42a)	
Hot water usage for baths	29.5865	29.1471	28.5283	27.3874	26.5331	25.5858	25.0742	25.6886	26.3576	27.3712	28.5356	29.4864 (42b)	
Hot water usage for other uses	41.6846	40.1688	38.6530	37.1372	35.6214	34.1056	34.1056	35.6214	37.1372	38.6530	40.1688	41.6846 (42c)	
Average daily hot water use (litres/day)													128.4939 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	139.7850	136.8001	133.1652	127.6378	123.1492	118.3236	116.4691	120.0883	123.9054	128.9714	134.5840	139.4224 (44)
Energy content (annual)	221.3852	194.8016	204.6699	174.7298	165.7825	145.4927	140.8592	148.6944	152.7877	175.0130	191.7396	218.3018 (45)
Distribution loss (46)m = 0.15 x (45)m	33.2078	29.2202	30.7005	26.2095	24.8674	21.8239	21.1289	22.3042	22.9182	26.2520	28.7609	32.7453 (46)

Water storage loss:													210.0000 (47)
Store volume													1.7016 (48)
a) If manufacturer declared loss factor is known (kWh/day):													0.5400 (49)
Temperature factor from Table 2b													0.9188 (55)
Enter (49) or (54) in (55)													

Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	27.5653 (56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	27.5653 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	

Total heat required for water heating calculated for each month	273.1318	241.5404	256.4165	224.8071	217.5291	195.5700	192.6058	200.4410	202.8651	226.7596	241.8169	270.0484 (62)
WWHRS	-31.3217	-27.7012	-29.0071	-24.0190	-22.3848	-19.1549	-17.9546	-19.0930	-19.8184	-23.3637	-26.4682	-30.7417 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)

Output from w/h 241.8101 213.8392 227.4094 200.7881 195.1442 176.4151 174.6512 181.3480 183.0467 203.3959 215.3487 239.3068 (64)
 Total per year (kWh/year) = Sum(64)m = 2452.5035 (64)
 2453 (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 0.0000 (64a)
 Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month 115.0079 102.1626 109.4500 98.1595 96.5199 88.4382 88.2330 90.8382 90.8638 99.5891 103.8153 113.9826 (65)

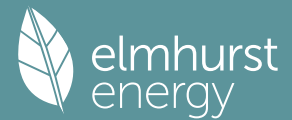
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	132.0896	132.0896	132.0896	132.0896	132.0896	132.0896	132.0896	132.0896	132.0896	132.0896	132.0896	132.0896 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.0531	146.2017	132.0531	136.4549	132.0531	136.4549	132.0531	132.0531	136.4549	132.0531	136.4549	132.0531 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	241.2682	243.7718	237.4628	224.0316	207.0772	191.1425	180.4971	177.9935	184.3025	197.7336	214.6880	230.6228 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.2090	36.2090	36.2090	36.2090	36.2090	36.2090	36.2090	36.2090	36.2090	36.2090	36.2090	36.2090 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-105.6717	-105.6717	-105.6717	-105.6717	-105.6717	-105.6717	-105.6717	-105.6717	-105.6717	-105.6717	-105.6717	-105.6717 (71)
Water heating gains (Table 5)	154.5805	152.0277	147.1102	136.3327	129.7311	122.8308	118.5927	122.0943	126.1997	133.8563	144.1879	153.2025 (72)
Total internal gains	593.5286	607.6280	582.2530	562.4461	534.4883	513.0551	493.7698	494.7678	509.5840	529.2700	560.9577	581.5053 (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	6.1200	19.6403	0.6300	0.7000	0.7700	36.7342 (76)
Southeast	6.0000	36.7938	0.6300	0.7000	0.7700	67.4680 (77)

Solar gains	104.2022	186.7829	275.5857	367.4275	429.7505	433.1808	415.0198	368.4956	307.8984	212.2822	126.6144	87.9470 (83)
Total gains	697.7309	794.4109	857.8387	929.8736	964.2388	946.2359	908.7896	863.2634	817.4824	741.5522	687.5721	669.4523 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	42.8055	42.9250	43.0427	43.6046	43.7114	44.2153	44.2153	44.3099	44.0198	43.7114	43.4959	43.2730
alpha	3.8537	3.8617	3.8695	3.9070	3.9141	3.9477	3.9477	3.9540	3.9347	3.9141	3.8997	3.8849
util living area	0.9526	0.9241	0.8792	0.7844	0.6492	0.4814	0.3525	0.3855	0.5834	0.8134	0.9223	0.9583 (86)
MIT	19.7256	19.9744	20.2783	20.6323	20.8592	20.9669	20.9924	20.9892	20.9295	20.6374	20.1414	19.6861 (87)
Th 2	20.5832	20.5843	20.5855	20.5908	20.5918	20.5964	20.5964	20.5973	20.5947	20.5918	20.5898	20.5877 (88)
util rest of house	0.9490	0.9187	0.8707	0.7701	0.6280	0.4539	0.3211	0.3532	0.5552	0.7978	0.9158	0.9551 (89)
MIT 2	19.3702	19.6160	19.9144	20.2597	20.4721	20.5712	20.5915	20.5901	20.5388	20.2691	19.7867	19.3347 (90)
Living area fraction	FLA = Living area / (4) =											
MIT	19.6227	19.8707	20.1730	20.5244	20.7471	20.8524	20.8764	20.8737	20.8164	20.5308	20.0387	19.5844 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.6227	19.8707	20.1730	20.5244	20.7471	20.8524	20.8764	20.8737	20.8164	20.5308	20.0387	19.5844 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	655.4066	721.4395	739.0199	713.9081	613.4148	446.0877	311.6267	324.0886	466.5918	589.7936	623.0451	633.2850 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1165.0176	1135.0844	1033.8554	867.6326	673.6173	460.2236	314.7734	328.5927	496.5723	739.4105	968.1396	1157.0687 (97)
Space heating kWh	379.1506	277.9693	219.3577	110.6816	44.7907	0.0000	0.0000	0.0000	0.0000	111.3150	248.4681	389.6951 (98a)
Space heating requirement - total per year (kWh/year)	1781.4280											
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	379.1506	277.9693	219.3577	110.6816	44.7907	0.0000	0.0000	0.0000	0.0000	111.3150	248.4681	389.6951 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1781.4280											
Space heating per m2	(98c) / (4) = 19.5332 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	379.1506	277.9693	219.3577	110.6816	44.7907	0.0000	0.0000	0.0000	0.0000	111.3150	248.4681	389.6951 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	410.7807	301.1585	237.6573	119.9151	48.5273	0.0000	0.0000	0.0000	0.0000	120.6013	269.1962	422.2048 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	241.8101	213.8392	227.4094	200.7881	195.1442	176.4151	174.6512	181.3480	183.0467	203.3959	215.3487	239.3068 (64)
Efficiency of water heater (217)m	85.0641	84.6490	83.9790	82.7814	81.3389	79.8000	79.8000	79.8000	79.8000	82.7671	84.3814	85.1465 (217)
Fuel for water heating, kWh/month	284.2681	252.6187	270.7932	242.5521	239.9149	221.0716	218.8611	227.2532	229.3818	245.7450	255.2087	281.0530 (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	27.4380	22.0118	19.8192	14.5204	11.2160	9.1635	10.2316	13.2994	17.2746	22.6652	25.6003	28.2006 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-9.2539	-14.3630	-22.6982	-28.1358	-32.7238	-31.4299	-31.0468	-28.1002	-23.3813	-17.5037	-10.6291	-7.8546 (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	-1.8740	-4.1130	-8.5104	-13.2997	-18.1153	-18.4058	-18.1927	-15.1573	-10.7927	-6.0463	-2.5520	-1.4697 (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												1930.0411 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.8000
Water heating fuel used												2968.7215 (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)	221.4407 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-375.6490 (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	4830.5542 (238)

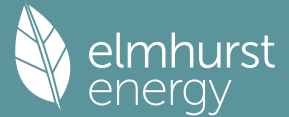
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1930.0411	0.2100	405.3086 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2968.7215	0.2100	623.4315 (264)
Space and water heating			1028.7401 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	221.4407	0.1443	31.9607 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-257.1203	0.1326	-34.1056
PV Unit electricity exported	-118.5287	0.1248	-14.7866
Total			-48.8921 (269)
Total CO2, kg/year			1023.7380 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.2300 (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	1930.0411	1.1300	2180.9465 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2968.7215	1.1300	3354.6553 (278)
Space and water heating			5535.6018 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	221.4407	1.5338	339.6531 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-257.1203	1.4901	-383.1399
PV Unit electricity exported	-118.5287	0.4579	-54.2700
Total			-437.4100 (283)
Total Primary energy kWh/year			5567.9457 (286)
Target Primary Energy Rate (TPER)			61.0500 (287)

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Property Reference	Unit 3		Issued on Date	25/01/2024	
Assessment Reference	Be Lean_Copy_Copy	Prop Type Ref	Unit 3		
Property					
SAP Rating	86 B	DER	11.00	TER	12.53
Environmental	91 B	% DER < TER		12.21	
CO ₂ Emissions (t/year)	0.79	DFEE	26.50	TFEE	27.35
Compliance Check	See BREL	% DFEE < TFEE		3.13	
% DPER < TPER	6.79	DPER	63.65	TPER	68.29
Assessor Details	Dr. Alan Harries			Assessor ID	BC24-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	77.2000 (1b)	2.6500 (2b)	204.5800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	77.2000		204.5800 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 204.5800 (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		3 (19)

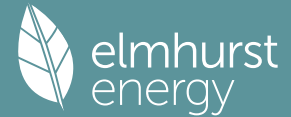
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												80.1000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2477	0.2448	0.2419	0.2274	0.2245	0.2099	0.2099	0.2070	0.2157	0.2245	0.2303	0.2361 (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
Window (Uw = 1.20)			9.0600	1.1450	10.3740		(27)
Door			1.8900	1.0000	1.8900		(26)
External Wall 1	35.0000	9.0600	25.9400	0.1500	3.8910	14.0000	363.1600 (29a)
Corridor Wall 2	38.4000	1.8900	36.5100	0.1400	5.1114	150.0000	5476.5000 (29a)
Total net area of external elements Aum(A, m ²)			73.4000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	21.2664	(33)
Party Floor 1			77.2000			40.0000	3088.0000 (32a)
Party Ceiling 1			77.2000			30.0000	2316.0000 (32b)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 11243.6600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							145.6433 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				5.1000	0.2500	1.2750	
E3 Sill				4.2000	0.0400	0.1680	

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E7 Party floor between dwellings (in blocks of flats)	48.5000	0.0500	2.4250
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	0.6900	1.0000	0.6900
E16 Corner (normal)	13.2500	0.0900	1.1925
E17 Corner (inverted - internal area greater than external area)	10.6000	0.0000	0.0000
E18 Party wall between dwellings	10.6000	0.0600	0.6360
E4 Jamb	21.0000	0.0400	0.8400

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
 Point Thermal bridges (36a) = 7.2265 (36)
 Total fabric heat loss (33) + (36) + (36a) = 28.4929 (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	16.7238	16.5276	16.3314	15.3504	15.1542	14.1732	14.1732	13.9770	14.5656	15.1542	15.5466	15.9390 (38)
Average = Sum(39)m / 12 =	45.2168	45.0206	44.8244	43.8434	43.6471	42.6661	42.6661	42.4699	43.0585	43.6471	44.0396	44.4320 (39)
												43.7943

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.5857	0.5832	0.5806	0.5679	0.5654	0.5527	0.5527	0.5501	0.5578	0.5654	0.5705	0.5755 (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 2.4076 (42)

Hot water usage for mixer showers

64.5870	63.6164	62.2020	59.4958	57.4988	55.2716	54.0057	55.4094	56.9481	59.3394	62.1037	64.3395 (42a)
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Hot water usage for baths

27.8977	27.4834	26.9000	25.8242	25.0187	24.1255	23.6430	24.2224	24.8532	25.8090	26.9069	27.8034 (42b)
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Hot water usage for other uses

39.2861	37.8575	36.4289	35.0003	33.5718	32.1432	32.1432	33.5718	35.0003	36.4289	37.8575	39.2861 (42c)
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Average daily hot water use (litres/day)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	131.7708	128.9573	125.5309	120.3204	116.0892	111.5403	109.7919	113.2035	116.8016	121.5772	126.8680	131.4291 (44)
Energy content (annual)	208.6928	183.6335	192.9363	164.7126	156.2784	137.1518	132.7838	140.1696	144.0281	164.9792	180.7468	205.7862 (45)
Distribution loss (46)m = 0.15 x (45)m	31.3039	27.5450	28.9404	24.7069	23.4418	20.5728	19.9176	21.0254	21.6042	24.7469	27.1120	30.8679 (46)
Water storage loss:												210.0000 (47)
Store volume												1.2300 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.6642 (55)
Enter (49) or (54) in (55)												
Total storage loss												
20.5902	18.5976	20.5902	19.9260	20.5902	19.9260	20.5902	20.5902	19.9260	20.5902	19.9260	20.5902	20.5902 (56)
If cylinder contains dedicated solar storage												
20.5902	18.5976	20.5902	19.9260	20.5902	19.9260	20.5902	20.5902	19.9260	20.5902	19.9260	20.5902	20.5902 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	252.5454	223.2423	236.7889	207.1506	200.1310	179.5898	176.6364	184.0222	186.4661	208.8318	223.1848	249.6388 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	252.5454	223.2423	236.7889	207.1506	200.1310	179.5898	176.6364	184.0222	186.4661	208.8318	223.1848	249.6388 (64)
12Total per year (kWh/year)												2528.2280 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)

Heat gains from water heating, kWh/month

104.4724	92.7452	99.2334	88.7173	87.0446	79.5534	79.2327	81.6885	81.8397	89.9377	94.0487	103.5060 (65)
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5. Internal gains (see Table 5 and 5a)

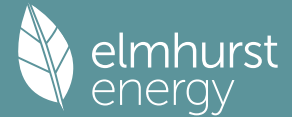
Metabolic gains (Table 5), Watts

(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	116.6121	129.1063	116.6121	120.4992	116.6121	120.4992	116.6121	116.6121	120.4992	116.6121	120.4992	116.6121 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	213.4892	215.7046	210.1220	198.2372	183.2349	169.1349	159.7151	157.4998	163.0824	174.9671	189.9694	204.0695 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.0379	35.0379	35.0379	35.0379	35.0379	35.0379	35.0379	35.0379	35.0379	35.0379	35.0379	35.0379 (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)	-96.3035	-96.3035	-96.3035	-96.3035	-96.3035	-96.3035	-96.3035	-96.3035	-96.3035	-96.3035	-96.3035	-96.3035 (71)
Water heating gains (Table 5)	140.4199	138.0137	133.3782	123.2185	116.9955	110.4908	106.4956	109.7963	113.6663	120.8839	130.6232	139.1209 (72)
Total internal gains	532.6351	544.9383	522.2261	504.0687	478.9563	459.2386	441.9366	443.0220	456.3617	474.5770	503.2056	521.9164 (73)

6. Solar gains

[Jan]	Area	Solar flux	Specific data	FF	Access	Gains						
	m2	Table 6a	g	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
East	9.0600	19.6403	0.4000	0.8000	0.7700	39.4601 (76)						
Solar gains	39.4601	77.1924	127.1249	185.4041	227.2197	232.5998	221.4445	190.2176	147.8515	91.5953	49.2022	32.4501 (83)
Total gains	572.0952	622.1307	649.3510	689.4729	706.1760	691.8384	663.3811	633.2396	604.2132	566.1723	552.4078	554.3665 (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	69.0726	69.3736	69.6772	71.2363	71.5565	73.2018	73.2018	73.5400	72.5347	71.5565	70.9189	70.2926
alpha	5.6048	5.6249	5.6451	5.7491	5.7704	5.8801	5.8801	5.9027	5.8356	5.7704	5.7279	5.6862
util living area	0.9391	0.9058	0.8499	0.7220	0.5646	0.3937	0.2829	0.3083	0.4877	0.7445	0.8914	0.9451 (86)
MIT	20.4667	20.6047	20.7595	20.9195	20.9822	20.9983	20.9998	20.9997	20.9940	20.9201	20.7054	20.4535 (87)
Th 2	20.4429	20.4452	20.4475	20.4590	20.4613	20.4728	20.4728	20.4751	20.4682	20.4613	20.4567	20.4521 (88)
util rest of house	0.9310	0.8942	0.8329	0.6971	0.5342	0.3616	0.2490	0.2732	0.4513	0.7158	0.8767	0.9377 (89)
MIT 2	19.8231	19.9940	20.1822	20.3763	20.4449	20.4715	20.4727	20.4749	20.4634	20.3818	20.1287	19.8146 (90)
Living area fraction									fLA = Living area / (4) =			0.6438 (91)
MIT	20.2374	20.3872	20.5539	20.7260	20.7908	20.8106	20.8120	20.8127	20.8050	20.7284	20.5000	20.2259 (92)
Temperature adjustment												-0.1500
adjusted MIT	20.0874	20.2372	20.4039	20.5760	20.6408	20.6606	20.6620	20.6627	20.6550	20.5784	20.3500	20.0759 (93)

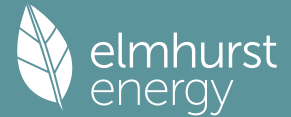
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9253	0.8896	0.8315	0.7026	0.5444	0.3730	0.2612	0.2858	0.4642	0.7222	0.8737	0.9320 (94)
Useful gains	529.3350	553.4290	539.9595	484.4342	384.4379	258.0858	173.2632	180.9586	280.4686	408.9037	482.6134	516.6791 (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	713.8571	690.4886	623.2328	511.9169	390.2397	258.5832	173.3110	181.0383	282.2495	435.5270	583.5223	705.3961 (97)
Space heating kWh	137.2844	92.1041	61.9553	19.7875	4.3165	0.0000	0.0000	0.0000	0.0000	19.8078	72.6544	140.4054 (98a)
Space heating requirement - total per year (kWh/year)												548.3155
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	137.2844	92.1041	61.9553	19.7875	4.3165	0.0000	0.0000	0.0000	0.0000	19.8078	72.6544	140.4054 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												548.3155
Space heating per m2												(98c) / (4) = 7.1025 (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 %)												88.7000 (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	137.2844	92.1041	61.9553	19.7875	4.3165	0.0000	0.0000	0.0000	0.0000	19.8078	72.6544	140.4054 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	154.7739	103.8378	69.8482	22.3084	4.8665	0.0000	0.0000	0.0000	0.0000	22.3312	81.9102	158.2925 (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	252.5454	223.2423	236.7889	207.1506	200.1310	179.5898	176.6364	184.0222	186.4661	208.8318	223.1848	249.6388 (64)
Efficiency of water heater (217)m	82.6534	82.1341	81.4131	80.4114	79.8711	79.7000	79.7000	79.7000	79.7000	80.4068	81.7368	79.7000 (216)
Fuel for water heating, kWh/month	305.5474	271.8023	290.8485	257.6134	250.5674	225.3322	221.6266	230.8936	233.9600	259.7190	273.0531	301.7826 (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	21.0615	19.0233	21.0615	20.3821	21.0615	20.3821	21.0615	21.0615	20.3821	21.0615	20.3821	21.0615 (231)
Lighting	25.1867	20.2057	18.1930	13.3290	10.2957	8.4116	9.3921	12.2081	15.8572	20.8055	23.4997	25.8867 (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												618.1685 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.7000
Water heating fuel used												3122.7463 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6490)												
mechanical ventilation fans (SFP = 0.6490)												161.9824 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												247.9824 (231)
Electricity for lighting (calculated in Appendix L)												203.2709 (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	4192.1680 (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	618.1685	0.2100	129.8154 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3122.7463	0.2100	655.7767 (264)
Space and water heating			785.5921 (265)
Pumps, fans and electric keep-hot	247.9824	0.1387	34.3982 (267)
Energy for lighting	203.2709	0.1443	29.3383 (268)
Total CO2, kg/year			849.3286 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.0000 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	618.1685	1.1300	698.5304 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3122.7463	1.1300	3528.7033 (278)
Space and water heating			4227.2337 (279)
Pumps, fans and electric keep-hot	247.9824	1.5128	375.1477 (281)
Energy for lighting	203.2709	1.5338	311.7836 (282)
Total Primary energy kWh/year			4914.1651 (286)
Dwelling Primary energy Rate (DPER)			63.6500 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	77.2000 (1b)	2.6500 (2b)	204.5800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	77.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	204.5800 (5)

2. Ventilation rate

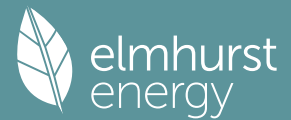
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1466 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3966 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3074 (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	0.3919	0.3842	0.3766	0.3381	0.3305	0.2920	0.2920	0.2843	0.3074	0.3305	0.3458	0.3612 (22b)
Effective ac	0.5768	0.5738	0.5709	0.5572	0.5546	0.5426	0.5426	0.5404	0.5472	0.5546	0.5598	0.5652 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.20)			9.0600	1.1450	10.3740		(27)
External Wall 1	35.0000	9.0600	25.9400	0.1800	4.6692		(29a)

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Corridor Wall 2	38.4000	1.8900	36.5100	0.1800	6.5718	(29a)
Total net area of external elements Aum(A, m2)			73.4000			(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		23.5050	(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 155.6433 (35)

List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.1000	0.0500	0.2550
E3 Sill	4.2000	0.0500	0.2100
E7 Party floor between dwellings (in blocks of flats)	48.5000	0.0700	3.3950
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	0.6900	0.0200	0.0138
E16 Corner (normal)	13.2500	0.0900	1.1925
E17 Corner (inverted - internal area greater than external area)	10.6000	-0.0900	-0.9540
E18 Party wall between dwellings	10.6000	0.0600	0.6360
E4 Jamb	21.0000	0.0500	1.0500

Thermal bridges (Sum(L x Psi) calculated using Appendix K)						5.7983 (36)
Point Thermal bridges						0.0000
Total fabric heat loss					(33) + (36) + (36a) =	29.3033 (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	38.9409	38.7396	38.5422	37.6152	37.4418	36.6344	36.6344	36.4849	36.9454	37.4418	37.7926	38.1595 (38)
Average = Sum(39)m / 12 =	68.2443	68.0429	67.8456	66.9186	66.7451	65.9377	65.9377	65.7882	66.2487	66.7451	67.0960	67.4628 (39)
												66.9177

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8840	0.8814	0.8788	0.8668	0.8646	0.8541	0.8541	0.8522	0.8581	0.8646	0.8691	0.8739 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31
												0.8668
												31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.4076 (42)
Hot water usage for mixer showers	64.5870	63.6164	62.2020	59.4958	57.4988	55.2716	54.0057	55.4094	56.9481	59.3394	62.1037	64.3395 (42a)	
Hot water usage for baths	27.8977	27.4834	26.9000	25.8242	25.0187	24.1255	23.6430	24.2224	24.8532	25.8090	26.9069	27.8034 (42b)	
Hot water usage for other uses	39.2861	37.8575	36.4289	35.0003	33.5718	32.1432	32.1432	33.5718	35.0003	36.4289	37.8575	39.2861 (42c)	
Average daily hot water use (litres/day)													121.1273 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	131.7708	128.9573	125.5309	120.3204	116.0892	111.5403	109.7919	113.2035	116.8016	121.5772	126.8680	131.4291 (44)
Energy content (annual)	208.6928	183.6335	192.9363	164.7126	156.2784	137.1518	132.7838	140.1696	144.0281	164.9792	180.7468	205.7862 (45)
Distribution loss (46)m = 0.15 x (45)m												
Total = Sum(45)m =	31.3039	27.5450	28.9404	24.7069	23.4418	20.5728	19.9176	21.0254	21.6042	24.7469	27.1120	30.8679 (46)

Water storage loss:													210.0000 (47)
Store volume													1.7016 (48)
a) If manufacturer declared loss factor is known (kWh/day):													0.5400 (49)
Temperature factor from Table 2b													0.9188 (55)
Enter (49) or (54) in (55)													
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (56)	
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month	260.4394	230.3724	244.6829	214.7899	208.0250	187.2291	184.5304	191.9162	194.1055	216.7258	230.8241	257.5327 (62)	
WWHRS	-29.5265	-26.1135	-27.3445	-22.6423	-21.1018	-18.0570	-16.9256	-17.9986	-18.6825	-22.0246	-24.9512	-28.9797 (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	230.9129	204.2589	217.3384	192.1476	186.9231	169.1721	167.6048	173.9176	175.4230	194.7012	205.8730	228.5531 (64)	
Total per year (kWh/year)													2346.8257 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)

Heat gains from water heating, kWh/month	110.7876	98.4492	105.5486	94.8288	93.3598	85.6648	85.5479	88.0037	87.9512	96.2528	100.1602	109.8212 (65)
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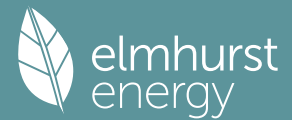
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	120.3793	120.3793	120.3793	120.3793	120.3793	120.3793	120.3793	120.3793	120.3793	120.3793	120.3793	120.3793 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	120.1116	132.9808	120.1116	124.1154	120.1116	124.1154	120.1116	120.1116	124.1154	120.1116	124.1154	120.1116 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	213.4892	215.7046	210.1220	198.2372	183.2349	169.1349	159.7151	157.4998	163.0824	174.9671	189.9694	204.0695 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.0379	35.0379	35.0379	35.0379	35.0379	35.0379	35.0379	35.0379	35.0379	35.0379	35.0379	35.0379 (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)	-96.3035	-96.3035	-96.3035	-96.3035	-96.3035	-96.3035	-96.3035	-96.3035	-96.3035	-96.3035	-96.3035	-96.3035 (71)
Water heating gains (Table 5)	148.9081	146.5018	141.8664	131.7067	125.4836	118.9789	114.9837	118.2845	122.1545	129.3721	139.1114	147.6091 (72)
Total internal gains	544.6228	557.3009	534.2138	516.1731	490.9440	471.3430	453.9243	455.0098	468.4661	486.5647	515.3100	533.9041 (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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East	9.0600	19.6403	0.6300	0.7000	0.7700	54.3810 (76)						
Solar gains	54.3810	106.3808	175.1940	255.5101	313.1372	320.5516	305.1782	262.1436	203.7579	126.2298	67.8067	44.7203 (83)
Total gains	599.0038	663.6818	709.4078	771.6832	804.0812	791.8946	759.1025	717.1533	672.2240	612.7945	583.1167	578.6244 (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	48.9079	49.0526	49.1953	49.8768	50.0064	50.6187	50.6187	50.7338	50.3811	50.0064	49.7449	49.4744
alpha	4.2605	4.2702	4.2797	4.3251	4.3338	4.3746	4.3746	4.3823	4.3587	4.3338	4.3163	4.2983
util living area	0.9683	0.9501	0.9163	0.8312	0.6954	0.5165	0.3787	0.4164	0.6336	0.8594	0.9462	0.9720 (86)
MIT	19.8102	20.0109	20.2895	20.6405	20.8683	20.9721	20.9942	20.9914	20.9332	20.6420	20.1869	19.7828 (87)
Th 2	20.1811	20.1834	20.1855	20.1958	20.1977	20.2067	20.2067	20.2083	20.2032	20.1977	20.1938	20.1898 (88)
util rest of house	0.9626	0.9413	0.9017	0.8037	0.6512	0.4578	0.3119	0.3471	0.5735	0.8301	0.9354	0.9669 (89)
MIT 2	18.7975	19.0500	19.3965	19.8239	20.0781	20.1870	20.2039	20.2039	20.1515	19.8359	19.2813	18.7693 (90)
Living area fraction	19.4495	19.6686	19.9714	20.3496	20.5869	20.6925	20.7127	20.7108	20.6548	20.3548	19.8643	19.4218 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4495	19.6686	19.9714	20.3496	20.5869	20.6925	20.7127	20.7108	20.6548	20.3548	19.8643	19.4218 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9564	0.9349	0.8974	0.8093	0.6732	0.4941	0.3547	0.3913	0.6083	0.8363	0.9302	0.9611 (94)
Useful gains	572.8976	620.5005	636.6175	624.5231	541.2929	391.2846	269.2439	280.6410	408.9250	512.4675	542.4320	556.0888 (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	1033.8668	1004.8975	913.9731	766.1931	593.1543	401.7224	271.1823	283.6023	434.2457	651.0865	856.4357	1026.9045 (97)
Space heating kWh	342.9611	258.3148	206.3526	102.0024	38.5849	0.0000	0.0000	0.0000	0.0000	103.1325	226.0827	350.2869 (98a)
Space heating requirement - total per year (kWh/year)												1627.7178
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	342.9611	258.3148	206.3526	102.0024	38.5849	0.0000	0.0000	0.0000	0.0000	103.1325	226.0827	350.2869 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1627.7178
Space heating per m2										(98c) / (4) =		21.0844 (99)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	342.9611	258.3148	206.3526	102.0024	38.5849	0.0000	0.0000	0.0000	0.0000	103.1325	226.0827	350.2869 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	371.5721	279.8644	223.5672	110.5118	41.8038	0.0000	0.0000	0.0000	0.0000	111.7362	244.9433	379.5091 (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	230.9129	204.2589	217.3384	192.1476	186.9231	169.1721	167.6048	173.9176	175.4230	194.7012	205.8730	228.5531 (64)
Efficiency of water heater (217)m	84.9451	84.5874	83.9436	82.7068	81.2083	79.8000	79.8000	79.8000	79.8000	82.7025	84.2703	79.8000 (216)
Fuel for water heating, kWh/month	271.8377	241.4766	258.9100	232.3239	230.1774	211.9952	210.0311	217.9418	219.8283	235.4236	244.3009	268.8411 (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	24.9568	20.0213	18.0270	13.2073	10.2017	8.3349	9.3063	12.0967	15.7125	20.6156	23.2853	25.6505 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-7.8735	-12.2428	-19.3832	-24.0733	-28.0434	-26.9541	-26.6296	-24.0835	-20.0090	-14.9425	-9.0522	-6.6808 (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	-1.5462	-3.3969	-7.0346	-11.0014	-14.9914	-15.2314	-15.0512	-12.5336	-8.9191	-4.9923	-2.1054	-1.2122 (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												1763.5079 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.8000
Water heating fuel used												2843.0877 (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)	201.4159 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-317.9836 (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	4576.0279 (238)

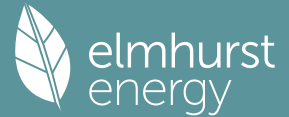
 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1763.5079	0.2100	370.3367 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2843.0877	0.2100	597.0484 (264)
Space and water heating			967.3851 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	201.4159	0.1443	29.0705 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-219.9679	0.1326	-29.1689
PV Unit electricity exported	-98.0158	0.1247	-12.2261
Total			-41.3951 (269)
Total CO2, kg/year			966.9898 (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	1763.5079	1.1300	1992.7640 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2843.0877	1.1300	3212.6891 (278)
Space and water heating			5205.4531 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	201.4159	1.5338	308.9384 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-219.9679	1.4900	-327.7461
PV Unit electricity exported	-98.0158	0.4578	-44.8727
Total			-372.6188 (283)
Total Primary energy kWh/year			5271.8736 (286)
Target Primary Energy Rate (TPER)			68.2900 (287)

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Property Reference	Unit 4		Issued on Date	25/01/2024	
Assessment Reference	Be Lean_Copy_Copy	Prop Type Ref	Unit 4		
Property					
SAP Rating	85 B	DER	12.98	TER	14.01
Environmental	90 B	% DER < TER		7.35	
CO ₂ Emissions (t/year)	0.74	DFEE	28.73	TFEE	29.38
Compliance Check	See BREL	% DFEE < TFEE		2.22	
% DPER < TPER	2.49	DPER	74.43	TPER	76.33
Assessor Details	Dr. Alan Harries			Assessor ID	BC24-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.2000 (1b)	2.6500 (2b)	162.1800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.2000		162.1800 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 162.1800 (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)

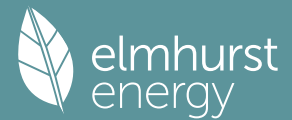
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (21)

	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) =												80.1000 (23c)
Effective ac	0.2621	0.2589	0.2557	0.2397	0.2366	0.2206	0.2206	0.2174	0.2270	0.2366	0.2429	0.2493 (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
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			12.1200	1.1450	13.8779		(27)
External Wall 1	40.0000	12.1200	27.8800	0.1500	4.1820	14.0000	390.3200 (29a)
Corridor Wall 2	26.8000	1.8900	24.9100	0.1400	3.4874	150.0000	3736.5000 (29a)
Total net area of external elements Aum(A, m ²)			66.8000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	23.4373	(33)
Party Floor 1			61.2000			40.0000	2448.0000 (32a)
Party Ceiling 1			61.2000			30.0000	1836.0000 (32b)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =	8410.8200 (34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							137.4317 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				6.9000	0.2500	1.7250	
E3 Sill				6.0000	0.0400	0.2400	

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E4 Jamb	27.8000	0.0400	1.1120	
E7 Party floor between dwellings (in blocks of flats)	45.9000	0.0500	2.2950	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	0.4500	1.0000	0.4500	
E16 Corner (normal)	13.2500	0.0900	1.1925	
E17 Corner (inverted - internal area greater than external area)	5.3000	-0.0900	-0.4770	
E18 Party wall between dwellings	5.3000	0.0600	0.3180	
E9 Balcony between dwellings, wall insulation continuous	0.0000	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.8555	(36)
Point Thermal bridges			0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	30.2928	(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	14.0254	13.8548	13.6842	12.8313	12.6607	11.8077	11.8077	11.6371	12.1489	12.6607	13.0019	13.3431
Average = Sum(39)m / 12 =	44.3182	44.1476	43.9770	43.1240	42.9534	42.1005	42.1005	41.9299	42.4417	42.9534	43.2946	43.6358
												43.0814

HLP (average)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7242	0.7214	0.7186	0.7046	0.7019	0.6879	0.6879	0.6851	0.6935	0.7019	0.7074	0.7130
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0154 (42)

Hot water usage for mixer showers 58.0104 57.1386 55.8683 53.4377 51.6439 49.6436 48.5066 49.7673 51.1493 53.2971 55.7799 57.7881 (42a)

Hot water usage for baths 25.0696 24.6973 24.1730 23.2063 22.4824 21.6797 21.2462 21.7668 22.3337 23.1926 24.1792 24.9848 (42b)

Hot water usage for other uses 35.2692 33.9867 32.7042 31.4217 30.1392 28.8566 28.8566 30.1392 31.4217 32.7042 33.9867 35.2692 (42c)

Average daily hot water use (litres/day) 108.7901 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	118.3492	115.8226	112.7454	108.0656	104.2655	100.1800	98.6094	101.6733	104.9047	109.1939	113.9458	118.0422
Energy content (annual)	187.4362	164.9299	173.2855	147.9364	140.3614	123.1829	119.2595	125.8928	129.3580	148.1750	162.3367	184.8256
Distribution loss (46)m = 0.15 x (45)m	28.1154	24.7395	25.9928	22.1905	21.0542	18.4774	17.8889	18.8839	19.4037	22.2263	24.3505	27.7238
Water storage loss:												210.0000
Store volume												1.2300
a) If manufacturer declared loss factor is known (kWh/day):												0.5400
Temperature factor from Table 2b												0.6642
Enter (49) or (54) in (55)												0.6642
Total storage loss	20.5902	18.5976	20.5902	19.9260	20.5902	19.9260	20.5902	20.5902	19.9260	20.5902	19.9260	20.5902
If cylinder contains dedicated solar storage	20.5902	18.5976	20.5902	19.9260	20.5902	19.9260	20.5902	20.5902	19.9260	20.5902	19.9260	20.5902
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624
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
Total heat required for water heating calculated for each month	231.2888	204.5387	217.1381	190.3744	184.2140	165.6209	163.1121	169.7454	171.7960	192.0276	204.7747	228.6782
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
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
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Output from w/h	231.2888	204.5387	217.1381	190.3744	184.2140	165.6209	163.1121	169.7454	171.7960	192.0276	204.7747	228.6782
Total per year (kWh/year)												2323.3090
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
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000
Heat gains from water heating, kWh/month	97.4046	86.5262	92.6995	83.1392	81.7522	74.9087	74.7359	76.9414	76.9619	84.3503	87.9274	96.5366

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

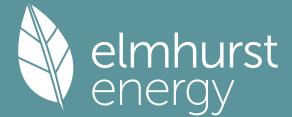
Metabolic gains (Table 5), Watts

(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	88.7362	98.2437	88.7362	91.6941	88.7362	91.6941	88.7362	88.7362	91.6941	88.7362	91.6941	88.7362
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.9629	177.7888	173.1875	163.3919	151.0266	139.4050	131.6410	129.8151	134.4164	144.2121	156.5773	168.1990
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0768	33.0768	33.0768	33.0768	33.0768	33.0768	33.0768	33.0768	33.0768	33.0768	33.0768	33.0768
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
Losses e.g. evaporation (negative values) (Table 5)	-80.6141	-80.6141	-80.6141	-80.6141	-80.6141	-80.6141	-80.6141	-80.6141	-80.6141	-80.6141	-80.6141	-80.6141
Water heating gains (Table 5)	130.9202	128.7592	124.5961	115.4712	109.8820	104.0399	100.4514	103.4159	106.8916	113.3740	122.1213	129.7535
Total internal gains	451.8496	461.0220	442.7501	426.7874	405.8751	388.3692	374.0590	375.1975	386.2323	402.5526	426.6230	442.9189

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	3.0600	19.6403	0.4000	0.8000	0.7700	13.3276 (76)						
Southeast	6.0000	36.7938	0.4000	0.8000	0.7700	48.9564 (77)						
South	3.0600	46.7521	0.4000	0.8000	0.7700	31.7253 (78)						
Solar gains	94.0093	161.4203	223.2203	278.7976	313.0438	310.7821	299.6510	274.3234	242.6198	179.1422	112.8617	80.2700
Total gains	545.8589	622.4423	665.9704	705.5850	718.9190	699.1514	673.7100	649.5208	628.8522	581.6948	539.4847	523.1889

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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	52.7174	52.9211	53.1264	54.1772	54.3924	55.4944	55.4944	55.7201	55.0482	54.3924	53.9637	53.5418
alpha	4.5145	4.5281	4.5418	4.6118	4.6262	4.6996	4.6996	4.7147	4.6699	4.6262	4.5976	4.5695
util living area	0.9184	0.8689	0.8013	0.6808	0.5387	0.3827	0.2745	0.2963	0.4586	0.7000	0.8631	0.9276 (86)
MIT	20.2616	20.4741	20.6778	20.8711	20.9621	20.9941	20.9990	20.9986	20.9860	20.8770	20.5767	20.2312 (87)
Th 2	20.3195	20.3220	20.3245	20.3367	20.3392	20.3515	20.3515	20.3540	20.3466	20.3392	20.3343	20.3294 (88)
util rest of house	0.9078	0.8538	0.7803	0.6524	0.5042	0.3448	0.2342	0.2549	0.4172	0.6671	0.8452	0.9181 (89)
MIT 2	19.4688	19.7287	19.9735	20.2055	20.3047	20.3472	20.3510	20.3532	20.3356	20.2181	19.8675	19.4395 (90)
Living area fraction										FLA = Living area / (4) = 0.6144 (91)		
MIT	19.9559	20.1866	20.4062	20.6144	20.7086	20.7446	20.7491	20.7497	20.7352	20.6229	20.3032	19.9259 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.8059	20.0366	20.2562	20.4644	20.5586	20.5946	20.5991	20.5997	20.5852	20.4729	20.1532	19.7759 (93)

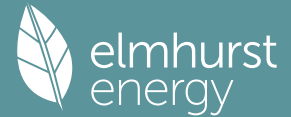
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8989	0.8469	0.7781	0.6580	0.5158	0.3591	0.2496	0.2707	0.4325	0.6739	0.8399	0.9092 (94)
Useful gains	490.6481	527.1595	518.1890	464.2840	370.8000	251.0304	168.1785	175.8210	271.9476	392.0277	453.1027	475.6903 (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	687.1913	668.2466	604.9573	498.7055	380.5080	252.3768	168.3653	176.0940	275.2438	424.0746	565.1341	679.6673 (97)
Space heating kWh	146.2282	94.8105	64.5556	24.7835	7.2228	0.0000	0.0000	0.0000	0.0000	23.8429	80.6626	151.7588 (98a)
Space heating requirement - total per year (kWh/year)												593.8648
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	146.2282	94.8105	64.5556	24.7835	7.2228	0.0000	0.0000	0.0000	0.0000	23.8429	80.6626	151.7588 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												593.8648
Space heating per m2												9.7037 (99)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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 %)												88.7000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	146.2282	94.8105	64.5556	24.7835	7.2228	0.0000	0.0000	0.0000	0.0000	23.8429	80.6626	151.7588 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	164.8570	106.8890	72.7797	27.9408	8.1429	0.0000	0.0000	0.0000	0.0000	26.8803	90.9387	171.0923 (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	231.2888	204.5387	217.1381	190.3744	184.2140	165.6209	163.1121	169.7454	171.7960	192.0276	204.7747	228.6782 (64)
Efficiency of water heater (217)m	82.9605	82.3463	81.5974	80.6425	80.0063	79.7000	79.7000	79.7000	79.7000	80.6033	82.0527	79.7000 (216)
Fuel for water heating, kWh/month	278.7939	248.3883	266.1092	236.0720	230.2494	207.8055	204.6576	212.9804	215.5533	238.2379	249.5648	83.0620 (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	18.2102	16.4480	18.2102	17.6228	18.2102	17.6228	18.2102	18.2102	17.6228	18.2102	17.6228	18.2102 (231)
Lighting	19.2216	15.4202	13.8842	10.1722	7.8573	6.4195	7.1677	9.3168	12.1016	15.8780	17.9341	19.7558 (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												669.5207 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.7000
Water heating fuel used												2863.7227 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6490)												
mechanical ventilation fans (SFP = 0.6490)												128.4109 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												214.4109 (231)

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Electricity for lighting (calculated in Appendix L)	155.1290 (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	3902.7833 (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	669.5207	0.2100	140.5993 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2863.7227	0.2100	601.3818 (264)
Space and water heating			741.9811 (265)
Pumps, fans and electric keep-hot	214.4109	0.1387	29.7414 (267)
Energy for lighting	155.1290	0.1443	22.3899 (268)
Total CO2, kg/year			794.1125 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.9800 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	669.5207	1.1300	756.5583 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2863.7227	1.1300	3236.0067 (278)
Space and water heating			3992.5650 (279)
Pumps, fans and electric keep-hot	214.4109	1.5128	324.3608 (281)
Energy for lighting	155.1290	1.5338	237.9420 (282)
Total Primary energy kWh/year			4554.8678 (286)
Dwelling Primary energy Rate (DPER)			74.4300 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	61.2000 (1b)	x 2.6500 (2b)	= 162.1800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 162.1800 (5)

2. Ventilation rate

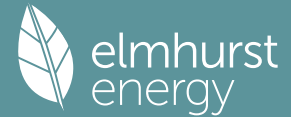
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.1233 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3733 (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) = 0.3173 (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	0.4046	0.3967	0.3887	0.3491	0.3411	0.3015	0.3015	0.2935	0.3173	0.3411	0.3570	0.3729 (22b)
Effective ac	0.5818	0.5787	0.5756	0.5609	0.5582	0.5454	0.5454	0.5431	0.5503	0.5582	0.5637	0.5695 (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
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TER Opaque door			1.8900	1.0000	1.8900							(26)
TER Opening Type (Uw = 1.20)			12.1200	1.1450	13.8779							(27)
External Wall 1	40.0000		12.1200	27.8800	0.1800	5.0184						(29a)
Corridor Wall 2	26.8000		1.8900	24.9100	0.1800	4.4838						(29a)
Total net area of external elements Aum(A, m ²)				66.8000								(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	25.2701							(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 147.4317 (35)

List of Thermal Bridges				Length	Psi-value	Total	
K1 Element				6.9000	0.0500	0.3450	
E2 Other lintels (including other steel lintels)				6.0000	0.0500	0.3000	
E3 Sill				27.8000	0.0500	1.3900	
E4 Jamb				45.9000	0.0700	3.2130	
E7 Party floor between dwellings (in blocks of flats)				0.4500	0.0200	0.0090	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation				13.2500	0.0900	1.1925	
E16 Corner (normal)				5.3000	-0.0900	-0.4770	
E17 Corner (inverted - internal area greater than external area)				5.3000	0.0600	0.3180	
E18 Party wall between dwellings				0.0000	0.0200	0.0000	
E9 Balcony between dwellings, wall insulation continuous							

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.2905 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 31.5606 (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
	31.1400	30.9699	30.8032	30.0201	29.8736	29.1915	29.1915	29.0652	29.4542	29.8736	30.1699	30.4798
Heat transfer coeff												
	62.7005	62.5304	62.3637	61.5806	61.4341	60.7521	60.7521	60.6258	61.0148	61.4341	61.7305	62.0404
Average = Sum(39)m / 12 =												61.5799

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1.0245	1.0217	1.0190	1.0062	1.0038	0.9927	0.9927	0.9906	0.9970	1.0038	1.0087	1.0137
HLP (average)												1.0062
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

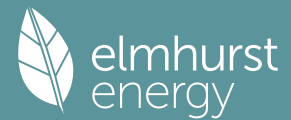
Assumed occupancy 2.0154 (42)												
Hot water usage for mixer showers												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	58.0104	57.1386	55.8683	53.4377	51.6439	49.6436	48.5066	49.7673	51.1493	53.2971	55.7799	57.7881
Hot water usage for baths												
	25.0696	24.6973	24.1730	23.2063	22.4824	21.6797	21.2462	21.7668	22.3337	23.1926	24.1792	24.9848
Hot water usage for other uses												
	35.2692	33.9867	32.7042	31.4217	30.1392	28.8566	28.8566	30.1392	31.4217	32.7042	33.9867	35.2692
Average daily hot water use (litres/day)												108.7901
Daily hot water use												
	118.3492	115.8226	112.7454	108.0656	104.2655	100.1800	98.6094	101.6733	104.9047	109.1939	113.9458	118.0422
Energy conte	187.4362	164.9299	173.2855	147.9364	140.3614	123.1829	119.2595	125.8928	129.3580	148.1750	162.3367	184.8256
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m	28.1154	24.7395	25.9928	22.1905	21.0542	18.4774	17.8889	18.8839	19.4037	22.2263	24.3505	27.7238
Water storage loss:												
Store volume												210.0000
a) If manufacturer declared loss factor is known (kWh/day):												1.7016
Temperature factor from Table 2b												0.5400
Enter (49) or (54) in (55)												0.9188
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624
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
Total heat required for water heating calculated for each month	239.1828	211.6687	225.0321	198.0137	192.1080	173.2603	171.0061	177.6394	179.4353	199.9216	212.4141	236.5722
WWHRS	-26.5199	-23.4544	-24.5601	-20.3368	-18.9531	-16.2183	-15.2021	-16.1659	-16.7801	-19.7819	-22.4105	-26.0288
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
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Output from w/h	212.6629	188.2143	200.4720	177.6770	173.1548	157.0420	155.8040	161.4735	162.6552	180.1397	190.0036	210.5433
12Total per year (kWh/year)												2169.8422
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
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000
Heat gains from water heating, kWh/month	103.7198	92.2303	99.0147	89.2507	88.0674	81.0202	81.0511	83.2566	83.0734	90.6655	94.0388	102.8518

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
	100.7676	100.7676	100.7676	100.7676	100.7676	100.7676	100.7676	100.7676	100.7676	100.7676	100.7676	100.7676
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	89.4729	99.0593	89.4729	92.4554	89.4729	92.4554	89.4729	89.4729	92.4554	89.4729	92.4554	89.4729
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	175.9629	177.7888	173.1875	163.3919	151.0266	139.4050	131.6410	129.8151	134.4164	144.2121	156.5773	168.1990
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	33.0768	33.0768	33.0768	33.0768	33.0768	33.0768	33.0768	33.0768	33.0768	33.0768	33.0768	33.0768
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000
Losses e.g. evaporation (negative values) (Table 5)												
	-80.6141	-80.6141	-80.6141	-80.6141	-80.6141	-80.6141	-80.6141	-80.6141	-80.6141	-80.6141	-80.6141	-80.6141
Water heating gains (Table 5)												
	139.4084	137.2474	133.0843	123.9593	118.3702	112.5281	108.9396	111.9041	115.3797	121.8622	130.6095	138.2416
Total internal gains	461.0745	470.3258	451.9750	436.0368	415.1000	397.6187	383.2838	384.4224	395.4818	411.7775	435.8725	452.1438

6. Solar gains

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[Jan]		Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
East		3.0600	19.6403	0.6300	0.7000	0.7700	18.3671 (76)
Southeast		6.0000	36.7938	0.6300	0.7000	0.7700	67.4680 (77)
South		3.0600	46.7521	0.6300	0.7000	0.7700	43.7214 (78)

Solar gains	129.5565	222.4574	307.6255	384.2180	431.4135	428.2966	412.9565	378.0519	334.3605	246.8804	155.5375	110.6221 (83)
Total gains	590.6310	692.7832	759.6005	820.2548	846.5135	825.9153	796.2404	762.4742	729.8422	658.6579	591.4100	562.7659 (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	39.9732	40.0819	40.1891	40.7001	40.7972	41.2552	41.2552	41.3412	41.0776	40.7972	40.6013	40.3985
alpha	3.6649	3.6721	3.6793	3.7133	3.7198	3.7503	3.7503	3.7561	3.7385	3.7198	3.7068	3.6932
util living area	0.9426	0.9042	0.8490	0.7485	0.6147	0.4556	0.3320	0.3604	0.5431	0.7760	0.9054	0.9500 (86)
MIT	19.6842	19.9788	20.3029	20.6462	20.8624	20.9660	20.9919	20.9889	20.9335	20.6551	20.1305	19.6338 (87)
Th 2	20.0630	20.0653	20.0675	20.0782	20.0801	20.0894	20.0894	20.0912	20.0859	20.0801	20.0761	20.0719 (88)
util rest of house	0.9329	0.8894	0.8265	0.7140	0.5667	0.3957	0.2649	0.2914	0.4809	0.7372	0.8882	0.9415 (89)
MIT 2	18.5573	18.9209	19.3148	19.7229	19.9587	20.0661	20.0857	20.0856	20.0364	19.7448	19.1225	18.5011 (90)
Living area fraction									FLA = Living area / (4) = 0.6144 (91)			
MIT	19.2496	19.5709	19.9219	20.2901	20.5139	20.6190	20.6425	20.6406	20.5876	20.3040	19.7418	19.1970 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2496	19.5709	19.9219	20.2901	20.5139	20.6190	20.6425	20.6406	20.5876	20.3040	19.7418	19.1970 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9230	0.8805	0.8227	0.7223	0.5899	0.4309	0.3058	0.3334	0.5157	0.7472	0.8811	0.9319 (94)
Useful gains	545.1535	610.0100	624.9238	592.5002	499.3386	355.8663	243.5180	254.2028	376.3718	492.1456	521.1066	524.4166 (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	937.3497	917.3760	837.0369	701.4121	541.4728	365.6664	245.5874	257.0906	395.8378	596.1584	780.3868	930.4188 (97)
Space heating kWh	291.7940	206.5500	157.8121	78.4166	31.3478	0.0000	0.0000	0.0000	0.0000	77.3855	186.6817	302.0656 (98a)
Space heating requirement - total per year (kWh/year)												1332.0533
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	291.7940	206.5500	157.8121	78.4166	31.3478	0.0000	0.0000	0.0000	0.0000	77.3855	186.6817	302.0656 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1332.0533
Space heating per m2												(98c) / (4) = 21.7656 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
 Fraction of space heat from main system(s) 1.0000 (202)
 Efficiency of main space heating system 1 (in %) 92.3000 (206)
 Efficiency of main space heating system 2 (in %) 0.0000 (207)
 Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	291.7940	206.5500	157.8121	78.4166	31.3478	0.0000	0.0000	0.0000	0.0000	77.3855	186.6817	302.0656 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	316.1365	223.7811	170.9774	84.9583	33.9630	0.0000	0.0000	0.0000	0.0000	83.8413	202.2554	327.2650 (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	212.6629	188.2143	200.4720	177.6770	173.1548	157.0420	155.8040	161.4735	162.6552	180.1397	190.0036	210.5433 (64)
Efficiency of water heater (217)m	84.7696	84.2687	83.5289	82.3558	81.0593	79.8000	79.8000	79.8000	79.8000	82.3067	84.0202	84.8686 (217)
Fuel for water heating, kWh/month	250.8716	223.3501	240.0032	215.7430	213.6149	196.7944	195.2431	202.3477	203.8286	218.8639	226.1402	248.0814 (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	18.5907	14.9142	13.4285	9.8383	7.5994	6.2088	6.9324	9.0110	11.7044	15.3569	17.3455	19.1074 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-6.2672	-9.7608	-15.4808	-19.2655	-22.4829	-21.6290	-21.3705	-19.3067	-16.0117	-11.9285	-7.2111	-5.3163 (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	-1.2002	-2.6376	-5.4618	-8.5399	-11.6327	-11.8133	-11.6719	-9.7214	-6.9209	-3.8747	-1.6342	-0.9408 (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												1443.1780 (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	79.8000	
Water heating fuel used	2634.8823	(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)	150.0376	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-252.0803	(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	4062.0177	(238)

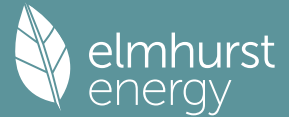
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1443.1780	0.2100	303.0674 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2634.8823	0.2100	553.3253 (264)
Space and water heating			856.3927 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	150.0376	0.1443	21.6551 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-176.0309	0.1326	-23.3356
PV Unit electricity exported	-76.0494	0.1247	-9.4871
Total			-32.8227 (269)
Total CO2, kg/year			857.1543 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.0100 (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	1443.1780	1.1300	1630.7912 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2634.8823	1.1300	2977.4170 (278)
Space and water heating			4608.2082 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	150.0376	1.5338	230.1328 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-176.0309	1.4898	-262.2549
PV Unit electricity exported	-76.0494	0.4579	-34.8197
Total			-297.0746 (283)
Total Primary energy kWh/year			4671.3671 (286)
Target Primary Energy Rate (TPER)			76.3300 (287)

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Property Reference	Unit 5		Issued on Date	25/01/2024	
Assessment Reference	Be Lean_Copy_Copy	Prop Type Ref	Unit 5		
Property					
SAP Rating	84 B	DER	13.73	TER	14.68
Environmental	90 B	% DER < TER			6.47
CO ₂ Emissions (t/year)	0.78	DFEE	32.13	TFEE	32.48
Compliance Check	See BREL	% DFEE < TFEE			1.07
% DPER < TPER	1.90	DPER	78.43	TPER	79.95
Assessor Details	Dr. Alan Harries			Assessor ID	BC24-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.4000 (1b)	2.6500 (2b)	162.7100 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.4000		162.7100 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 162.7100 (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)

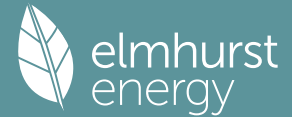
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (21)

	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												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												80.1000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2621	0.2589	0.2557	0.2397	0.2366	0.2206	0.2206	0.2174	0.2270	0.2366	0.2429	0.2493 (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
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			13.6500	1.1450	15.6298		(27)
External Wall 1	41.3000	13.6500	27.6500	0.1500	4.1475	14.0000	387.1000 (29a)
Corridor Wall 2	8.5000	1.8900	6.6100	0.1400	0.9254	150.0000	991.5000 (29a)
Total net area of external elements Aum(A, m ²)			49.8000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	22.5927	(33)
Party Floor 1			61.4000			40.0000	2456.0000 (32a)
Party Ceiling 1			61.4000			30.0000	1842.0000 (32b)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5676.6000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							92.4528 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)				33.1000	0.0500	1.6550	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation				0.4500	1.0000	0.4500	

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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	35.5010	35.6383	35.7767	36.4851	36.6301	37.3731	37.3731	37.5253	37.0723	36.6301	36.3412	36.0567
alpha	3.3667	3.3759	3.3851	3.4323	3.4420	3.4915	3.4915	3.5017	3.4715	3.4420	3.4227	3.4038
util living area	0.8986	0.8651	0.8098	0.6927	0.5448	0.3881	0.2843	0.3194	0.5065	0.7334	0.8553	0.9056 (86)
MIT	19.7665	19.9872	20.2904	20.6615	20.8784	20.9723	20.9929	20.9894	20.9301	20.6521	20.1888	19.7446 (87)
Th 2	20.3202	20.3227	20.3251	20.3374	20.3399	20.3522	20.3522	20.3547	20.3473	20.3399	20.3349	20.3300 (88)
util rest of house	0.8887	0.8526	0.7926	0.6680	0.5129	0.3512	0.2434	0.2760	0.4650	0.7056	0.8401	0.8964 (89)
MIT 2	18.8711	19.1458	19.5197	19.9718	20.2195	20.3289	20.3475	20.3473	20.2849	19.9715	19.4090	18.8512 (90)
Living area fraction									FLA = Living area / (4) =			0.5814 (91)
MIT	19.3917	19.6350	19.9678	20.3728	20.6026	20.7030	20.7227	20.7206	20.6601	20.3672	19.8624	19.3707 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.2417	19.4850	19.8178	20.2228	20.4526	20.5530	20.5727	20.5706	20.5101	20.2172	19.7124	19.2207 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8705	0.8352	0.7786	0.6636	0.5185	0.3627	0.2574	0.2906	0.4756	0.7002	0.8243	0.8785 (94)
Useful gains	428.3006	450.4748	449.1543	422.8331	353.1347	246.1927	166.5017	173.5543	259.8434	347.5057	392.6914	418.2975 (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	663.6602	645.3205	586.9753	489.3543	376.7761	251.1678	167.6166	175.2528	272.6463	413.9977	547.2485	656.8837 (97)
Space heating kWh	175.1076	130.9363	102.5388	47.8953	17.5892	0.0000	0.0000	0.0000	0.0000	49.4700	111.2811	177.5081 (98a)
Space heating requirement - total per year (kWh/year)												812.3264
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	175.1076	130.9363	102.5388	47.8953	17.5892	0.0000	0.0000	0.0000	0.0000	49.4700	111.2811	177.5081 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												812.3264
Space heating per m2												(98c) / (4) = 13.2301 (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 %)												88.7000 (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	175.1076	130.9363	102.5388	47.8953	17.5892	0.0000	0.0000	0.0000	0.0000	49.4700	111.2811	177.5081 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	197.4155	147.6171	115.6018	53.9969	19.8300	0.0000	0.0000	0.0000	0.0000	55.7723	125.4579	200.1219 (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	231.5911	204.8046	217.4175	190.6129	184.4403	165.8196	163.3044	169.9484	172.0046	192.2666	205.0365	228.9762 (64)
Efficiency of water heater												79.7000 (216)
(217)m	83.3409	82.9837	82.3787	81.3577	80.4103	79.7000	79.7000	79.7000	79.7000	81.3900	82.6503	83.3952 (217)
Fuel for water heating, kWh/month	277.8840	246.8009	263.9243	234.2899	229.3739	208.0546	204.8989	213.2351	215.8150	236.2287	248.0772	274.5677 (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	18.2459	16.4801	18.2459	17.6573	18.2459	17.6573	18.2459	18.2459	17.6573	18.2459	17.6573	18.2459 (231)
Lighting	18.7344	15.0295	13.5324	9.9144	7.6582	6.2568	6.9860	9.0807	11.7949	15.4756	17.4797	19.2551 (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												915.8133 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.7000
Water heating fuel used												2853.1502 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6490)												
mechanical ventilation fans (SFP = 0.6490)												128.8305 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												214.8305 (231)
Electricity for lighting (calculated in Appendix L)												151.1977 (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	4134.9917 (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	915.8133	0.2100	192.3208 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2853.1502	0.2100	599.1615 (264)
Space and water heating			791.4823 (265)
Pumps, fans and electric keep-hot	214.8305	0.1387	29.7996 (267)
Energy for lighting	151.1977	0.1443	21.8225 (268)
Total CO2, kg/year			843.1045 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.7300 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	915.8133	1.1300	1034.8691 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2853.1502	1.1300	3224.0597 (278)
Space and water heating			4258.9288 (279)
Pumps, fans and electric keep-hot	214.8305	1.5128	324.9956 (281)
Energy for lighting	151.1977	1.5338	231.9120 (282)
Total Primary energy kWh/year			4815.8364 (286)
Dwelling Primary energy Rate (DPER)			78.4300 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	61.4000 (1b)	x 2.6500 (2b)	= 162.7100 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.4000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 162.7100 (5)

2. Ventilation rate

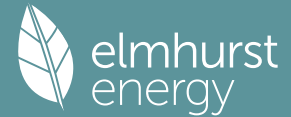
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.1229 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3729 (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) = 0.3170 (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	0.4041	0.3962	0.3883	0.3487	0.3408	0.3011	0.3011	0.2932	0.3170	0.3408	0.3566	0.3725 (22b)
Effective ac	0.5817	0.5785	0.5754	0.5608	0.5581	0.5453	0.5453	0.5430	0.5502	0.5581	0.5636	0.5694 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)

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TER Opening Type (Uw = 1.20)				13.4700	1.1450	15.4237	(27)
External Wall 1	41.3000	13.4700		27.8300	0.1800	5.0094	(29a)
Corridor Wall 2	8.5000	1.8900		6.6100	0.1800	1.1898	(29a)
Total net area of external elements Aum(A, m2)				49.8000			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	23.5129		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 102.4528 (35)

List of Thermal Bridges				Length	Psi-value	Total	
K1 Element							
E7 Party floor between dwellings (in blocks of flats)				33.1000	0.0700	2.3170	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation				0.4500	0.0200	0.0090	
E16 Corner (normal)				5.3000	0.0900	0.4770	
E18 Party wall between dwellings				7.9500	0.0600	0.4770	
E25 Staggered party wall between dwellings				2.6500	0.0600	0.1590	
E2 Other lintels (including other steel lintels)				9.5300	0.0500	0.4765	
E3 Sill				8.6300	0.0500	0.4315	
E4 Jamb				41.2000	0.0500	2.0600	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.4070 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 29.9199 (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
	31.2323	31.0620	30.8951	30.1111	29.9645	29.2817	29.2817	29.1552	29.5447	29.9645	30.2612	30.5714 (38)
Heat transfer coeff	61.1522	60.9819	60.8150	60.0310	59.8843	59.2015	59.2015	59.0751	59.4645	59.8843	60.1810	60.4913 (39)
Average = Sum(39)m / 12 =												60.0303
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9960	0.9932	0.9905	0.9777	0.9753	0.9642	0.9642	0.9621	0.9685	0.9753	0.9801	0.9852 (40)
HLP (average)												0.9777
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0209 (42)												
Hot water usage for mixer showers												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	58.1039	57.2307	55.9583	53.5238	51.7272	49.7236	48.5848	49.8476	51.2318	53.3830	55.8698	57.8813 (42a)
Hot water usage for baths												
	25.1098	24.7369	24.2118	23.2435	22.5185	21.7145	21.2803	21.8017	22.3695	23.2298	24.2180	25.0249 (42b)
Hot water usage for other uses												
	35.3263	34.0417	32.7571	31.4725	30.1880	28.9034	28.9034	30.1880	31.4725	32.7571	34.0417	35.3263 (42c)
Average daily hot water use (litres/day)												
	31	28	31	30	31	30	31	31	30	31	30	31 (43)
Daily hot water use												
	118.5401	116.0094	112.9272	108.2398	104.4336	100.3415	98.7684	101.8372	105.0739	109.3699	114.1295	118.2325 (44)
Energy content (annual)												
	187.7385	165.1958	173.5649	148.1749	140.5877	123.3816	119.4518	126.0958	129.5666	148.4140	162.5985	185.1236 (45)
Distribution loss (46)m = 0.15 x (45)m												
	28.1608	24.7794	26.0347	22.2262	21.0882	18.5072	17.9178	18.9144	19.4350	22.2621	24.3898	27.7685 (46)
Water storage loss:												
Store volume 210.0000 (47)												
a) If manufacturer declared loss factor is known (kWh/day): 1.7016 (48)												
Temperature factor from Table 2b 0.5400 (49)												
Enter (49) or (54) in (55) 0.9188 (55)												
Total storage loss												
	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (56)
If cylinder contains dedicated solar storage												
	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (57)
Primary loss												
	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	239.4851	211.9346	225.3115	198.2523	192.3343	173.4589	171.1984	177.8424	179.6439	200.1605	212.6758	236.8702 (62)
WWHRS												
	-26.5627	-23.4923	-24.5997	-20.3696	-18.9837	-16.2445	-15.2266	-16.1920	-16.8072	-19.8138	-22.4466	-26.0708 (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												
	212.9224	188.4424	200.7118	177.8827	173.3506	157.2144	155.9718	161.6504	162.8368	180.3468	190.2292	210.7994 (64)
Total per year (kWh/year) = Sum(64)m = 2172.3585 (64)												
12Total per year (kWh/year) 2172 (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												
	103.8203	92.3187	99.1076	89.3300	88.1427	81.0862	81.1150	83.3241	83.1428	90.7449	94.1259	102.9509 (65)

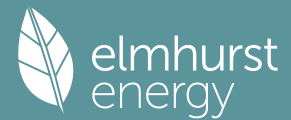
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	89.0445	98.5850	89.0445	92.0126	89.0445	92.0126	89.0445	89.0445	92.0126	89.0445	92.0126	89.0445 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	176.4635	178.2946	173.6802	163.8567	151.4562	139.8015	132.0155	130.1844	134.7988	144.6223	157.0227	168.6774 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046	33.1046 (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)												
	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371	-80.8371 (71)
Water heating gains (Table 5)												
	139.5434	137.3790	133.2091	124.0695	118.4713	112.6198	109.0255	111.9948	115.4761	121.9690	130.7304	138.3748 (72)
Total internal gains												
	461.3653	470.5725	452.2478	436.2527	415.2860	397.7479	383.3995	384.5376	395.6014	411.9497	436.0797	452.4107 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
	m2	Table 6a	Specific data	Specific data	factor	W

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				W/m2	or Table 6b	or Table 6c	Table 6d	
North				4.5300	10.6334	0.6300	0.7700	14.7212 (74)
West				3.0200	19.6403	0.6300	0.7700	18.1270 (80)
Northwest				5.9200	11.2829	0.6300	0.7700	20.4134 (81)

Solar gains	53.2616	105.1453	181.0663	284.9042	373.0833	393.7753	369.9333	300.8022	216.6186	126.3451	66.4481	43.8497 (83)
Total gains	514.6269	575.7178	633.3141	721.1569	788.3693	791.5232	753.3328	685.3398	612.2200	538.2948	502.5277	496.2603 (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	28.5744	28.6542	28.7329	29.1081	29.1794	29.5159	29.5159	29.5791	29.3854	29.1794	29.0355	28.8866
alpha	2.9050	2.9103	2.9155	2.9405	2.9453	2.9677	2.9677	2.9719	2.9590	2.9453	2.9357	2.9258
util living area	0.9272	0.9001	0.8522	0.7489	0.6066	0.4491	0.3360	0.3808	0.5851	0.7981	0.8966	0.9332 (86)
MIT	19.1205	19.3969	19.8158	20.3522	20.7260	20.9181	20.9741	20.9624	20.8182	20.3277	19.6591	19.0816 (87)
Th 2	20.0867	20.0890	20.0913	20.1020	20.1040	20.1133	20.1133	20.1150	20.1097	20.1040	20.0999	20.0957 (88)
util rest of house	0.9179	0.8877	0.8339	0.7196	0.5642	0.3943	0.2717	0.3128	0.5277	0.7669	0.8818	0.9245 (89)
MIT 2	17.9011	18.2466	18.7657	19.4169	19.8428	20.0493	20.0984	20.0921	19.9560	19.4059	18.5875	17.8583 (90)
Living area fraction	FLA = Living area / (4) =											
MIT	18.6101	18.9154	19.3763	19.9607	20.3563	20.5544	20.6076	20.5981	20.4573	19.9419	19.2106	18.5696 (91)
Temperature adjustment	0.0000											
adjusted MIT	18.6101	18.9154	19.3763	19.9607	20.3563	20.5544	20.6076	20.5981	20.4573	19.9419	19.2106	18.5696 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8992	0.8686	0.8175	0.7146	0.5765	0.4220	0.3079	0.3504	0.5509	0.7607	0.8644	0.9064 (94)
Useful gains	462.7570	500.0766	517.7462	515.3670	454.5264	334.0379	231.9299	240.1469	337.2664	409.4940	434.3637	449.8071 (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	875.0940	854.6855	783.0707	663.9837	518.3777	352.5115	237.2544	248.0016	378.0367	559.4304	728.8272	869.2336 (97)
Space heating kWh	306.7787	238.2972	197.4014	107.0040	47.5054	0.0000	0.0000	0.0000	0.0000	111.5527	212.0137	312.0533 (98a)
Space heating requirement - total per year (kWh/year)												1532.6064
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	306.7787	238.2972	197.4014	107.0040	47.5054	0.0000	0.0000	0.0000	0.0000	111.5527	212.0137	312.0533 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1532.6064
Space heating per m2												(98c) / (4) = 24.9610 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	306.7787	238.2972	197.4014	107.0040	47.5054	0.0000	0.0000	0.0000	0.0000	111.5527	212.0137	312.0533 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	332.3713	258.1768	213.8693	115.9307	51.4684	0.0000	0.0000	0.0000	0.0000	120.8589	229.7006	338.0859 (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	212.9224	188.4424	200.7118	177.8827	173.3506	157.2144	155.9718	161.6504	162.8368	180.3468	190.2292	210.7994 (64)
Efficiency of water heater (217)m	84.8780	84.5873	84.0225	82.9580	81.5784	79.8000	79.8000	79.8000	79.8000	83.0154	84.3035	79.8000 (216)
Fuel for water heating, kWh/month	250.8568	222.7786	238.8786	214.4249	212.4956	197.0106	195.4534	202.5694	204.0561	217.2449	225.6480	248.1808 (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	18.5017	14.8427	13.3642	9.7912	7.5630	6.1791	6.8992	8.9679	11.6484	15.2833	17.2625	19.0159 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-6.2870	-9.7913	-15.5287	-19.3247	-22.5517	-21.6950	-21.4354	-19.3653	-16.0605	-11.9653	-7.2336	-5.3331 (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	-1.2049	-2.6476	-5.4823	-8.5715	-11.6755	-11.8567	-11.7149	-9.7576	-6.9471	-3.8896	-1.6405	-0.9445 (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												1660.4620 (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	79.8000	
Water heating fuel used	2629.5977	(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)	149.3192	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-252.9041	(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	4272.4748	(238)

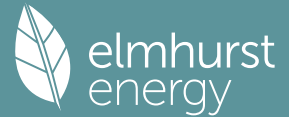
 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1660.4620	0.2100	348.6970 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2629.5977	0.2100	552.2155 (264)
Space and water heating			900.9125 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	149.3192	0.1443	21.5514 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-176.5714	0.1326	-23.4074
PV Unit electricity exported	-76.3326	0.1247	-9.5225
Total			-32.9299 (269)
Total CO2, kg/year			901.4633 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.6800 (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	1660.4620	1.1300	1876.3220 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2629.5977	1.1300	2971.4454 (278)
Space and water heating			4847.7674 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	149.3192	1.5338	229.0308 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-176.5714	1.4898	-263.0605
PV Unit electricity exported	-76.3326	0.4579	-34.9497
Total			-298.0102 (283)
Total Primary energy kWh/year			4908.8888 (286)
Target Primary Energy Rate (TPER)			79.9500 (287)

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Property Reference	Unit 6		Issued on Date	25/01/2024	
Assessment Reference	Be Lean_Copy_Copy	Prop Type Ref	Unit 6		
Property					
SAP Rating	85 B	DER	12.38	TER	13.48
Environmental	91 B	% DER < TER			8.16
CO ₂ Emissions (t/year)	0.71	DFEE	25.93	TFEE	26.67
Compliance Check	See BREL	% DFEE < TFEE			2.80
% DPER < TPER	3.21	DPER	71.26	TPER	73.62
Assessor Details	Dr. Alan Harries			Assessor ID	BC24-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.0000 (1b)	2.6500 (2b)	161.6500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0000		161.6500 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	161.6500 (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		3 (19)

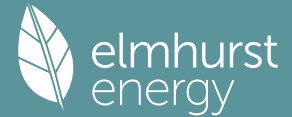
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												80.1000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2477	0.2448	0.2419	0.2274	0.2245	0.2099	0.2099	0.2070	0.2157	0.2245	0.2303	0.2361 (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
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			9.0600	1.1450	10.3740		(27)
External Wall 1	25.2000	9.0600	16.1400	0.1500	2.4210	14.0000	225.9600 (29a)
Corridor Wall 2	29.8000	1.8900	27.9100	0.1400	3.9074	150.0000	4186.5000 (29a)
Total net area of external elements Aum(A, m ²)			55.0000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	18.5924	(33)
Party Floor 1			61.0000			40.0000	2440.0000 (32a)
Party Ceiling 1			61.0000			30.0000	1830.0000 (32b)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) =
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							8682.4600 (34)
List of Thermal Bridges							142.3354 (35)
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				5.1000	0.2500	1.2750	
E3 Sill				4.2000	0.0400	0.1680	

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E4 Jamb		21.0000	0.0400	0.8400
E7 Party floor between dwellings (in blocks of flats)		37.2000	0.0500	1.8600
E23 Balcony within or between dwellings, balcony support penetrates wall insulation		0.5600	1.0000	0.5600
E16 Corner (normal)		5.3000	0.0900	0.4770
E17 Corner (inverted - internal area greater than external area)		2.6500	-0.0900	-0.2385
E18 Party wall between dwellings		5.3000	0.0600	0.3180
E25 Staggered party wall between dwellings		5.3000	0.1200	0.6360
E19 Ground floor (inverted)		0.0000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
 Point Thermal bridges (36a) = 5.8955 (36)
 Total fabric heat loss (33) + (36) + (36a) = 24.4879 (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
	13.2144	13.0594	12.9044	12.1292	11.9742	11.1990	11.1990	11.0440	11.5091	11.9742	12.2842	12.5943 (38)
Heat transfer coeff	37.7024	37.5473	37.3923	36.6172	36.4621	35.6870	35.6870	35.5319	35.9970	36.4621	36.7722	37.0822 (39)
Average = Sum(39)m / 12 =												36.5784

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.6181	0.6155	0.6130	0.6003	0.5977	0.5850	0.5850	0.5825	0.5901	0.5977	0.6028	0.6079 (40)
HLP (average)												0.5996
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0098 (42)

Hot water usage for mixer showers

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	57.9167	57.0463	55.7780	53.3513	51.5605	49.5634	48.4282	49.6869	51.0667	53.2110	55.6898	57.6948 (42a)
Hot water usage for baths	25.0293	24.6576	24.1341	23.1690	22.4462	21.6449	21.2120	21.7318	22.2978	23.1553	24.1403	24.9447 (42b)
Hot water usage for other uses	35.2120	33.9315	32.6511	31.3707	30.0902	28.8098	28.8098	30.0902	31.3707	32.6511	33.9315	35.2120 (42c)
Average daily hot water use (litres/day)												108.6142 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	118.1580	115.6354	112.5632	107.8910	104.0970	100.0181	98.4501	101.5090	104.7352	109.0174	113.7617	117.8515 (44)
Energy content (annual)	187.1333	164.6633	173.0055	147.6973	140.1346	122.9839	119.0668	125.6893	129.1490	147.9356	162.0744	184.5269 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1804.0599
Water storage loss:	28.0700	24.6995	25.9508	22.1546	21.0202	18.4476	17.8600	18.8534	19.3723	22.1903	24.3112	27.6790 (46)
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.2300 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.6642 (55)
Total storage loss	20.5902	18.5976	20.5902	19.9260	20.5902	19.9260	20.5902	20.5902	19.9260	20.5902	19.9260	20.5902 (56)
If cylinder contains dedicated solar storage	20.5902	18.5976	20.5902	19.9260	20.5902	19.9260	20.5902	20.5902	19.9260	20.5902	19.9260	20.5902 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	230.9859	204.2721	216.8581	190.1353	183.9872	165.4219	162.9194	169.5419	171.5870	191.7882	204.5124	228.3795 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	230.9859	204.2721	216.8581	190.1353	183.9872	165.4219	162.9194	169.5419	171.5870	191.7882	204.5124	228.3795 (64)
12Total per year (kWh/year)												2320.3889 (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	97.3039	86.4376	92.6064	83.0598	81.6768	74.8425	74.6718	76.8738	76.8924	84.2707	87.8401	96.4373 (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
	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	91.3013	101.0836	91.3013	94.3447	91.3013	94.3447	91.3013	91.3013	94.3447	91.3013	94.3447	91.3013 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.4617	177.2825	172.6943	162.9265	150.5964	139.0079	131.2661	129.4454	134.0336	143.8013	156.1314	167.7199 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488 (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)	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905 (71)
Water heating gains (Table 5)	130.7848	128.6274	124.4710	115.3608	109.7807	103.9480	100.3653	103.3250	106.7950	113.2670	122.0002	129.6200 (72)
Total internal gains	453.6943	463.1398	444.6130	428.7784	407.8248	390.4470	376.0791	377.2181	388.3197	404.5161	428.6227	444.7876 (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	
West		9.0600	19.6403	0.4000	0.8000	0.7700	39.4601 (80)
Solar gains	39.4601	77.1924	127.1249	185.4041	227.2197	232.5998	221.4445
Total gains	493.1544	540.3323	571.7379	614.1825	635.0445	623.0468	597.5236
							190.2176
							147.8515
							567.4356
							536.1712
							496.1114
							477.8248
							32.4501 (83)
							477.2377 (84)

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7. Mean internal temperature (heating season)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	63.9693	64.2334	64.4997	65.8652	66.1452	67.5820	67.5820	67.8768	66.9998	66.1452	65.5875	65.0391
alpha	5.2646	5.2822	5.3000	5.3910	5.4097	5.5055	5.5055	5.5251	5.4667	5.4097	5.3725	5.3359
util living area	0.9236	0.8840	0.8181	0.6819	0.5255	0.3657	0.2627	0.2878	0.4595	0.7131	0.8700	0.9308 (86)
MIT	20.4560	20.6035	20.7671	20.9239	20.9830	20.9982	20.9998	20.9996	20.9937	20.9201	20.7005	20.4398 (87)
Th 2	20.4138	20.4160	20.4183	20.4297	20.4320	20.4435	20.4435	20.4458	20.4389	20.4320	20.4275	20.4229 (88)
util rest of house	0.9139	0.8707	0.7992	0.6561	0.4953	0.3342	0.2295	0.2532	0.4233	0.6831	0.8536	0.9219 (89)
MIT 2	19.7852	19.9663	20.1635	20.3522	20.4166	20.4421	20.4434	20.4456	20.4339	20.3530	20.0963	19.7731 (90)
Living area fraction										FLA = Living area / (4) =		0.4344 (91)
MIT	20.0766	20.2431	20.4257	20.6005	20.6626	20.6837	20.6851	20.6863	20.6771	20.5993	20.3588	20.0627 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.9266	20.0931	20.2757	20.4505	20.5126	20.5337	20.5351	20.5363	20.5271	20.4493	20.2088	19.9127 (93)

8. Space heating requirement

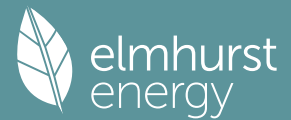
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9049	0.8627	0.7944	0.6570	0.4996	0.3393	0.2350	0.2589	0.4290	0.6841	0.8468	0.9131 (94)
Useful gains	446.2657	466.1568	454.1634	403.5320	317.2936	211.3877	140.3939	146.9068	230.0215	339.3715	404.5995	435.7599 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	589.1615	570.4618	515.1063	422.9476	321.3276	211.7554	140.4310	146.9693	231.3565	359.1279	482.0383	582.6624 (97)
Space heating kWh	106.3145	70.0930	45.3415	13.9792	3.0013	0.0000	0.0000	0.0000	0.0000	14.6988	55.7560	109.2955 (98a)
Space heating requirement - total per year (kWh/year)												418.4798
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	106.3145	70.0930	45.3415	13.9792	3.0013	0.0000	0.0000	0.0000	0.0000	14.6988	55.7560	109.2955 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												418.4798
Space heating per m2										(98c) / (4) =		6.8603 (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 %) 88.7000 (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	106.3145	70.0930	45.3415	13.9792	3.0013	0.0000	0.0000	0.0000	0.0000	14.6988	55.7560	109.2955 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	119.8585	79.0225	51.1178	15.7601	3.3837	0.0000	0.0000	0.0000	0.0000	16.5714	62.8590	123.2192 (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	230.9859	204.2721	216.8581	190.1353	183.9872	165.4219	162.9194	169.5419	171.5870	191.7882	204.5124	228.3795 (64)
Efficiency of water heater (217)m	82.3331	81.8209	81.1234	80.2577	79.8300	79.7000	79.7000	79.7000	79.7000	80.2798	81.4709	82.4063 (217)
Fuel for water heating, kWh/month	280.5505	249.6575	267.3188	236.9060	230.4737	207.5557	204.4158	212.7252	215.2910	238.8995	251.0251	277.1383 (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	18.1746	16.4158	18.1746	17.5883	18.1746	17.5883	18.1746	18.1746	17.5883	18.1746	17.5883	18.1746 (221)
Lighting	19.7562	15.8491	14.2704	10.4551	8.0758	6.5980	7.3670	9.5760	12.4382	16.3196	18.4330	20.3053 (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												471.7923 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.7000
Water heating fuel used												2871.9570 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6490)												
mechanical ventilation fans (SFP = 0.6490)												127.9912 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												213.9912 (231)
Electricity for lighting (calculated in Appendix L)												159.4438 (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	3717.1843 (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	471.7923	0.2100	99.0764 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2871.9570	0.2100	603.1110 (264)
Space and water heating			702.1874 (265)
Pumps, fans and electric keep-hot	213.9912	0.1387	29.6832 (267)
Energy for lighting	159.4438	0.1443	23.0127 (268)
Total CO2, kg/year			754.8832 (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	471.7923	1.1300	533.1253 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2871.9570	1.1300	3245.3114 (278)
Space and water heating			3778.4367 (279)
Pumps, fans and electric keep-hot	213.9912	1.5128	323.7259 (281)
Energy for lighting	159.4438	1.5338	244.5602 (282)
Total Primary energy kWh/year			4346.7228 (286)
Dwelling Primary energy Rate (DPER)			71.2600 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	61.0000 (1b)	x 2.6500 (2b)	= 161.6500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 161.6500 (5)

2. Ventilation rate

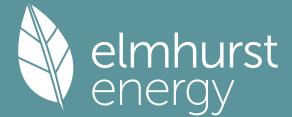
		m3 per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number 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) = 0.1237 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	Yes	
Infiltration rate		5.0000 (17)
Number of sides sheltered		0.3737 (18)
		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2896 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.3693	0.3620	0.3548	0.3186	0.3114	0.2752	0.2752	0.2679	0.2896	0.3114	0.3258	0.3403 (22b)
	0.5682	0.5655	0.5629	0.5508	0.5485	0.5379	0.5379	0.5359	0.5419	0.5485	0.5531	0.5579 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)

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TER Opening Type (Uw = 1.20)			9.0600	1.1450	10.3740		(27)
External Wall 1	25.2000	9.0600	16.1400	0.1800	2.9052		(29a)
Corridor Wall 2	29.8000	1.8900	27.9100	0.1800	5.0238		(29a)
Total net area of external elements Aum(A, m2)			55.0000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.1930		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 152.3354 (35)

List of Thermal Bridges				Length	Psi-value	Total	
K1 Element				5.1000	0.0500	0.2550	
E2 Other lintels (including other steel lintels)				4.2000	0.0500	0.2100	
E3 Sill				21.0000	0.0500	1.0500	
E4 Jamb				37.2000	0.0700	2.6040	
E7 Party floor between dwellings (in blocks of flats)				0.5600	0.0200	0.0112	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation				5.3000	0.0900	0.4770	
E16 Corner (normal)				2.6500	-0.0900	-0.2385	
E17 Corner (inverted - internal area greater than external area)				5.3000	0.0600	0.3180	
E18 Party wall between dwellings				5.3000	0.0600	0.3180	
E25 Staggered party wall between dwellings				0.0000	0.0700	0.0000	
E19 Ground floor (inverted)							

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.0047 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 25.1977 (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
	30.3096	30.1684	30.0299	29.3796	29.2580	28.6916	28.6916	28.5867	28.9098	29.2580	29.5041	29.7614
Heat transfer coeff												
	55.5074	55.3661	55.2277	54.5774	54.4557	53.8893	53.8893	53.7845	54.1075	54.4557	54.7018	54.9592
Average = Sum(39)m / 12 =												54.5768

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9100	0.9076	0.9054	0.8947	0.8927	0.8834	0.8834	0.8817	0.8870	0.8927	0.8968	0.9010
HLP (average)												0.8947
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

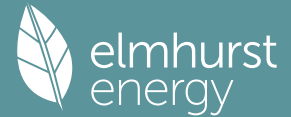
Assumed occupancy 2.0098 (42)												
Hot water usage for mixer showers												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	57.9167	57.0463	55.7780	53.3513	51.5605	49.5634	48.4282	49.6869	51.0667	53.2110	55.6898	57.6948
Hot water usage for baths												
	25.0293	24.6576	24.1341	23.1690	22.4462	21.6449	21.2120	21.7318	22.2978	23.1553	24.1403	24.9447
Hot water usage for other uses												
	35.2120	33.9315	32.6511	31.3707	30.0902	28.8098	28.8098	30.0902	31.3707	32.6511	33.9315	35.2120
Average daily hot water use (litres/day)												108.6142
Daily hot water use												
	118.1580	115.6354	112.5632	107.8910	104.0970	100.0181	98.4501	101.5090	104.7352	109.0174	113.7617	117.8515
Energy conte	187.1333	164.6633	173.0055	147.6973	140.1346	122.9839	119.0668	125.6893	129.1490	147.9356	162.0744	184.5269
Energy content (annual)										Total = Sum(45)m =		1804.0599
Distribution loss (46)m = 0.15 x (45)m												
	28.0700	24.6995	25.9508	22.1546	21.0202	18.4476	17.8600	18.8534	19.3723	22.1903	24.3112	27.6790
Water storage loss:												
Store volume 210.0000 (47)												
a) If manufacturer declared loss factor is known (kWh/day):												
Temperature factor from Table 2b 1.7016 (48)												
Enter (49) or (54) in (55) 0.5400 (49)												
Total storage loss 0.9188 (55)												
	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842
If cylinder contains dedicated solar storage												
	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624
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
Total heat required for water heating calculated for each month												
	238.8799	211.4022	224.7521	197.7747	191.8811	173.0612	170.8134	177.4359	179.2263	199.6822	212.1517	236.2735
WWHRS	-26.4771	-23.4166	-24.5205	-20.3039	-18.9225	-16.1921	-15.1775	-16.1398	-16.7530	-19.7500	-22.3743	-25.9868
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
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Output from w/h	212.4028	187.9856	200.2316	177.4708	172.9586	156.8691	155.6359	161.2961	162.4733	179.9322	189.7774	210.2867
Total per year (kWh/year) = Sum(64)m = 2167.3202 (64)												
Electric shower(s) 0.0000 (64a)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)												
Heat gains from water heating, kWh/month												
	103.6191	92.1416	98.9216	89.1712	87.9920	80.9540	80.9870	83.1890	83.0039	90.5859	93.9516	102.7525

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
	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	93.7480	103.7924	93.7480	96.8729	93.7480	96.8729	93.7480	93.7480	96.8729	93.7480	96.8729	93.7480
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	175.4617	177.2825	172.6943	162.9265	150.5964	139.0079	131.2661	129.4454	134.0336	143.8013	156.1314	167.7199
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000
Losses e.g. evaporation (negative values) (Table 5)												
	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905
Water heating gains (Table 5)												
	139.2730	137.1155	132.9591	123.8489	118.2688	112.4361	108.8535	111.8131	115.2832	121.7552	130.4883	138.1082
Total internal gains	464.6292	474.3369	455.5479	439.7948	418.7597	401.4635	387.0140	388.1529	399.3361	415.4510	439.6391	455.7225

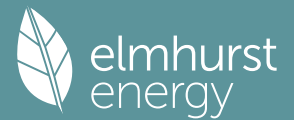
6. Solar gains

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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					
West			9.0600	19.6403	0.6300	0.7000	0.7700	54.3810 (80)					
Solar gains	54.3810	106.3808	175.1940	255.5101	313.1372	320.5516	203.7579	126.2298	67.8067	44.7203 (83)			
Total gains	519.0102	580.7177	630.7419	695.3049	731.8969	722.0151	603.0941	541.6808	507.4458	500.4428 (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	46.5027	46.6213	46.7382	47.2950	47.4007	47.8989	47.8989	47.9923	47.7057	47.4007	47.1874	46.9665	
alpha	4.1002	4.1081	4.1159	4.1530	4.1600	4.1933	4.1933	4.1995	4.1804	4.1600	4.1458	4.1311	
util living area	0.9570	0.9325	0.8873	0.7846	0.6378	0.4662	0.3400	0.3764	0.5844	0.8237	0.9289	0.9619 (86)	
MIT	19.8321	20.0497	20.3446	20.6870	20.8919	20.9773	20.9952	20.9927	20.9429	20.6723	20.2127	19.7974 (87)	
Th 2	20.1590	20.1610	20.1629	20.1720	20.1737	20.1816	20.1816	20.1831	20.1786	20.1737	20.1703	20.1667 (88)	
util rest of house	0.9496	0.9214	0.8693	0.7537	0.5928	0.4103	0.2779	0.3113	0.5248	0.7905	0.9155	0.9553 (89)	
MIT 2	18.8096	19.0811	19.4436	19.8532	20.0772	20.1658	20.1793	20.1793	20.1351	19.8477	19.2948	18.7719 (90)	
Living area fraction									FLA = Living area / (4) =				
MIT	19.2538	19.5019	19.8350	20.2154	20.4311	20.5183	20.5338	20.5327	20.4860	20.2059	19.6936	19.2174 (91)	
Temperature adjustment												0.0000	
adjusted MIT	19.2538	19.5019	19.8350	20.2154	20.4311	20.5183	20.5338	20.5327	20.4860	20.2059	19.6936	19.2174 (93)	
8. Space heating requirement													
Utilisation	0.9399	0.9113	0.8614	0.7554	0.6072	0.4336	0.3048	0.3393	0.5477	0.7919	0.9064	0.9460 (94)	
Useful gains	487.8011	529.1906	543.3322	525.2626	444.4173	313.0609	210.9558	220.6561	330.3022	428.9450	459.9635	473.4314 (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	830.0434	808.4511	736.4595	617.5672	475.4585	318.9340	211.9872	222.2742	345.5329	523.0963	688.8919	825.3435 (97)	
Space heating kWh	254.6282	187.6630	143.6867	66.4593	23.0946	0.0000	0.0000	0.0000	0.0000	70.0486	164.8285	261.8226 (98a)	
Space heating requirement - total per year (kWh/year)												1172.2316	
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	254.6282	187.6630	143.6867	66.4593	23.0946	0.0000	0.0000	0.0000	0.0000	70.0486	164.8285	261.8226 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1172.2316	
Space heating per m2												(98c) / (4) =	19.2169 (99)
9a. Energy requirements - Individual heating systems, including micro-CHP													
Fraction of space heat from secondary/supplementary system (Table 11)										0.0000 (201)			
Fraction of space heat from main system(s)										1.0000 (202)			
Efficiency of main space heating system 1 (in %)										92.3000 (206)			
Efficiency of main space heating system 2 (in %)										0.0000 (207)			
Efficiency of secondary/supplementary heating system, %										0.0000 (208)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	254.6282	187.6630	143.6867	66.4593	23.0946	0.0000	0.0000	0.0000	0.0000	70.0486	164.8285	261.8226 (98)	
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)	
Space heating fuel (main heating system)	275.8702	203.3186	155.6736	72.0036	25.0212	0.0000	0.0000	0.0000	0.0000	75.8923	178.5791	283.6648 (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	212.4028	187.9856	200.2316	177.4708	172.9586	156.8691	155.6359	161.2961	162.4733	179.9322	189.7774	210.2867 (64)	
Efficiency of water heater (217)m	84.4675	84.0559	83.3285	82.0661	80.7642	79.8000	79.8000	79.8000	79.8000	82.1326	83.7453	79.8000 (216)	
Fuel for water heating, kWh/month	251.4612	223.6435	240.2920	216.2534	214.1525	196.5778	195.0324	202.1255	203.6006	219.0753	226.6127	248.7055 (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	19.4790	15.6268	14.0702	10.3084	7.9625	6.5054	7.2637	9.4416	12.2637	16.0906	18.1743	20.0204 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-6.2493	-9.7338	-15.4388	-19.2136	-22.4220	-21.5702	-21.3135	-19.2569	-15.9712	-11.8974	-7.1912	-5.3010 (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	-1.1937	-2.6240	-5.4353	-8.5009	-11.5821	-11.7629	-11.6208	-9.6763	-6.8865	-3.8542	-1.6252	-0.9356 (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												1270.0234 (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	79.8000	
Water heating fuel used	2637.5324 (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)	157.2066 (232)	
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-251.2565 (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	3899.5059 (238)	

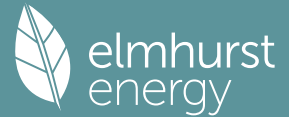
 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1270.0234	0.2100	266.7049 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2637.5324	0.2100	553.8818 (264)
Space and water heating			820.5867 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	157.2066	0.1443	22.6898 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-175.5589	0.1326	-23.2729
PV Unit electricity exported	-75.6976	0.1247	-9.4427
Total			-32.7156 (269)
Total CO2, kg/year			822.4902 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.4800 (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	1270.0234	1.1300	1435.1264 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2637.5324	1.1300	2980.4117 (278)
Space and water heating			4415.5381 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	157.2066	1.5338	241.1287 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-175.5589	1.4898	-261.5510
PV Unit electricity exported	-75.6976	0.4578	-34.6569
Total			-296.2079 (283)
Total Primary energy kWh/year			4490.5597 (286)
Target Primary Energy Rate (TPER)			73.6200 (287)

Full SAP Calculation Printout



Property Reference	Unit 7		Issued on Date	25/01/2024	
Assessment Reference	Be Lean_Copy_Copy	Prop Type Ref	Unit 7		
Property					
SAP Rating	85 B	DER	12.45	TER	14.41
Environmental	90 B	% DER < TER		13.60	
CO ₂ Emissions (t/year)	0.8	DFEE	31.44	TFEE	34.11
Compliance Check	See BREL	% DFEE < TFEE		7.80	
% DPER < TPER	8.37	DPER	71.93	TPER	78.50
Assessor Details	Dr. Alan Harries			Assessor ID	BC24-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	70.4000	2.6500	186.5600
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4000		186.5600
Dwelling volume			186.5600

2. Ventilation rate

	Value	Reference
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)

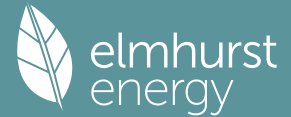
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (21)

	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) =												80.1000 (23c)
Effective ac	0.2621	0.2589	0.2557	0.2397	0.2366	0.2206	0.2206	0.2174	0.2270	0.2366	0.2429	0.2493 (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
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			9.0600	1.1450	10.3740		(27)
External Wall 1	47.6000	9.0600	38.5400	0.1500	5.7810	14.0000	539.5600 (29a)
Corridor Wall 2	41.0000	1.8900	39.1100	0.1400	5.4754	150.0000	5866.5000 (29a)
Total net area of external elements Aum(A, m ²)			88.6000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	23.5204	(33)
Party Floor 1			70.4000			40.0000	2816.0000 (32a)
Party Ceiling 1			70.4000			30.0000	2112.0000 (32b)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) =
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							11334.0600 (34)
List of Thermal Bridges							160.9952 (35)
K1 Element				Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate				6.9000	0.2500	1.7250	
E3 Sill				6.0000	0.0400	0.2400	

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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	66.3932	66.6691	66.9473	68.3739	68.6665	70.1681	70.1681	70.4763	69.5596	68.6665	68.0837	67.5107
alpha	5.4262	5.4446	5.4632	5.5583	5.5778	5.6779	5.6779	5.6984	5.6373	5.5778	5.5389	5.5007
util living area	0.9597	0.9387	0.8999	0.7935	0.6342	0.4463	0.3225	0.3552	0.5612	0.8138	0.9271	0.9638 (86)
MIT	20.3156	20.4537	20.6336	20.8551	20.9635	20.9959	20.9995	20.9991	20.9857	20.8593	20.5856	20.3038 (87)
Th 2	20.3642	20.3667	20.3692	20.3816	20.3841	20.3965	20.3965	20.3990	20.3915	20.3841	20.3791	20.3741 (88)
util rest of house	0.9532	0.9292	0.8849	0.7672	0.5976	0.4051	0.2785	0.3091	0.5151	0.7842	0.9145	0.9578 (89)
MIT 2	19.5686	19.7416	19.9635	20.2330	20.3513	20.3936	20.3962	20.3985	20.3806	20.2441	19.9167	19.5619 (90)
Living area fraction									FLA = Living area / (4) =			
MIT	20.0259	20.1776	20.3737	20.6139	20.7261	20.7623	20.7655	20.7662	20.7510	20.6207	20.3262	20.0161 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.8759	20.0276	20.2237	20.4639	20.5761	20.6123	20.6155	20.6162	20.6010	20.4707	20.1762	19.8661 (93)

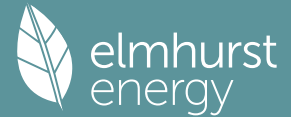
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9474	0.9235	0.8811	0.7709	0.6092	0.4199	0.2945	0.3258	0.5312	0.7886	0.9100	0.9522 (94)
Useful gains	501.4172	525.1826	519.0289	483.2059	395.1562	268.6029	180.0489	188.1338	290.0159	405.8788	462.9349	489.6100 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	738.6080	714.3779	645.3893	532.4725	406.9690	269.7655	180.1723	188.3483	294.2446	452.5726	604.6741	730.5861 (97)
Space heating kWh	176.4699	127.1393	94.0121	35.4720	8.7887	0.0000	0.0000	0.0000	0.0000	34.7401	102.0522	179.2862 (98a)
Space heating requirement - total per year (kWh/year)												757.9605
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	176.4699	127.1393	94.0121	35.4720	8.7887	0.0000	0.0000	0.0000	0.0000	34.7401	102.0522	179.2862 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												757.9605
Space heating per m2										(98c) / (4) =		10.7665 (99)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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 %)												88.7000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	176.4699	127.1393	94.0121	35.4720	8.7887	0.0000	0.0000	0.0000	0.0000	34.7401	102.0522	179.2862 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	198.9514	143.3363	105.9888	39.9909	9.9083	0.0000	0.0000	0.0000	0.0000	39.1659	115.0532	202.1265 (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	244.3194	216.0042	229.1843	200.6584	193.9713	174.1840	171.4027	178.4973	180.7890	202.3288	216.0603	241.5273 (64)
Efficiency of water heater (217)m	83.2422	82.8133	82.1238	80.9336	80.0521	79.7000	79.7000	79.7000	79.7000	80.9029	82.3816	79.7000 (216)
Fuel for water heating, kWh/month	293.5044	260.8327	279.0716	247.9296	242.3064	218.5496	215.0598	223.9615	226.8368	250.0883	262.2678	289.9451 (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	23.2713	21.0192	23.2713	22.5206	23.2713	22.5206	23.2713	23.2713	22.5206	23.2713	22.5206	23.2713 (231)
Lighting	22.7859	18.2797	16.4588	12.0585	9.3143	7.6099	8.4968	11.0445	14.3457	18.8223	21.2598	23.4192 (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												854.5214 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.7000
Water heating fuel used												3010.3536 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8260)												
mechanical ventilation fans (SFP = 0.8260)												188.0002 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												274.0002 (231)
Electricity for lighting (calculated in Appendix L)												183.8953 (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	4322.7706 (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	854.5214	0.2100	179.4495 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3010.3536	0.2100	632.1743 (264)
Space and water heating			811.6238 (265)
Pumps, fans and electric keep-hot	274.0002	0.1387	38.0072 (267)
Energy for lighting	183.8953	0.1443	26.5418 (268)
Total CO2, kg/year			876.1727 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.4500 (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	854.5214	1.1300	965.6091 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3010.3536	1.1300	3401.6996 (278)
Space and water heating			4367.3088 (279)
Pumps, fans and electric keep-hot	274.0002	1.5128	414.5076 (281)
Energy for lighting	183.8953	1.5338	282.0648 (282)
Total Primary energy kWh/year			5063.8811 (286)
Dwelling Primary energy Rate (DPER)			71.9300 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	70.4000 (1b)	x 2.6500 (2b)	= 186.5600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 186.5600 (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) = 0.1608 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4108 (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) = 0.3492 (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	0.4452	0.4365	0.4278	0.3841	0.3754	0.3317	0.3317	0.3230	0.3492	0.3754	0.3928	0.4103 (22b)
Effective ac	0.5991	0.5953	0.5915	0.5738	0.5705	0.5550	0.5550	0.5522	0.5610	0.5705	0.5772	0.5842 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.20)			9.0600	1.1450	10.3740		(27)

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External Wall 1	47.6000	9.0600	38.5400	0.1800	6.9372	(29a)
Corridor Wall 2	41.0000	1.8900	39.1100	0.1800	7.0398	(29a)
Total net area of external elements Aum(A, m2)			88.6000			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	26.2410		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 170.9952 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	6.9000	0.0500	0.3450
E3 Sill	6.0000	0.0500	0.3000
E4 Jamb	27.8000	0.0500	1.3900
E7 Party floor between dwellings (in blocks of flats)	64.1000	0.0700	4.4870
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	0.4500	0.0200	0.0090
E16 Corner (normal)	15.9000	0.0900	1.4310
E17 Corner (inverted - internal area greater than external area)	7.9500	-0.0900	-0.7155
E18 Party wall between dwellings	5.3000	0.0600	0.3180

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.5645 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 33.8055 (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	36.8839	36.6469	36.4147	35.3239	35.1198	34.1698	34.1698	33.9938	34.5357	35.1198	35.5327	35.9643 (38)
Average = Sum(39)m / 12 =	70.6894	70.4525	70.2203	69.1294	68.9254	67.9753	67.9753	67.7994	68.3413	68.9254	69.3382	69.7699 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0041	1.0007	0.9974	0.9820	0.9791	0.9656	0.9656	0.9631	0.9708	0.9791	0.9849	0.9910 (40)
HLP (average)												0.9819
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2558 (42)

Hot water usage for mixer showers 61.8042 (42a)

Hot water usage for baths 26.7127 (42b)

Hot water usage for other uses 37.7316 (42c)

Average daily hot water use (litres/day) 116.3529 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	126.5768	123.8744	120.5831	115.5779	111.5136	107.1440	105.4644	108.7415	112.1977	116.7850	121.8673	126.2485 (44)
Energy conte	200.4668	176.3954	185.3317	158.2204	150.1187	131.7460	127.5501	134.6447	138.3510	158.4762	173.6223	197.6747 (45)
Energy content (annual)												Total = Sum(45)m = 1932.5980
Distribution loss (46)m = 0.15 x (45)m	30.0700	26.4593	27.7998	23.7331	22.5178	19.7619	19.1325	20.1967	20.7526	23.7714	26.0433	29.6512 (46)
Water storage loss:												210.0000 (47)
Store volume												1.7016 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.9188 (55)
Enter (49) or (54) in (55)												
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	252.2134	223.1343	237.0783	208.2978	201.8653	181.8234	179.2967	186.3913	188.4283	210.2228	223.6997	249.4213 (62)
WWHRS	-28.3630	-25.0845	-26.2670	-21.7501	-20.2703	-17.3455	-16.2586	-17.2894	-17.9463	-21.1567	-23.9680	-27.8377 (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	223.8504	198.0498	210.8113	186.5476	181.5950	164.4779	163.0381	169.1019	170.4820	189.0661	199.7317	221.5835 (64)
12Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m = 2278.3353 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	108.0525	96.0426	103.0201	92.6702	91.3117	83.8674	83.8077	86.1666	86.0636	94.0906	97.7913	107.1241 (65)

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

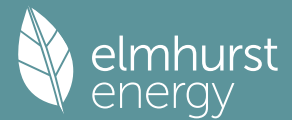
Metabolic gains (Table 5), Watts

(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	109.2704	120.9779	109.2704	112.9127	109.2704	112.9127	109.2704	109.2704	112.9127	109.2704	112.9127	109.2704 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.2288	200.2858	195.1023	184.0671	170.1371	157.0450	148.2986	146.2416	151.4251	162.4603	176.3903	189.4825 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790 (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)	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319 (71)
Water heating gains (Table 5)	145.2318	142.9205	138.4678	128.7086	122.7308	116.4825	112.6447	115.8154	119.5327	126.4659	135.8212	143.9840 (72)
Total internal gains	512.5680	524.0212	502.6774	485.5253	461.9753	443.2772	427.0506	428.1643	440.7076	458.0335	484.9612	502.5738 (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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West	3.0600	19.6403	0.6300	0.7000	0.7700	18.3671 (80)
Northwest	6.0000	11.2829	0.6300	0.7000	0.7700	20.6893 (81)

Solar gains	39.0564	78.0436	135.0469	210.9073	273.2607	286.8376	270.1237	221.7130	161.2742	94.1001	48.9341	32.0001 (83)
Total gains	551.6244	602.0648	637.7243	696.4326	735.2360	730.1148	697.1743	649.8772	601.9818	552.1336	533.8953	534.5739 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	47.3042	47.4633	47.6202	48.3717	48.5149	49.1929	49.1929	49.3206	48.9295	48.5149	48.2260	47.9277
alpha	4.1536	4.1642	4.1747	4.2248	4.2343	4.2795	4.2795	4.2880	4.2620	4.2343	4.2151	4.1952
util living area	0.9769	0.9651	0.9418	0.8747	0.7498	0.5678	0.4224	0.4690	0.7005	0.8979	0.9612	0.9795 (86)
MIT	19.6499	19.8349	20.1199	20.5190	20.8100	20.9564	20.9902	20.9849	20.8941	20.5318	20.0472	19.6308 (87)
Th 2	20.0799	20.0827	20.0855	20.0984	20.1008	20.1121	20.1121	20.1142	20.1078	20.1008	20.0959	20.0908 (88)
util rest of house	0.9721	0.9579	0.9295	0.8488	0.7022	0.4984	0.3401	0.3834	0.6331	0.8710	0.9520	0.9752 (89)
MIT 2	18.5159	18.7506	19.1085	19.6015	19.9304	20.0826	20.1078	20.1070	20.0275	19.6282	19.0300	18.4995 (90)
Living area fraction												fLA = Living area / (4) = 0.6122 (91)
MIT	19.2101	19.4144	19.7277	20.1632	20.4689	20.6176	20.6480	20.6444	20.5581	20.1814	19.6527	19.1921 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2101	19.4144	19.7277	20.1632	20.4689	20.6176	20.6480	20.6444	20.5581	20.1814	19.6527	19.1921 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9664	0.9516	0.9239	0.8508	0.7226	0.5386	0.3902	0.4352	0.6684	0.8737	0.9466	0.9698 (94)
Ext temp.	533.1068	572.8998	589.2025	592.5430	531.2673	393.2324	272.0236	282.8284	402.3676	482.4165	505.3589	518.4392 (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	1053.9877	1022.5740	928.8505	778.6177	604.3994	409.0468	275.1636	287.7703	441.3513	660.4041	870.3842	1045.9941 (97)
Solar heating kWh	387.5354	302.1811	252.6981	133.9738	54.4103	0.0000	0.0000	0.0000	0.0000	132.4228	262.8183	392.5009 (98a)
Solar heating contribution - total per year (kWh/year)												1918.5407
Space heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Space heating kWh	387.5354	302.1811	252.6981	133.9738	54.4103	0.0000	0.0000	0.0000	0.0000	132.4228	262.8183	392.5009 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1918.5407
Space heating per m2												(98c) / (4) = 27.2520 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	387.5354	302.1811	252.6981	133.9738	54.4103	0.0000	0.0000	0.0000	0.0000	132.4228	262.8183	392.5009 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	419.8650	327.3902	273.7791	145.1504	58.9494	0.0000	0.0000	0.0000	0.0000	143.4700	284.7435	425.2447 (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	223.8504	198.0498	210.8113	186.5476	181.5950	164.4779	163.0381	169.1019	170.4820	189.0661	199.7317	221.5835 (64)
Efficiency of water heater (217)m	85.2785	85.0044	84.4673	83.3302	81.7092	79.8000	79.8000	79.8000	79.8000	83.2766	84.6763	79.8000 (216)
Fuel for water heating, kWh/month	262.4932	232.9878	249.5776	223.8657	222.2453	206.1127	204.3084	211.9071	213.6366	227.0340	235.8768	259.6859 (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	22.7042	18.2142	16.3998	12.0152	9.2809	7.5826	8.4664	11.0049	14.2943	18.7548	21.1836	23.3352 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-7.1941	-11.1947	-17.7377	-22.0489	-25.7044	-24.7150	-24.4187	-22.0747	-18.3266	-13.6716	-8.2742	-6.1035 (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	-1.3959	-3.0674	-6.3531	-9.9364	-13.5397	-13.7547	-13.5908	-11.3171	-8.0534	-4.5073	-1.9007	-1.0942 (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												2078.5923 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.8000
Water heating fuel used												2749.7311 (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)	183.2361 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-289.9747 (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	4807.5848 (238)

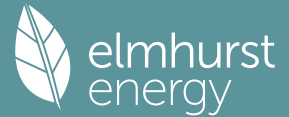
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2078.5923	0.2100	436.5044 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2749.7311	0.2100	577.4435 (264)
Space and water heating			1013.9479 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	183.2361	0.1443	26.4466 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-201.4641	0.1326	-26.7117
PV Unit electricity exported	-88.5106	0.1247	-11.0406
Total			-37.7523 (269)
Total CO2, kg/year			1014.5715 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.4100 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2078.5923	1.1300	2348.8093 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2749.7311	1.1300	3107.1961 (278)
Space and water heating			5456.0054 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	183.2361	1.5338	281.0537 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-201.4641	1.4899	-300.1628
PV Unit electricity exported	-88.5106	0.4578	-40.5214
Total			-340.6842 (283)
Total Primary energy kWh/year			5526.4757 (286)
Target Primary Energy Rate (TPER)			78.5000 (287)

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Property Reference	Unit 8		Issued on Date	25/01/2024	
Assessment Reference	Be Lean_Copy_Copy	Prop Type Ref	Unit 8		
Property					
SAP Rating	85 B	DER	11.88	TER	13.74
Environmental	91 B	% DER < TER		13.54	
CO ₂ Emissions (t/year)	0.77	DFEE	28.21	TFEE	31.38
Compliance Check	See BREL	% DFEE < TFEE		10.10	
% DPER < TPER	8.63	DPER	68.34	TPER	74.79
Assessor Details	Dr. Alan Harries			Assessor ID	BC24-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	70.4000	2.6500	186.5600
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4000		186.5600
Dwelling volume			186.5600

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)

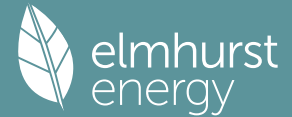
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (21)

	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												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												80.1000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2621	0.2589	0.2557	0.2397	0.2366	0.2206	0.2206	0.2174	0.2270	0.2366	0.2429	0.2493 (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
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.00)			12.1200	0.9615	11.6538		(27)
External Wall 1	47.6000	12.1200	35.4800	0.1500	5.3220	14.0000	496.7200 (29a)
Corridor Wall 2	41.0000	1.8900	39.1100	0.1400	5.4754	150.0000	5866.5000 (29a)
Total net area of external elements Aum(A, m ²)			88.6000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	24.3412	(33)
Party Floor 1			70.4000			40.0000	2816.0000 (32a)
Party Ceiling 1			70.4000			30.0000	2112.0000 (32b)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 11291.2200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							160.3866 (35)
List of Thermal Bridges							
K1 Element					Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate					6.9000	0.2500	1.7250
E3 Sill					6.0000	0.0400	0.2400

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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	65.0168	65.2824	65.5502	66.9225	67.2039	68.6471	68.6471	68.9432	68.0624	67.2039	66.6434	66.0923
alpha	5.3345	5.3522	5.3700	5.4615	5.4803	5.5765	5.5765	5.5962	5.5375	5.4803	5.4429	5.4062
util living area	0.9411	0.8975	0.8337	0.7102	0.5607	0.3954	0.2830	0.3050	0.4731	0.7267	0.8904	0.9488 (86)
MIT	20.3961	20.5797	20.7522	20.9117	20.9782	20.9975	20.9997	20.9995	20.9932	20.9161	20.6680	20.3709 (87)
Th 2	20.3539	20.3564	20.3588	20.3712	20.3737	20.3861	20.3861	20.3886	20.3811	20.3737	20.3687	20.3638 (88)
util rest of house	0.9322	0.8837	0.8135	0.6816	0.5258	0.3580	0.2436	0.2646	0.4321	0.6936	0.8738	0.9409 (89)
MIT 2	19.6590	19.8843	20.0915	20.2830	20.3545	20.3844	20.3859	20.3883	20.3761	20.2930	20.0050	19.6363 (90)
Living area fraction	20.1103	20.3101	20.4960	20.6679	20.7364	20.7597	20.7617	20.7625	20.7539	20.6745	20.4109	0.6122 (91)
MIT	19.9603	20.1601	20.3460	20.5179	20.5864	20.6097	20.6117	20.6125	20.6039	20.5245	20.2609	20.0860 (92)
Temperature adjustment												-0.1500
adjusted MIT												19.9360 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9261	0.8792	0.8131	0.6884	0.5378	0.3717	0.2581	0.2794	0.4469	0.7018	0.8707	0.9349 (94)
Useful gains	546.0985	586.9964	576.4738	514.3608	407.7031	273.8804	183.2205	191.5312	297.7230	435.3109	505.5859	529.1008 (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	755.4597	733.1590	662.5040	544.4948	414.7327	274.5820	183.2920	191.6415	299.7122	463.1822	619.3918	746.7615 (97)
Space heating kWh	155.7647	98.2212	64.0064	21.6965	5.2300	0.0000	0.0000	0.0000	0.0000	20.7362	81.9402	161.9396 (98a)
Space heating requirement - total per year (kWh/year)												609.5350
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	155.7647	98.2212	64.0064	21.6965	5.2300	0.0000	0.0000	0.0000	0.0000	20.7362	81.9402	161.9396 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												609.5350
Space heating per m2												(98c) / (4) = 8.6582 (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 %)												88.7000 (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	155.7647	98.2212	64.0064	21.6965	5.2300	0.0000	0.0000	0.0000	0.0000	20.7362	81.9402	161.9396 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	175.6085	110.7342	72.1606	24.4605	5.8963	0.0000	0.0000	0.0000	0.0000	23.3779	92.3791	182.5700 (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	244.3194	216.0042	229.1843	200.6584	193.9713	174.1840	171.4027	178.4973	180.7890	202.3288	216.0603	241.5273 (64)
Efficiency of water heater	82.9779	82.3106	81.5054	80.4970	79.9129	79.7000	79.7000	79.7000	79.7000	80.4589	81.9874	79.7000 (216)
Fuel for water heating, kWh/month	294.4390	262.4258	281.1890	249.2745	242.7284	218.5496	215.0598	223.9615	226.8368	251.4685	263.5286	83.0836 (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	290.7039 (219)
Pumps and Fa	19.8497	17.9288	19.8497	19.2094	19.8497	19.2094	19.8497	19.8497	19.2094	19.8497	19.2094	0.0000 (221)
Lighting	21.6559	17.3731	15.6426	11.4604	8.8524	7.2325	8.0754	10.4967	13.6342	17.8889	20.2054	19.8497 (231)
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												687.1872 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.7000
Water heating fuel used												3020.1655 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6490)												
mechanical ventilation fans (SFP = 0.6490)												147.7145 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												233.7145 (231)
Electricity for lighting (calculated in Appendix L)												174.7753 (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	4115.8424 (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	687.1872	0.2100	144.3093 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3020.1655	0.2100	634.2348 (264)
Space and water heating			778.5441 (265)
Pumps, fans and electric keep-hot	233.7145	0.1387	32.4191 (267)
Energy for lighting	174.7753	0.1443	25.2255 (268)
Total CO2, kg/year			836.1886 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.8800 (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	687.1872	1.1300	776.5215 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3020.1655	1.1300	3412.7870 (278)
Space and water heating			4189.3085 (279)
Pumps, fans and electric keep-hot	233.7145	1.5128	353.5633 (281)
Energy for lighting	174.7753	1.5338	268.0762 (282)
Total Primary energy kWh/year			4810.9479 (286)
Dwelling Primary energy Rate (DPER)			68.3400 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	70.4000 (1b)	x 2.6500 (2b)	= 186.5600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 186.5600 (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) = 0.1608 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4108 (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) = 0.3492 (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	0.4452	0.4365	0.4278	0.3841	0.3754	0.3317	0.3317	0.3230	0.3492	0.3754	0.3928	0.4103 (22b)
Effective ac	0.5991	0.5953	0.5915	0.5738	0.5705	0.5550	0.5550	0.5522	0.5610	0.5705	0.5772	0.5842 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)

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TER Opening Type (Uw = 1.20)			12.1200	1.1450	13.8779	(27)
External Wall 1	47.6000	12.1200	35.4800	0.1800	6.3864	(29a)
Corridor Wall 2	41.0000	1.8900	39.1100	0.1800	7.0398	(29a)
Total net area of external elements Aum(A, m2)			88.6000			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	29.1941		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 170.3866 (35)

List of Thermal Bridges				
K1 Element		Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate		6.9000	0.0500	0.3450
E3 Sill		6.0000	0.0500	0.3000
E4 Jamb		27.8000	0.0500	1.3900
E7 Party floor between dwellings (in blocks of flats)		64.1000	0.0700	4.4870
E23 Balcony within or between dwellings, balcony support penetrates wall insulation		0.4500	0.0200	0.0090
E16 Corner (normal)		15.9000	0.0900	1.4310
E17 Corner (inverted - internal area greater than external area)		7.9500	-0.0900	-0.7155
E18 Party wall between dwellings		5.3000	0.0600	0.3180
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				7.5645 (36)
Point Thermal bridges				0.0000 (36a) =
Total fabric heat loss				(33) + (36) + (36a) = 36.7586 (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	36.8839	36.6469	36.4147	35.3239	35.1198	34.1698	34.1698	33.9938	34.5357	35.1198	35.5327	35.9643 (38)
Average = Sum(39)m / 12 =	73.6424	73.4055	73.1733	72.0825	71.8784	70.9283	70.9283	70.7524	71.2943	71.8784	72.2912	72.7229 (39)
												72.0815
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0461	1.0427	1.0394	1.0239	1.0210	1.0075	1.0075	1.0050	1.0127	1.0210	1.0269	1.0330 (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													2.2558 (42)
Hot water usage for mixer showers													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for baths	62.0419	61.1096	59.7509	57.1514	55.2330	53.0937	51.8776	53.2260	54.7041	57.0011	59.6564	61.8042 (42a)	
Hot water usage for other uses	26.8033	26.4052	25.8447	24.8111	24.0372	23.1790	22.7155	23.2721	23.8782	24.7964	25.8513	26.7127 (42b)	
Average daily hot water use (litres/day)	37.7316	36.3596	34.9875	33.6154	32.2434	30.8713	30.8713	32.2434	33.6154	34.9875	36.3596	37.7316 (42c)	
												116.3529 (43)	
Daily hot water use													
Energy conte	126.5768	123.8744	120.5831	115.5779	111.5136	107.1440	105.4644	108.7415	112.1977	116.7850	121.8673	126.2485 (44)	
Energy content (annual)	200.4668	176.3954	185.3317	158.2204	150.1187	131.7460	127.5501	134.6447	138.3510	158.4762	173.6223	197.6747 (45)	
Distribution loss (46)m = 0.15 x (45)m	30.0700	26.4593	27.7998	23.7331	22.5178	19.7619	19.1325	20.1967	20.7526	23.7714	26.0433	29.6512 (46)	
Water storage loss:													
Store volume												210.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.7016 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												0.9188 (55)	
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (56)	
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month	252.2134	223.1343	237.0783	208.2978	201.8653	181.8234	179.2967	186.3913	188.4283	210.2228	223.6997	249.4213 (62)	
WWHRS	-28.3630	-25.0845	-26.2670	-21.7501	-20.2703	-17.3455	-16.2586	-17.2894	-17.9463	-21.1567	-23.9680	-27.8377 (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	223.8504	198.0498	210.8113	186.5476	181.5950	164.4779	163.0381	169.1019	170.4820	189.0661	199.7317	221.5835 (64)	
												2278.3353 (64)	
12Total per year (kWh/year)												2278 (64)	
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
												0.0000 (64a)	
Heat gains from water heating, kWh/month	108.0525	96.0426	103.0201	92.6702	91.3117	83.8674	83.8077	86.1666	86.0636	94.0906	97.7913	107.1241 (65)	

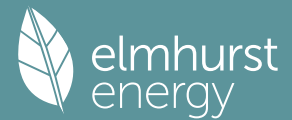
5. Internal gains (see Table 5 and 5a)

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	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	102.8876	113.9113	102.8876	106.3172	102.8876	106.3172	102.8876	102.8876	106.3172	102.8876	106.3172	102.8876 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	198.2288	200.2858	195.1023	184.0671	170.1371	157.0450	148.2986	146.2416	151.4251	162.4603	176.3903	189.4825 (68)
Pumps, fans	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790 (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)	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319 (71)
Total internal gains	145.2318	142.9205	138.4678	128.7086	122.7308	116.4825	112.6447	115.8154	119.5327	126.4659	135.8212	143.9840 (72)
	506.1852	516.9545	496.2947	478.9298	455.5925	436.6816	420.6679	421.7815	434.1120	451.6507	478.3657	496.1910 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
	m2	Table 6a	Specific data	Specific data	factor	W

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				W/m2	or Table 6b	or Table 6c	Table 6d	
South			3.0600	46.7521	0.6300	0.7000	0.7700	43.7214 (78)
Southwest			6.0000	36.7938	0.6300	0.7000	0.7700	67.4680 (79)
West			3.0600	19.6403	0.6300	0.7000	0.7700	18.3671 (80)

Solar gains	129.5565	222.4574	307.6255	384.2180	431.4135	428.2966	412.9565	378.0519	334.3605	246.8804	155.5375	110.6221 (83)
Total gains	635.7418	739.4119	803.9201	863.1478	887.0061	864.9783	833.6244	799.8334	768.4725	698.5311	633.9032	606.8131 (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	45.2457	45.3918	45.5358	46.2249	46.3562	46.9771	46.9771	47.0939	46.7360	46.3562	46.0914	45.8178
alpha	4.0164	4.0261	4.0357	4.0817	4.0904	4.1318	4.1318	4.1396	4.1157	4.0904	4.0728	4.0545
util living area	0.9646	0.9374	0.8950	0.8074	0.6771	0.5068	0.3703	0.4010	0.5992	0.8298	0.9374	0.9696 (86)
MIT	19.7126	19.9788	20.2857	20.6319	20.8574	20.9671	20.9929	20.9901	20.9338	20.6473	20.1386	19.6733 (87)
Th 2	20.0451	20.0479	20.0506	20.0635	20.0659	20.0771	20.0771	20.0792	20.0728	20.0659	20.0610	20.0559 (88)
util rest of house	0.9575	0.9256	0.8756	0.7741	0.6263	0.4399	0.2945	0.3233	0.5312	0.7928	0.9236	0.9635 (89)
MIT 2	18.5695	18.9016	19.2787	19.6956	19.9423	20.0555	20.0740	20.0746	20.0253	19.7247	19.1148	18.5281 (90)
Living area fraction									FLA = Living area / (4) =			
MIT	19.2694	19.5611	19.8952	20.2689	20.5026	20.6136	20.6365	20.6351	20.5815	20.2895	19.7416	19.2292 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2694	19.5611	19.8952	20.2689	20.5026	20.6136	20.6365	20.6351	20.5815	20.2895	19.7416	19.2292 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9505	0.9186	0.8720	0.7818	0.6508	0.4793	0.3407	0.3706	0.5694	0.8024	0.9181	0.9569 (94)
Useful gains	604.2518	679.2304	701.0567	674.8401	577.2266	414.5716	284.0238	296.4010	437.5663	560.4735	582.0139	580.6403 (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	1102.3801	1076.2046	980.1725	819.4954	632.7135	426.5358	286.3050	299.6401	462.0935	696.4648	913.8753	1092.9685 (97)
Space heating kWh	370.6075	266.7667	207.6622	104.1518	41.2822	0.0000	0.0000	0.0000	0.0000	101.1775	238.9402	381.1722 (98a)
Space heating requirement - total per year (kWh/year)												1711.7603
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	370.6075	266.7667	207.6622	104.1518	41.2822	0.0000	0.0000	0.0000	0.0000	101.1775	238.9402	381.1722 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1711.7603
Space heating per m2												(98c) / (4) = 24.3148 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	370.6075	266.7667	207.6622	104.1518	41.2822	0.0000	0.0000	0.0000	0.0000	101.1775	238.9402	381.1722 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	401.5249	289.0213	224.9861	112.8405	44.7261	0.0000	0.0000	0.0000	0.0000	109.6181	258.8734	412.9710 (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	223.8504	198.0498	210.8113	186.5476	181.5950	164.4779	163.0381	169.1019	170.4820	189.0661	199.7317	221.5835 (64)
Efficiency of water heater (217)m	85.1824	84.7284	84.0260	82.8069	81.3267	79.8000	79.8000	79.8000	79.8000	82.7226	84.4628	79.8000 (216)
Fuel for water heating, kWh/month	262.7896	233.7466	250.8881	225.2803	223.2906	206.1127	204.3084	211.9071	213.6366	228.5542	236.4731	259.8767 (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	21.3780	17.1502	15.4419	11.3134	8.7388	7.1397	7.9718	10.3621	13.4593	17.6593	19.9462	21.9722 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-7.1908	-11.1886	-17.7273	-22.0362	-25.6909	-24.7026	-24.4048	-22.0595	-18.3123	-13.6618	-8.2696	-6.1008 (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	-1.3991	-3.0735	-6.3635	-9.9490	-13.5533	-13.7671	-13.6047	-11.3323	-8.0676	-4.5171	-1.9053	-1.0969 (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												1854.5615 (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	79.8000	
Water heating fuel used	2756.8640 (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)	172.5328 (232)	
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-289.9747 (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	4579.9836 (238)	

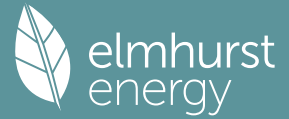
 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1854.5615	0.2100	389.4579 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2756.8640	0.2100	578.9414 (264)
Space and water heating			968.3994 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	172.5328	0.1443	24.9018 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-201.3453	0.1326	-26.6961
PV Unit electricity exported	-88.6294	0.1247	-11.0561
Total			-37.7522 (269)
Total CO2, kg/year			967.4782 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.7400 (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	1854.5615	1.1300	2095.6545 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2756.8640	1.1300	3115.2564 (278)
Space and water heating			5210.9109 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	172.5328	1.5338	264.6366 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-201.3453	1.4899	-299.9863
PV Unit electricity exported	-88.6294	0.4578	-40.5785
Total			-340.5648 (283)
Total Primary energy kWh/year			5265.0835 (286)
Target Primary Energy Rate (TPER)			74.7900 (287)

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Property Reference	Unit 9		Issued on Date	25/01/2024	
Assessment Reference	Be Lean_Copy_Copy	Prop Type Ref	Unit 9		
Property					
SAP Rating	84 B	DER	13.75	TER	15.48
Environmental	90 B	% DER < TER			11.18
CO ₂ Emissions (t/year)	0.78	DFEE	32.30	TFEE	35.19
Compliance Check	See BREL	% DFEE < TFEE			8.22
% DPER < TPER	6.15	DPER	79.28	TPER	84.47
Assessor Details	Dr. Alan Harries			Assessor ID	BC24-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.1000 (1b)	2.6500 (2b)	161.9150 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.1000		161.9150 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 161.9150 (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)

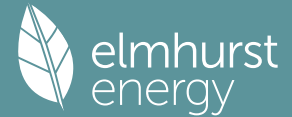
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (21)

	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) =												78.3000 (23c)
Effective ac	0.2711	0.2679	0.2647	0.2488	0.2456	0.2296	0.2296	0.2264	0.2360	0.2456	0.2519	0.2583 (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
Window (Uw = 1.00)			6.7500	0.9615	6.4904		(27)
Door			7.8900	1.0000	7.8900		(26)
External Wall 1	40.3000	12.7500	27.5500	0.1500	4.1325	14.0000	385.7000 (29a)
Corridor Wall 2	27.0000	1.8900	25.1100	0.1400	3.5154	150.0000	3766.5000 (29a)
Total net area of external elements Aum(A, m ²)			67.3000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	22.0283	(33)
Party Floor 1			61.1000			40.0000	2444.0000 (32a)
Party Ceiling 1			61.1000			30.0000	1833.0000 (32b)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 8429.2000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							137.9574 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				6.0000	0.2500	1.5000	
E3 Sill				2.7000	0.0400	0.1080	

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E4 Jamb	29.2000	0.0400	1.1680
E7 Party floor between dwellings (in blocks of flats)	46.3000	0.0500	2.3150
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	0.4500	1.0000	0.4500
E16 Corner (normal)	15.9000	0.0900	1.4310
E17 Corner (inverted - internal area greater than external area)	5.3000	-0.0900	-0.4770
E18 Party wall between dwellings	2.6500	0.0600	0.1590
E25 Staggered party wall between dwellings	2.6500	0.1200	0.3180
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.9720 (36)
Point Thermal bridges			0.0000
Total fabric heat loss	(33) + (36) + (36a) =		29.0003 (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	14.4834	14.3131	14.1428	13.2912	13.1209	12.2693	12.2693	12.0990	12.6099	13.1209	13.4615	13.8021 (38)
Average = Sum(39)m / 12 =	43.4837	43.3134	43.1431	42.2915	42.1212	41.2696	41.2696	41.0993	41.6102	42.1212	42.4618	42.8024 (39)

HLP (average)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7117	0.7089	0.7061	0.6922	0.6894	0.6754	0.6754	0.6727	0.6810	0.6894	0.6950	0.7005 (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 2.0126 (42)

Hot water usage for mixer showers 57.9636 57.0925 55.8232 53.3945 51.6022 49.6035 48.4674 49.7272 51.1081 53.2541 55.7349 57.7415 (42a)

Hot water usage for baths 25.0495 24.6774 24.1536 23.1876 22.4643 21.6623 21.2291 21.7493 22.3158 23.1739 24.1598 24.9648 (42b)

Hot water usage for other uses 35.2406 33.9591 32.6777 31.3962 30.1147 28.8332 28.8332 30.1147 31.3962 32.6777 33.9591 35.2406 (42c)

Average daily hot water use (litres/day) 108.7022 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	118.2537	115.7291	112.6544	107.9783	104.1813	100.0991	98.5298	101.5912	104.8200	109.1057	113.8538	117.9469 (44)
Energy content (annual)	187.2849	164.7967	173.1456	147.8169	140.2480	123.0835	119.1632	125.7911	129.2535	148.0554	162.2056	184.6763 (45)
Distribution loss (46)m = 0.15 x (45)m	28.0927	24.7195	25.9718	22.1725	21.0372	18.4625	17.8745	18.8687	19.3880	22.2083	24.3308	27.7014 (46)
Water storage loss:												210.0000 (47)
Store volume												1.2300 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.6642 (55)
Enter (49) or (54) in (55)												
Total storage loss	20.5902	18.5976	20.5902	19.9260	20.5902	19.9260	20.5902	20.5902	19.9260	20.5902	19.9260	20.5902 (56)
If cylinder contains dedicated solar storage	20.5902	18.5976	20.5902	19.9260	20.5902	19.9260	20.5902	20.5902	19.9260	20.5902	19.9260	20.5902 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	231.1375	204.4055	216.9982	190.2549	184.1006	165.5215	163.0158	169.6437	171.6915	191.9080	204.6436	228.5289 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	231.1375	204.4055	216.9982	190.2549	184.1006	165.5215	163.0158	169.6437	171.6915	191.9080	204.6436	228.5289 (64)
Total per year (kWh/year)												2321.8498 (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	97.3543	86.4819	92.6530	83.0995	81.7146	74.8757	74.7039	76.9076	76.9272	84.3105	87.8838	96.4870 (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	97.2700	107.6918	97.2700	100.5124	97.2700	100.5124	97.2700	97.2700	100.5124	97.2700	100.5124	97.2700 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.7124	177.5357	172.9410	163.1592	150.8116	139.2065	131.4536	129.6303	134.2250	144.0068	156.3544	167.9595 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628 (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)	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024 (71)
Water heating gains (Table 5)	130.8526	128.6933	124.5336	115.4160	109.8314	103.9940	100.4084	103.3705	106.8433	113.3206	122.0608	129.6868 (72)
Total internal gains	460.0234	470.1093	450.9330	435.2760	414.1014	396.9012	382.3204	383.4591	394.7691	410.7857	435.1160	451.1047 (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	4.5000	10.6334	0.4000	0.8000	0.7700	10.6113 (74)
East	2.2500	19.6403	0.4000	0.8000	0.7700	9.7997 (76)
Solar gains	20.4110	39.4490	66.0292	101.3932	130.9890	137.5839
Total gains	480.4343	509.5583	516.9622	536.6692	545.0904	534.4851
						129.5158
						511.8362
						489.8217
						472.9174
						457.6720
						460.4254
						16.9049 (83)
						468.0096 (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	53.8465	54.0582	54.2716	55.3644	55.5883	56.7353	56.7353	56.9704	56.2709	55.5883	55.1424	54.7035
alpha	4.5898	4.6039	4.6181	4.6910	4.7059	4.7824	4.7824	4.7980	4.7514	4.7059	4.6762	4.6469
util living area	0.9436	0.9232	0.8905	0.8041	0.6683	0.4854	0.3532	0.3835	0.5835	0.8062	0.9089	0.9479 (86)
MIT	20.1540	20.2959	20.4869	20.7498	20.9143	20.9854	20.9974	20.9962	20.9650	20.7843	20.4647	20.1429 (87)
Th 2	20.3305	20.3330	20.3354	20.3478	20.3502	20.3626	20.3626	20.3650	20.3576	20.3502	20.3453	20.3404 (88)
util rest of house	0.9357	0.9128	0.8756	0.7793	0.6314	0.4398	0.3027	0.3316	0.5356	0.7773	0.8952	0.9406 (89)
MIT 2	19.3457	19.5234	19.7605	20.0839	20.2694	20.3514	20.3611	20.3628	20.3291	20.1301	19.7443	19.3396 (90)
Living area fraction										FLA = Living area / (4) =		0.6219 (91)
MIT	19.8484	20.0038	20.2123	20.4981	20.6705	20.7457	20.7568	20.7567	20.7246	20.5369	20.1923	19.8392 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.6984	19.8538	20.0623	20.3481	20.5205	20.5957	20.6068	20.6067	20.5746	20.3869	20.0423	19.6892 (93)

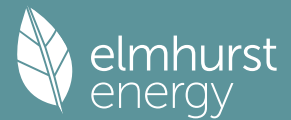
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9270	0.9044	0.8688	0.7794	0.6413	0.4566	0.3221	0.3514	0.5521	0.7791	0.8881	0.9322 (94)
Useful gains	445.3776	460.8383	449.1620	418.2535	349.5873	244.0585	164.8564	172.1357	261.0825	356.5496	408.9164	436.2865 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	669.5803	647.7003	585.1174	484.1558	371.5283	247.4394	165.3609	172.8939	269.4102	412.2375	549.5536	662.9771 (97)
Space heating kWh	166.8068	125.5713	101.1508	47.4497	16.3241	0.0000	0.0000	0.0000	0.0000	41.4318	101.2588	168.6578 (98a)
Space heating requirement - total per year (kWh/year)												768.6510
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	166.8068	125.5713	101.1508	47.4497	16.3241	0.0000	0.0000	0.0000	0.0000	41.4318	101.2588	168.6578 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												768.6510
Space heating per m2												(98c) / (4) = 12.5802 (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 %)												88.7000 (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	166.8068	125.5713	101.1508	47.4497	16.3241	0.0000	0.0000	0.0000	0.0000	41.4318	101.2588	168.6578 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	188.0573	141.5685	114.0369	53.4946	18.4037	0.0000	0.0000	0.0000	0.0000	46.7101	114.1587	190.1440 (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	231.1375	204.4055	216.9982	190.2549	184.1006	165.5215	163.0158	169.6437	171.6915	191.9080	204.6436	228.5289 (64)
Efficiency of water heater												79.7000 (216)
(217)m	83.2403	82.9010	82.3568	81.3476	80.3641	79.7000	79.7000	79.7000	79.7000	81.1622	82.4699	83.2885 (217)
Fuel for water heating, kWh/month	277.6749	246.5657	263.4855	233.8789	229.0831	207.6806	204.5368	212.8529	215.4223	236.4498	248.1434	274.3823 (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	21.5143	19.4322	21.5143	20.8203	21.5143	20.8203	21.5143	21.5143	20.8203	21.5143	20.8203	21.5143 (231)
Lighting	21.0589	16.8943	15.2114	11.1445	8.6084	7.0331	7.8528	10.2074	13.2584	17.3958	19.6485	21.6442 (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												866.5739 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.7000
Water heating fuel used												2850.1561 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8470)												
mechanical ventilation fans (SFP = 0.8470)												167.3132 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												253.3132 (231)
Electricity for lighting (calculated in Appendix L)												169.9577 (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	4140.0009 (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	866.5739	0.2100	181.9805 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2850.1561	0.2100	598.5328 (264)
Space and water heating			780.5133 (265)
Pumps, fans and electric keep-hot	253.3132	0.1387	35.1377 (267)
Energy for lighting	169.9577	0.1443	24.5301 (268)
Total CO2, kg/year			840.1811 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.7500 (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	866.5739	1.1300	979.2285 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2850.1561	1.1300	3220.6764 (278)
Space and water heating			4199.9049 (279)
Pumps, fans and electric keep-hot	253.3132	1.5128	383.2123 (281)
Energy for lighting	169.9577	1.5338	260.6868 (282)
Total Primary energy kWh/year			4843.8039 (286)
Dwelling Primary energy Rate (DPER)			79.2800 (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)
Ground floor	61.1000 (1b)	x 2.6500 (2b)	= 161.9150 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 161.9150 (5)

2. Ventilation rate

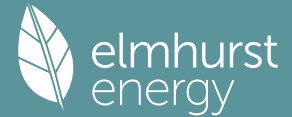
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.1235 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3735 (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) = 0.3175 (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	0.4048	0.3969	0.3889	0.3492	0.3413	0.3016	0.3016	0.2937	0.3175	0.3413	0.3572	0.3731 (22b)
Effective ac	0.5819	0.5788	0.5756	0.5610	0.5582	0.5455	0.5455	0.5431	0.5504	0.5582	0.5638	0.5696 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			7.8900	1.0000	7.8900		(26)

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TER Opening Type (Uw = 1.20)			6.7500	1.1450	7.7290	(27)
External Wall 1	40.3000	12.7500	27.5500	0.1800	4.9590	(29a)
Corridor Wall 2	27.0000	1.8900	25.1100	0.1800	4.5198	(29a)
Total net area of external elements Aum(A, m2)			67.3000			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	25.0978		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 147.9574 (35)

List of Thermal Bridges				
K1 Element		Length	Psi-value	Total
E2 Other lintels (including other steel lintels)		6.0000	0.0500	0.3000
E3 Sill		2.7000	0.0500	0.1350
E4 Jamb		29.2000	0.0500	1.4600
E7 Party floor between dwellings (in blocks of flats)		46.3000	0.0700	3.2410
E23 Balcony within or between dwellings, balcony support penetrates wall insulation		0.4500	0.0200	0.0090
E16 Corner (normal)		15.9000	0.0900	1.4310
E17 Corner (inverted - internal area greater than external area)		5.3000	-0.0900	-0.4770
E18 Party wall between dwellings		2.6500	0.0600	0.1590
E25 Staggered party wall between dwellings		2.6500	0.0600	0.1590

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.4170 (36)
 Total Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 31.5148 (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
	31.0938	30.9238	30.7572	29.9745	29.8281	29.1464	29.1464	29.0202	29.4090	29.8281	30.1243	30.4340
Heat transfer coeff	62.6086	62.4386	62.2720	61.4893	61.3429	60.6612	60.6612	60.5350	60.9238	61.3429	61.6391	61.9488
Average = Sum(39)m / 12 =												61.4886

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1.0247	1.0219	1.0192	1.0064	1.0040	0.9928	0.9928	0.9908	0.9971	1.0040	1.0088	1.0139
HLP (average)												1.0064
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0126 (42)	
Hot water usage for mixer showers														57.7415 (42a)
Hot water usage for baths	57.9636	57.0925	55.8232	53.3945	51.6022	49.6035	48.4674	49.7272	51.1081	53.2541	55.7349	57.7415		
Hot water usage for other uses	25.0495	24.6774	24.1536	23.1876	22.4643	21.6623	21.2291	21.7493	22.3158	23.1739	24.1598	24.9648	(42b)	
Average daily hot water use (litres/day)	35.2406	33.9591	32.6777	31.3962	30.1147	28.8332	28.8332	30.1147	31.3962	32.6777	33.9591	35.2406	(42c)	
Daily hot water use	118.2537	115.7291	112.6544	107.9783	104.1813	100.0991	98.5298	101.5912	104.8200	109.1057	113.8538	117.9469	(44)	
Energy conte	187.2849	164.7967	173.1456	147.8169	140.2480	123.0835	119.1632	125.7911	129.2535	148.0554	162.2056	184.6763	(45)	
Energy content (annual)													1805.5208	
Distribution loss (46)m = 0.15 x (45)m	28.0927	24.7195	25.9718	22.1725	21.0372	18.4625	17.8745	18.8687	19.3880	22.2083	24.3308	27.7014	(46)	
Water storage loss:													210.0000 (47)	
Store volume													1.7016 (48)	
a) If manufacturer declared loss factor is known (kWh/day):													0.5400 (49)	
Temperature factor from Table 2b													0.9188 (55)	
Enter (49) or (54) in (55)														
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)	
If cylinder contains dedicated solar storage														
Primary loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(57)	
Combi loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	(59)	
Total heat required for water heating calculated for each 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	(61)	
WWHRS	239.0315	211.5355	224.8922	197.8943	191.9946	173.1608	170.9098	177.5377	179.3309	199.8020	212.2830	236.4229	(62)	
PV diverter	-26.4985	-23.4355	-24.5403	-20.3204	-18.9378	-16.2052	-15.1898	-16.1529	-16.7666	-19.7659	-22.3924	-26.0078	(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	212.5329	188.1000	200.3519	177.5739	173.0568	156.9556	155.7200	161.3849	162.5643	180.0360	189.8905	210.4151	(64)	
12Total per year (kWh/year)													2169 (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	103.6695	92.1860	98.9682	89.2110	88.0297	80.9871	81.0190	83.2228	83.0387	90.6257	93.9952	102.8021	(65)	

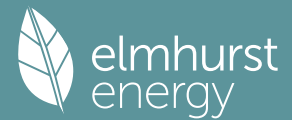
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	100.1777	110.9110	100.1777	103.5169	100.1777	103.5169	100.1777	100.1777	103.5169	100.1777	103.5169	100.1777
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.7124	177.5357	172.9410	163.1592	150.8116	139.2065	131.4536	129.6303	134.2250	144.0068	156.3544	167.9595
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000
Losses e.g. evaporation (negative values) (Table 5)	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024
Water heating gains (Table 5)	139.3407	137.1815	133.0218	123.9042	118.3195	112.4821	108.8966	111.8586	115.3315	121.8087	130.5489	138.1749
Total internal gains	471.4192	481.8166	462.3288	446.7687	425.4972	408.3940	393.7163	394.8550	406.2619	422.1816	446.6087	462.5005

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	4.5000	10.6334	0.6300	0.7000	0.7700	14.6237 (74)
East	2.2500	19.6403	0.6300	0.7000	0.7700	13.5052 (76)

Solar gains	28.1289	54.3656	90.9965	139.7325	180.5193	189.6078	178.4889	146.5809	107.6982	64.6152	34.8796	23.2970 (83)
Total gains	499.5481	536.1823	553.3253	586.5012	606.0165	598.0018	572.2052	541.4359	513.9600	486.7968	481.4883	485.7975 (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	40.1090	40.2182	40.3258	40.8391	40.9365	41.3966	41.3966	41.4829	41.2182	40.9365	40.7398	40.5361
alpha	3.6739	3.6812	3.6884	3.7226	3.7291	3.7598	3.7598	3.7655	3.7479	3.7291	3.7160	3.7024
util living area	0.9642	0.9513	0.9293	0.8706	0.7641	0.5978	0.4519	0.4930	0.7039	0.8802	0.9449	0.9673 (86)
MIT	19.4885	19.6715	19.9563	20.3711	20.7103	20.9168	20.9775	20.9688	20.8417	20.4352	19.9181	19.4653 (87)
Th 2	20.0628	20.0651	20.0674	20.0780	20.0800	20.0893	20.0893	20.0910	20.0857	20.0800	20.0760	20.0718 (88)
util rest of house	0.9578	0.9425	0.9160	0.8459	0.7194	0.5277	0.3643	0.4039	0.6387	0.8524	0.9336	0.9614 (89)
MIT 2	18.3139	18.5452	18.9029	19.4169	19.8099	20.0289	20.0782	20.0745	19.9595	19.5037	18.8656	18.2909 (90)
Living area fraction	FLA = Living area / (4) =											
MIT	19.0444	19.2457	19.5581	20.0103	20.3699	20.5811	20.6375	20.6307	20.5082	20.0830	19.5202	19.0213 (91)
Temperature adjustment	0.0000											
adjusted MIT	19.0444	19.2457	19.5581	20.0103	20.3699	20.5811	20.6375	20.6307	20.5082	20.0830	19.5202	19.0213 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9490	0.9333	0.9076	0.8438	0.7343	0.5665	0.4178	0.4577	0.6702	0.8525	0.9254	0.9530 (94)
Useful gains	474.0905	500.3983	502.1717	494.9154	445.0014	338.7921	239.0518	247.8179	344.4676	414.9966	445.5664	462.9872 (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	923.1280	895.7274	813.1518	683.1675	531.8376	362.8210	244.9205	256.1044	390.4101	581.7177	765.5696	918.1610 (97)
Space heating kWh	334.0839	265.6611	231.3692	135.5415	64.6062	0.0000	0.0000	0.0000	0.0000	124.0405	230.4023	338.6494 (98a)
Space heating requirement - total per year (kWh/year)												1724.3541
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	334.0839	265.6611	231.3692	135.5415	64.6062	0.0000	0.0000	0.0000	0.0000	124.0405	230.4023	338.6494 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1724.3541
Space heating per m2												(98c) / (4) = 28.2218 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	334.0839	265.6611	231.3692	135.5415	64.6062	0.0000	0.0000	0.0000	0.0000	124.0405	230.4023	338.6494 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	361.9544	287.8235	250.6709	146.8489	69.9958	0.0000	0.0000	0.0000	0.0000	134.3884	249.6233	366.9007 (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	212.5329	188.1000	200.3519	177.5739	173.0568	156.9556	155.7200	161.3849	162.5643	180.0360	189.8905	210.4151 (64)
Efficiency of water heater (217)m	85.0696	84.8338	84.3834	83.4617	82.0609	79.8000	79.8000	79.8000	79.8000	83.2415	84.4945	79.8000 (216)
Fuel for water heating, kWh/month	249.8342	221.7276	237.4304	212.7609	210.8883	196.6862	195.1378	202.2367	203.7147	216.2815	224.7371	247.1953 (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	20.8149	16.6985	15.0352	11.0154	8.5086	6.9516	7.7618	10.0891	13.1048	17.1942	19.4208	21.3935 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-6.2624	-9.7552	-15.4731	-19.2558	-22.4699	-21.6156	-21.3598	-19.3013	-16.0097	-11.9255	-7.2070	-5.3121 (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	-1.1928	-2.6229	-5.4353	-8.5042	-11.5900	-11.7722	-11.6286	-9.6793	-6.8854	-3.8519	-1.6237	-0.9347 (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												1868.2059 (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	79.8000	
Water heating fuel used	2618.6306	(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)	167.9885	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-251.6684	(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	4489.1567	(238)

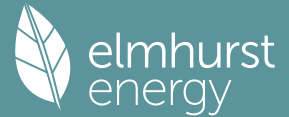
 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1868.2059	0.2100	392.3232 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2618.6306	0.2100	549.9124 (264)
Space and water heating			942.2357 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	167.9885	0.1443	24.2459 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-175.9475	0.1326	-23.3243
PV Unit electricity exported	-75.7209	0.1247	-9.4449
Total			-32.7693 (269)
Total CO2, kg/year			945.6416 (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	1868.2059	1.1300	2111.0727 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2618.6306	1.1300	2959.0526 (278)
Space and water heating			5070.1253 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	167.9885	1.5338	257.6664 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-175.9475	1.4898	-262.1297
PV Unit electricity exported	-75.7209	0.4578	-34.6650
Total			-296.7947 (283)
Total Primary energy kWh/year			5161.0978 (286)
Target Primary Energy Rate (TPER)			84.4700 (287)

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Property Reference	Unit 10		Issued on Date	25/01/2024	
Assessment Reference	Be Lean_Copy_Copy	Prop Type Ref	Unit 10		
Property					
SAP Rating	84 B	DER	13.69	TER	14.73
Environmental	91 B	% DER < TER		7.06	
CO ₂ Emissions (t/year)	0.65	DFEE	26.45	TFEE	27.17
Compliance Check	See BREL	% DFEE < TFEE		2.66	
% DPER < TPER	2.40	DPER	78.61	TPER	80.54
Assessor Details	Dr. Alan Harries			Assessor ID	BC24-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.1000 (1b)	2.6500 (2b)	132.7650 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	132.7650 (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		3 (19)

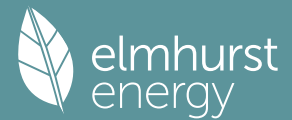
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												80.1000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2477	0.2448	0.2419	0.2274	0.2245	0.2099	0.2099	0.2070	0.2157	0.2245	0.2303	0.2361 (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
Window (Uw = 1.20)			8.2500	1.1450	9.4466		(27)
Door			1.8900	1.0000	1.8900		(26)
External Wall 1	20.1000	8.2500	11.8500	0.1500	1.7775	14.0000	165.9000 (29a)
Corridor Wall 2	22.8000	1.8900	20.9100	0.1400	2.9274	150.0000	3136.5000 (29a)
Total net area of external elements Aum(A, m ²)			42.9000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	16.0415	(33)
Party Floor 1			50.1000			40.0000	2004.0000 (32a)
Party Ceiling 1			50.1000			30.0000	1503.0000 (32b)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	6809.4000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							135.9162 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate				4.2000	0.2500	1.0500	
E3 Sill				3.3000	0.0400	0.1320	

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E4 Jamb	19.2000	0.0400	0.7680	
E7 Party floor between dwellings (in blocks of flats)	27.0000	0.0500	1.3500	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	0.5400	1.0000	0.5400	
E16 Corner (normal)	7.9500	0.0900	0.7155	
E17 Corner (inverted - internal area greater than external area)	5.3000	-0.0900	-0.4770	
E18 Party wall between dwellings	7.9500	0.0600	0.4770	
E25 Staggered party wall between dwellings	2.6500	0.1200	0.3180	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				4.8735 (36)
Point Thermal bridges				0.0000 (36a) =
Total fabric heat loss				20.9150 (37) (33) + (36) + (36a) =

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	10.8532	10.7258	10.5985	9.9619	9.8345	9.1979	9.1979	9.0705	9.4525	9.8345	10.0892	10.3438 (38)
Average = Sum(39)m / 12 =	31.7681	31.6408	31.5135	30.8768	30.7495	30.1128	30.1128	29.9855	30.3675	30.7495	31.0042	31.2588 (39)
												30.8450

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.6341	0.6316	0.6290	0.6163	0.6138	0.6011	0.6011	0.5985	0.6061	0.6138	0.6188	0.6239 (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 1.6930 (42)

Hot water usage for mixer showers 52.6063 51.8157 50.6637 48.4595 46.8329 45.0189 43.9878 45.1311 46.3844 48.3321 50.5836 52.4047 (42a)

Hot water usage for baths 22.7457 22.4079 21.9322 21.0550 20.3983 19.6700 19.2767 19.7490 20.2634 21.0426 21.9378 22.6688 (42b)

Hot water usage for other uses 31.9685 30.8060 29.6435 28.4810 27.3185 26.1560 26.1560 27.3185 28.4810 29.6435 30.8060 31.9685 (42c)

Average daily hot water use (litres/day) 98.6523 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	107.3204	105.0296	102.2394	97.9956	94.5497	90.8450	89.4205	92.1987	95.1288	99.0182	103.3274	107.0420 (44)
Energy content (annual)	169.9693	149.5607	157.1381	134.1511	127.2821	111.7045	108.1464	114.1612	117.3033	134.3668	147.2088	167.6019 (45)
Distribution loss (46)m = 0.15 x (45)m	25.4954	22.4341	23.5707	20.1227	19.0923	16.7557	16.2220	17.1242	17.5955	20.1550	22.0813	25.1403 (46)
Water storage loss:												210.0000 (47)
Store volume												1.2300 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.6642 (55)
Enter (49) or (54) in (55)												
Total storage loss	20.5902	18.5976	20.5902	19.9260	20.5902	19.9260	20.5902	20.5902	19.9260	20.5902	19.9260	20.5902 (56)
If cylinder contains dedicated solar storage												
Primary loss	20.5902	18.5976	20.5902	19.9260	20.5902	19.9260	20.5902	20.5902	19.9260	20.5902	19.9260	20.5902 (57)
Combi loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each 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 (61)
WWHRS	213.8219	189.1695	200.9907	176.5891	171.1347	154.1425	151.9990	158.0138	159.7413	178.2194	189.6468	211.4545 (62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
Output from w/h	213.8219	189.1695	200.9907	176.5891	171.1347	154.1425	151.9990	158.0138	159.7413	178.2194	189.6468	211.4545 (64)
Total per year (kWh/year)												2154.9230 (64)
Electric shower(s)												2155 (64)
Heat gains from 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 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)

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

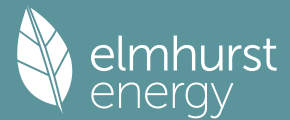
Metabolic gains (Table 5), Watts

(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	84.6523	84.6523	84.6523	84.6523	84.6523	84.6523	84.6523	84.6523	84.6523	84.6523	84.6523	84.6523 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	75.4776	83.5645	75.4776	77.9935	75.4776	77.9935	75.4776	75.4776	77.9935	75.4776	77.9935	75.4776 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	147.4937	149.0242	145.1673	136.9565	126.5918	116.8505	110.3427	108.8122	112.6690	120.8798	131.2445	140.9858 (68)
Pumps, fans	31.4652	31.4652	31.4652	31.4652	31.4652	31.4652	31.4652	31.4652	31.4652	31.4652	31.4652	31.4652 (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)	-67.7218	-67.7218	-67.7218	-67.7218	-67.7218	-67.7218	-67.7218	-67.7218	-67.7218	-67.7218	-67.7218	-67.7218 (71)
Total internal gains	123.1141	121.1547	117.3797	109.1050	104.0368	98.7391	95.4849	98.1730	101.3246	107.2030	115.1352	122.0560 (72)
	397.4810	405.1391	389.4203	375.4508	357.5019	341.9788	329.7008	330.8584	340.3829	354.9561	375.7689	389.9152 (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	8.2500	19.6403	0.4000	0.8000	0.7700	35.9323 (76)
Solar gains	35.9323	70.2911	115.7595	168.8283	206.9054	211.8045
Total gains	433.4133	475.4302	505.1798	544.2790	564.4073	553.7832
						201.6465
						173.2114
						134.6330
						83.4063
						44.8033
						29.5489 (83)
						419.4641 (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	59.5408	59.7804	60.0220	61.2595	61.5132	62.8137	62.8137	63.0805	62.2870	61.5132	61.0080	60.5109
alpha	4.9694	4.9854	5.0015	5.0840	5.1009	5.1876	5.1876	5.2054	5.1525	5.1009	5.0672	5.0341
util living area	0.9044	0.8603	0.7890	0.6511	0.4988	0.3471	0.2492	0.2734	0.4375	0.6833	0.8452	0.9125 (86)
MIT	20.4563	20.6057	20.7705	20.9240	20.9823	20.9979	20.9997	20.9995	20.9931	20.9199	20.7023	20.4394 (87)
Th 2	20.3994	20.4017	20.4040	20.4153	20.4176	20.4291	20.4291	20.4313	20.4245	20.4176	20.4131	20.4085 (88)
util rest of house	0.8932	0.8456	0.7690	0.6252	0.4693	0.3164	0.2169	0.2397	0.4020	0.6530	0.8273	0.9022 (89)
MIT 2	19.7735	19.9560	20.1535	20.3379	20.4015	20.4275	20.4289	20.4311	20.4190	20.3384	20.0849	19.7607 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	20.1347	20.2996	20.4799	20.6479	20.7087	20.7292	20.7308	20.7317	20.7227	20.6460	20.4115	20.1197 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.9847	20.1496	20.3299	20.4979	20.5587	20.5792	20.5808	20.5817	20.5727	20.4960	20.2615	19.9697 (93)

8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8848	0.8390	0.7664	0.6289	0.4765	0.3245	0.2255	0.2486	0.4112	0.6572	0.8223	0.8937 (94)
Useful gains	383.4822	398.8961	387.1913	342.2860	268.9312	179.6928	119.8327	125.3245	195.3315	288.0909	345.8423	374.8906 (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	498.2725	482.5109	435.8268	358.1062	272.4010	180.0508	119.8737	125.3919	196.5587	304.2965	408.0596	492.9422 (97)
Space heating kWh	85.4040	56.1891	36.1849	11.3905	2.5815	0.0000	0.0000	0.0000	0.0000	12.0570	44.7965	87.8304 (98a)
Space heating requirement - total per year (kWh/year)												336.4339
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	85.4040	56.1891	36.1849	11.3905	2.5815	0.0000	0.0000	0.0000	0.0000	12.0570	44.7965	87.8304 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												336.4339
Space heating per m2												(98c) / (4) =
												6.7152 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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 %)												88.7000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	85.4040	56.1891	36.1849	11.3905	2.5815	0.0000	0.0000	0.0000	0.0000	12.0570	44.7965	87.8304 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	96.2841	63.3474	40.7946	12.8416	2.9104	0.0000	0.0000	0.0000	0.0000	13.5930	50.5034	99.0196 (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	213.8219	189.1695	200.9907	176.5891	171.1347	154.1425	151.9990	158.0138	159.7413	178.2194	189.6468	211.4545 (64)
Efficiency of water heater (217)m	82.0769	81.5960	80.9532	80.1930	79.8204	79.7000	79.7000	79.7000	79.7000	80.2157	81.2757	79.7000 (216)
Fuel for water heating, kWh/month	260.5140	231.8367	248.2802	220.2049	214.3998	193.4034	190.7139	198.2608	200.4282	222.1750	233.3375	257.4128 (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	16.2322	14.6613	16.2322	15.7085	16.2322	15.7085	16.2322	16.2322	15.7085	16.2322	15.7085	16.2322 (231)
Lighting	16.3524	13.1185	11.8118	8.6538	6.6845	5.4613	6.0978	7.9261	10.2953	13.5079	15.2572	16.8069 (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												379.2941 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.7000
Water heating fuel used												2670.9672 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6490)												
mechanical ventilation fans (SFP = 0.6490)												105.1207 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												191.1207 (231)
Electricity for lighting (calculated in Appendix L)												131.9735 (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	3373.3555	(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	379.2941	0.2100	79.6518 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2670.9672	0.2100	560.9031 (264)
Space and water heating			640.5549 (265)
Pumps, fans and electric keep-hot	191.1207	0.1387	26.5108 (267)
Energy for lighting	131.9735	0.1443	19.0479 (268)
Total CO2, kg/year			686.1135 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.6900 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	379.2941	1.1300	428.6024 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2670.9672	1.1300	3018.1930 (278)
Space and water heating			3446.7953 (279)
Pumps, fans and electric keep-hot	191.1207	1.5128	289.1274 (281)
Energy for lighting	131.9735	1.5338	202.4254 (282)
Total Primary energy kWh/year			3938.3481 (286)
Dwelling Primary energy Rate (DPER)			78.6100 (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)
Ground floor	50.1000 (1b)	x 2.6500 (2b)	= 132.7650 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 132.7650 (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) = 0.1506 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4006 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3105 (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	0.3959	0.3881	0.3804	0.3415	0.3338	0.2950	0.2950	0.2872	0.3105	0.3338	0.3493	0.3648 (22b)
Effective ac	0.5784	0.5753	0.5723	0.5583	0.5557	0.5435	0.5435	0.5412	0.5482	0.5557	0.5610	0.5666 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.20)			8.2500	1.1450	9.4466		(27)

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External Wall 1	20.1000	8.2500	11.8500	0.1800	2.1330		(29a)
Corridor Wall 2	22.8000	1.8900	20.9100	0.1800	3.7638		(29a)
Total net area of external elements Aum(A, m2)			42.9000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		17.2334		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 145.9162 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	4.2000	0.0500	0.2100
E3 Sill	3.3000	0.0500	0.1650
E4 Jamb	19.2000	0.0500	0.9600
E7 Party floor between dwellings (in blocks of flats)	27.0000	0.0700	1.8900
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	0.5400	0.0200	0.0108
E16 Corner (normal)	7.9500	0.0900	0.7155
E17 Corner (inverted - internal area greater than external area)	5.3000	-0.0900	-0.4770
E18 Party wall between dwellings	7.9500	0.0600	0.4770
E25 Staggered party wall between dwellings	2.6500	0.0600	0.1590

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.1103 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 21.3437 (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	25.3395	25.2062	25.0755	24.4617	24.3469	23.8123	23.8123	23.7133	24.0182	24.3469	24.5792	24.8220 (38)
Average = Sum(39)m / 12 =	46.6831	46.5498	46.4191	45.8054	45.6905	45.1559	45.1559	45.0569	45.3618	45.6905	45.9228	46.1657 (39)
												45.8048

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9318	0.9291	0.9265	0.9143	0.9120	0.9013	0.9013	0.8993	0.9054	0.9120	0.9166	0.9215 (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 1.6930 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage for mixer showers	52.6063	51.8157	50.6637	48.4595	46.8329	45.0189	43.9878	45.1311	46.3844	48.3321	50.5836	52.4047 (42a)
Hot water usage for baths	22.7457	22.4079	21.9322	21.0550	20.3983	19.6700	19.2767	19.7490	20.2634	21.0426	21.9378	22.6688 (42b)
Hot water usage for other uses	31.9685	30.8060	29.6435	28.4810	27.3185	26.1560	26.1560	27.3185	28.4810	29.6435	30.8060	31.9685 (42c)
Average daily hot water use (litres/day)												98.6523 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	107.3204	105.0296	102.2394	97.9956	94.5497	90.8450	89.4205	92.1987	95.1288	99.0182	103.3274	107.0420 (44)
Energy content (annual)	169.9693	149.5607	157.1381	134.1511	127.2821	111.7045	108.1464	114.1612	117.3033	134.3668	147.2088	167.6019 (45)
Distribution loss (46)m = 0.15 x (45)m	25.4954	22.4341	23.5707	20.1227	19.0923	16.7557	16.2220	17.1242	17.5955	20.1550	22.0813	25.1403 (46)
Water storage loss:												
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9188 (55)
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	221.7159	196.2996	208.8847	184.2284	179.0287	161.7818	159.8930	165.9078	167.3806	186.1133	197.2861	219.3485 (62)
WWHRS	-24.0494	-21.2695	-22.2722	-18.4422	-17.1875	-14.7075	-13.7859	-14.6599	-15.2169	-17.9391	-20.3228	-23.6040 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	197.6665	175.0301	186.6125	165.7862	161.8412	147.0744	146.1071	151.2479	152.1637	168.1743	176.9633	195.7444 (64)
Total per year (kWh/year)												2024.4114 (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	97.9121	87.1200	93.6457	84.6671	83.7186	77.2036	77.3559	79.3559	79.0652	86.0742	89.0088	97.1249 (65)

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

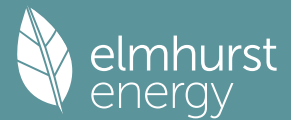
Metabolic gains (Table 5), Watts

(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	77.1818	85.4513	77.1818	79.7545	77.1818	77.1818	77.1818	77.1818	79.7545	77.1818	79.7545	77.1818 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.4937	149.0242	145.1673	136.9565	126.5918	116.8505	110.3427	108.8122	112.6690	120.8798	131.2445	140.9858 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4652	31.4652	31.4652	31.4652	31.4652	31.4652	31.4652	31.4652	31.4652	31.4652	31.4652	31.4652 (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)	-67.7218	-67.7218	-67.7218	-67.7218	-67.7218	-67.7218	-67.7218	-67.7218	-67.7218	-67.7218	-67.7218	-67.7218 (71)
Water heating gains (Table 5)	131.6022	129.6429	125.8679	117.5932	112.5249	107.2272	103.9730	106.6611	109.8128	115.6912	123.6233	130.5442 (72)
Total internal gains	407.6734	415.5140	399.6126	385.6999	367.6942	352.2279	339.8932	341.0507	350.6320	365.1485	386.0180	400.1075 (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				
East	8.2500		19.6403	0.6300		0.7000		0.7700			49.5191 (76)	
Solar gains	49.5191	96.8699	159.5310	232.6664	285.1415	291.8930	277.8941	238.7069	185.5411	114.9443	61.7445	40.7221 (83)
Total gains	457.1925	512.3839	559.1436	618.3663	652.8357	644.1210	617.7872	579.7576	536.1732	480.0928	447.7626	440.8297 (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	43.4989	43.6235	43.7463	44.3325	44.4439	44.9701	44.9701	45.0689	44.7660	44.4439	44.2191	43.9865	
alpha	3.8999	3.9082	3.9164	3.9555	3.9629	3.9980	3.9980	4.0046	3.9844	3.9629	3.9479	3.9324	
util living area	0.9443	0.9153	0.8631	0.7523	0.6039	0.4384	0.3193	0.3537	0.5532	0.7944	0.9110	0.9501 (86)	
MIT	19.8207	20.0485	20.3533	20.6967	20.8953	20.9775	20.9950	20.9925	20.9441	20.6802	20.2154	19.7870 (87)	
Th 2	20.1406	20.1428	20.1450	20.1554	20.1573	20.1664	20.1664	20.1681	20.1629	20.1573	20.1534	20.1493 (88)	
util rest of house	0.9353	0.9024	0.8430	0.7200	0.5593	0.3847	0.2598	0.2913	0.4948	0.7590	0.8953	0.9420 (89)	
MIT 2	18.7839	19.0667	19.4391	19.8480	20.0641	20.1506	20.1640	20.1642	20.1203	19.8411	19.2858	18.7485 (90)	
Living area fraction	FLA = Living area / (4) =												
MIT	19.3323	19.5860	19.9227	20.2969	20.5038	20.5880	20.6036	20.6023	20.5560	20.2849	19.7775	19.2978 (92)	
Temperature adjustment	0.0000												
adjusted MIT	19.3323	19.5860	19.9227	20.2969	20.5038	20.5880	20.6036	20.6023	20.5560	20.2849	19.7775	19.2978 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9253	0.8928	0.8373	0.7257	0.5780	0.4121	0.2911	0.3241	0.5228	0.7647	0.8874	0.9323 (94)
Useful gains	423.0464	457.4541	468.1706	448.7534	377.3387	265.4476	179.8420	187.8963	280.3000	367.1388	397.3318	410.9729 (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	701.7541	683.6313	623.0687	522.0380	402.2481	270.3924	180.7841	189.3448	292.8566	442.5078	582.1855	696.9991 (97)
Space heating kWh	207.3585	151.9910	115.2441	52.7650	18.5326	0.0000	0.0000	0.0000	0.0000	56.0746	133.0947	212.8035 (98a)
Space heating requirement - total per year (kWh/year)												947.8640
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	207.3585	151.9910	115.2441	52.7650	18.5326	0.0000	0.0000	0.0000	0.0000	56.0746	133.0947	212.8035 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												947.8640
Space heating per m2												(98c) / (4) = 18.9194 (99)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	207.3585	151.9910	115.2441	52.7650	18.5326	0.0000	0.0000	0.0000	0.0000	56.0746	133.0947	212.8035 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	224.6571	164.6707	124.8582	57.1668	20.0787	0.0000	0.0000	0.0000	0.0000	60.7525	144.1979	230.5563 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	197.6665	175.0301	186.6125	165.7862	161.8412	147.0744	146.1071	151.2479	152.1637	168.1743	176.9633	195.7444 (64)
Efficiency of water heater (217)m	84.1673	83.7448	83.0121	81.8016	80.6397	79.8000	79.8000	79.8000	79.8000	81.8750	83.4297	79.8000 (216)
Fuel for water heating, kWh/month	234.8495	209.0040	224.8016	202.6685	200.6965	184.3037	183.0915	189.5337	190.6813	205.4037	212.1108	232.3443 (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	16.0369	12.8654	11.5838	8.4868	6.5555	5.3559	5.9801	7.7732	10.0966	13.2473	14.9627	16.4826 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-5.1493	-8.0302	-12.7531	-15.8944	-18.5729	-17.8798	-17.6700	-15.9544	-13.2156	-9.8265	-5.9294	-4.3671 (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	-0.9638	-2.1195	-4.3911	-6.8678	-9.3551	-9.4970	-9.3794	-7.8087	-5.5577	-3.1105	-1.3115	-0.7551 (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												1026.9382 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.8000
Water heating fuel used												2469.4892 (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)	129.4266 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-206.3598 (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	3505.4942 (238)

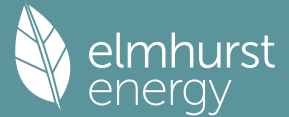
 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1026.9382	0.2100	215.6570 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2469.4892	0.2100	518.5927 (264)
Space and water heating			734.2498 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	129.4266	0.1443	18.6803 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-145.2427	0.1325	-19.2496
PV Unit electricity exported	-61.1172	0.1248	-7.6244
Total			-26.8740 (269)
Total CO2, kg/year			737.9852 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.7300 (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	1026.9382	1.1300	1160.4402 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2469.4892	1.1300	2790.5228 (278)
Space and water heating			3950.9630 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	129.4266	1.5338	198.5188 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-145.2427	1.4897	-216.3688
PV Unit electricity exported	-61.1172	0.4579	-27.9835
Total			-244.3522 (283)
Total Primary energy kWh/year			4035.2304 (286)
Target Primary Energy Rate (TPER)			80.5400 (287)

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Property Reference	Unit 11		Issued on Date	25/01/2024	
Assessment Reference	Be Lean_Copy_Copy	Prop Type Ref	Unit 9		
Property					
SAP Rating	84 B	DER	13.57	TER	14.79
Environmental	90 B	% DER < TER		8.25	
CO ₂ Emissions (t/year)	0.77	DFEE	30.87	TFEE	31.85
Compliance Check	See BREL	% DFEE < TFEE		3.08	
% DPER < TPER	3.03	DPER	78.31	TPER	80.75
Assessor Details	Dr. Alan Harries			Assessor ID	BC24-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.1000 (1b)	2.6500 (2b)	161.9150 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.1000		161.9150 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 161.9150 (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												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												78.3000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2711	0.2679	0.2647	0.2488	0.2456	0.2296	0.2296	0.2264	0.2360	0.2456	0.2519	0.2583 (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
Window (Uw = 1.20)			6.7500	1.1450	7.7290		(27)
Door			7.8900	1.0000	7.8900		(26)
External Wall 1	40.3000	12.7500	27.5500	0.1500	4.1325	14.0000	385.7000 (29a)
Corridor Wall 2	27.0000	1.8900	25.1100	0.1400	3.5154	150.0000	3766.5000 (29a)
Total net area of external elements Aum(A, m ²)			67.3000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	23.2669	(33)
Party Floor 1			61.1000			40.0000	2444.0000 (32a)
Party Ceiling 1			61.1000			30.0000	1833.0000 (32b)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 8429.2000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							137.9574 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				6.0000	0.2500	1.5000	
E3 Sill				2.7000	0.0400	0.1080	

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E4 Jamb	29.2000	0.0400	1.1680	
E7 Party floor between dwellings (in blocks of flats)	46.3000	0.0500	2.3150	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	0.4500	1.0000	0.4500	
E16 Corner (normal)	15.9000	0.0900	1.4310	
E17 Corner (inverted - internal area greater than external area)	5.3000	-0.0900	-0.4770	
E18 Party wall between dwellings	2.6500	0.0600	0.1590	
E25 Staggered party wall between dwellings	2.6500	0.1200	0.3180	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				6.9720 (36)
Point Thermal bridges				0.0000 (36a) =
Total fabric heat loss				30.2389 (37) (33) + (36) + (36a) =

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	14.4834	14.3131	14.1428	13.2912	13.1209	12.2693	12.2693	12.0990	12.6099	13.1209	13.4615	13.8021 (38)
Average = Sum(39)m / 12 =	44.7223	44.5520	44.3817	43.5301	43.3598	42.5082	42.5082	42.3379	42.8488	43.3598	43.7004	44.0410 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7320	0.7292	0.7264	0.7124	0.7097	0.6957	0.6957	0.6929	0.7013	0.7097	0.7152	0.7208 (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 2.0126 (42)

Hot water usage for mixer showers

Hot water usage for mixer showers	57.9636	57.0925	55.8232	53.3945	51.6022	49.6035	48.4674	49.7272	51.1081	53.2541	55.7349	57.7415 (42a)
Hot water usage for baths	25.0495	24.6774	24.1536	23.1876	22.4643	21.6623	21.2291	21.7493	22.3158	23.1739	24.1598	24.9648 (42b)
Hot water usage for other uses	35.2406	33.9591	32.6777	31.3962	30.1147	28.8332	28.8332	30.1147	31.3962	32.6777	33.9591	35.2406 (42c)
Average daily hot water use (litres/day)												108.7022 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	118.2537	115.7291	112.6544	107.9783	104.1813	100.0991	98.5298	101.5912	104.8200	109.1057	113.8538	117.9469 (44)
Energy content (annual)	187.2849	164.7967	173.1456	147.8169	140.2480	123.0835	119.1632	125.7911	129.2535	148.0554	162.2056	184.6763 (45)
Distribution loss (46)m = 0.15 x (45)m	28.0927	24.7195	25.9718	22.1725	21.0372	18.4625	17.8745	18.8687	19.3880	22.2083	24.3308	27.7014 (46)
Water storage loss:												210.0000 (47)
Store volume												1.2300 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.6642 (55)
Enter (49) or (54) in (55)												
Total storage loss	20.5902	18.5976	20.5902	19.9260	20.5902	19.9260	20.5902	20.5902	19.9260	20.5902	19.9260	20.5902 (56)
If cylinder contains dedicated solar storage	20.5902	18.5976	20.5902	19.9260	20.5902	19.9260	20.5902	20.5902	19.9260	20.5902	19.9260	20.5902 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	231.1375	204.4055	216.9982	190.2549	184.1006	165.5215	163.0158	169.6437	171.6915	191.9080	204.6436	228.5289 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	231.1375	204.4055	216.9982	190.2549	184.1006	165.5215	163.0158	169.6437	171.6915	191.9080	204.6436	228.5289 (64)
Total per year (kWh/year)												2321.8498 (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	97.3543	86.4819	92.6530	83.0995	81.7146	74.8757	74.7039	76.9076	76.9272	84.3105	87.8838	96.4870 (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	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	97.2700	107.6918	97.2700	100.5124	97.2700	100.5124	97.2700	97.2700	100.5124	97.2700	100.5124	97.2700 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	175.7124	177.5357	172.9410	163.1592	150.8116	139.2065	131.4536	129.6303	134.2250	144.0068	156.3544	167.9595 (68)
Pumps, fans	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628 (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)	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024 (71)
Total internal gains	130.8526	128.6933	124.5336	115.4160	109.8314	103.9940	100.4084	103.3705	106.8433	113.3206	122.0608	129.6868 (72)
	460.0234	470.1093	450.9330	435.2760	414.1014	396.9012	382.3204	383.4591	394.7691	410.7857	435.1160	451.1047 (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	2.2500	19.6403	0.4000	0.8000	0.7700	9.7997 (76)						
South	4.5000	46.7521	0.4000	0.8000	0.7700	46.6548 (78)						
Solar gains	56.4545	95.5789	128.9017	156.0492	171.0609	168.0827	162.7817	151.9158	138.3918	105.1610	67.5210	48.3729 (83)
Total gains	516.4779	565.6882	579.8347	591.3252	585.1622	564.9839	545.1022	535.3750	533.1609	515.9467	502.6369	499.4775 (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	52.3552	52.5553	52.7570	53.7891	54.0004	55.0822	55.0822	55.3037	54.6443	54.0004	53.5795	53.1650
alpha	4.4903	4.5037	4.5171	4.5859	4.6000	4.6721	4.6721	4.6869	4.6430	4.6000	4.5720	4.5443
util living area	0.9322	0.9005	0.8587	0.7705	0.6450	0.4732	0.3416	0.3617	0.5380	0.7621	0.8887	0.9386 (86)
MIT	20.1824	20.3591	20.5505	20.7796	20.9199	20.9853	20.9974	20.9966	20.9725	20.8209	20.5021	20.1619 (87)
Th 2	20.3127	20.3151	20.3176	20.3299	20.3323	20.3446	20.3446	20.3471	20.3397	20.3323	20.3274	20.3225 (88)
util rest of house	0.9229	0.8878	0.8409	0.7437	0.6075	0.4273	0.2914	0.3112	0.4911	0.7304	0.8728	0.9301 (89)
MIT 2	19.3662	19.5850	19.8200	20.1001	20.2574	20.3335	20.3432	20.3451	20.3177	20.1527	19.7736	19.3487 (90)
Living area fraction									FLA = Living area / (4) =			0.6219 (91)
MIT	19.8738	20.0665	20.2743	20.5227	20.6694	20.7389	20.7501	20.7503	20.7249	20.5682	20.2267	19.8545 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.7238	19.9165	20.1243	20.3727	20.5194	20.5889	20.6001	20.6003	20.5749	20.4182	20.0767	19.7045 (93)

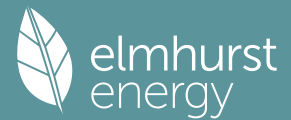
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9139	0.8796	0.8355	0.7455	0.6183	0.4446	0.3110	0.3309	0.5080	0.7347	0.8662	0.9212 (94)
Useful gains	472.0066	497.6034	484.4421	440.8423	361.7813	251.1658	169.5288	177.1526	270.8668	379.0709	435.4029	460.1414 (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	689.7900	669.0135	604.6710	499.4075	382.4090	254.5768	170.0357	177.8320	277.4429	425.7169	567.0865	682.8328 (97)
Space heating kWh	162.0308	115.1876	89.4502	42.1669	15.3471	0.0000	0.0000	0.0000	0.0000	34.7047	94.8122	165.6824 (98a)
Space heating requirement - total per year (kWh/year)												719.3818
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	162.0308	115.1876	89.4502	42.1669	15.3471	0.0000	0.0000	0.0000	0.0000	34.7047	94.8122	165.6824 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												719.3818
Space heating per m2												(98c) / (4) = 11.7738 (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 %)												88.7000 (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	162.0308	115.1876	89.4502	42.1669	15.3471	0.0000	0.0000	0.0000	0.0000	34.7047	94.8122	165.6824 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	182.6729	129.8620	100.8458	47.5388	17.3022	0.0000	0.0000	0.0000	0.0000	39.1259	106.8909	186.7896 (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	231.1375	204.4055	216.9982	190.2549	184.1006	165.5215	163.0158	169.6437	171.6915	191.9080	204.6436	228.5289 (64)
Efficiency of water heater												79.7000 (216)
(217)m	83.1781	82.7253	82.1325	81.1947	80.3272	79.7000	79.7000	79.7000	79.7000	80.9580	82.3454	83.2502 (217)
Fuel for water heating, kWh/month	277.8825	247.0895	264.2049	234.3195	229.1885	207.6806	204.5368	212.8529	215.4223	237.0463	248.5186	274.5086 (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	21.5143	19.4322	21.5143	20.8203	21.5143	20.8203	21.5143	21.5143	20.8203	21.5143	20.8203	21.5143 (231)
Lighting	21.0589	16.8943	15.2114	11.1445	8.6084	7.0331	7.8528	10.2074	13.2584	17.3958	19.6485	21.6442 (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												811.0280 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.7000
Water heating fuel used												2853.2510 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8470)												
mechanical ventilation fans (SFP = 0.8470)												167.3132 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												253.3132 (231)
Electricity for lighting (calculated in Appendix L)												169.9577 (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	4087.5499 (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	811.0280	0.2100	170.3159 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2853.2510	0.2100	599.1827 (264)
Space and water heating			769.4986 (265)
Pumps, fans and electric keep-hot	253.3132	0.1387	35.1377 (267)
Energy for lighting	169.9577	0.1443	24.5301 (268)
Total CO2, kg/year			829.1664 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.5700 (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	811.0280	1.1300	916.4616 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2853.2510	1.1300	3224.1737 (278)
Space and water heating			4140.6353 (279)
Pumps, fans and electric keep-hot	253.3132	1.5128	383.2123 (281)
Energy for lighting	169.9577	1.5338	260.6868 (282)
Total Primary energy kWh/year			4784.5343 (286)
Dwelling Primary energy Rate (DPER)			78.3100 (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)
Ground floor	61.1000 (1b)	x 2.6500 (2b)	= 161.9150 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 161.9150 (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) = 0.1235 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3735	(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) =	0.3175 (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	0.4048	0.3969	0.3889	0.3492	0.3413	0.3016	0.3016	0.2937	0.3175	0.3413	0.3572	0.3731 (22b)
Effective ac	0.5819	0.5788	0.5756	0.5610	0.5582	0.5455	0.5455	0.5431	0.5504	0.5582	0.5638	0.5696 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			7.8900	1.0000	7.8900		(26)

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TER Opening Type (Uw = 1.20)			6.7500	1.1450	7.7290	(27)
External Wall 1	40.3000	12.7500	27.5500	0.1800	4.9590	(29a)
Corridor Wall 2	27.0000	1.8900	25.1100	0.1800	4.5198	(29a)
Total net area of external elements Aum(A, m ²)			67.3000			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...	(30) + (32) =	25.0978	(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 147.9574 (35)

List of Thermal Bridges				
K1 Element		Length	Psi-value	Total
E2 Other lintels (including other steel lintels)		6.0000	0.0500	0.3000
E3 Sill		2.7000	0.0500	0.1350
E4 Jamb		29.2000	0.0500	1.4600
E7 Party floor between dwellings (in blocks of flats)		46.3000	0.0700	3.2410
E23 Balcony within or between dwellings, balcony support penetrates wall insulation		0.4500	0.0200	0.0090
E16 Corner (normal)		15.9000	0.0900	1.4310
E17 Corner (inverted - internal area greater than external area)		5.3000	-0.0900	-0.4770
E18 Party wall between dwellings		2.6500	0.0600	0.1590
E25 Staggered party wall between dwellings		2.6500	0.0600	0.1590

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.4170 (36)
 Total Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 31.5148 (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
	31.0938	30.9238	30.7572	29.9745	29.8281	29.1464	29.1464	29.0202	29.4090	29.8281	30.1243	30.4340
Heat transfer coeff	62.6086	62.4386	62.2720	61.4893	61.3429	60.6612	60.6612	60.5350	60.9238	61.3429	61.6391	61.9488
Average = Sum(39)m / 12 =												61.4886

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0247	1.0219	1.0192	1.0064	1.0040	0.9928	0.9928	0.9908	0.9971	1.0040	1.0088	1.0139
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0126 (42)	
Hot water usage for mixer showers														57.7415 (42a)
Hot water usage for baths	57.9636	57.0925	55.8232	53.3945	51.6022	49.6035	48.4674	49.7272	51.1081	53.2541	55.7349			24.9648 (42b)
Hot water usage for other uses	25.0495	24.6774	24.1536	23.1876	22.4643	21.6623	21.2291	21.7493	22.3158	23.1739	24.1598			35.2406 (42c)
Average daily hot water use (litres/day)	35.2406	33.9591	32.6777	31.3962	30.1147	28.8332	28.8332	30.1147	31.3962	32.6777	33.9591			108.7022 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	118.2537	115.7291	112.6544	107.9783	104.1813	100.0991	98.5298	101.5912	104.8200	109.1057	113.8538	117.9469	
Energy conte	187.2849	164.7967	173.1456	147.8169	140.2480	123.0835	119.1632	125.7911	129.2535	148.0554	162.2056	184.6763	
Energy content (annual)													1805.5208

Distribution loss (46)m = 0.15 x (45)m Total = Sum(45)m = 1805.5208

Water storage loss:													27.7014 (46)
Store volume													210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.7016 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.9188 (55)
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653		28.4842 (56)

If cylinder contains dedicated solar storage													
Primary loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653		28.4842 (57)
Combi loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624		23.2624 (59)
Total heat required for water heating calculated for each 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 (61)
WWHRS	239.0315	211.5355	224.8922	197.8943	191.9946	173.1608	170.9098	177.5377	179.3309	199.8020	212.2830		236.4229 (62)
PV diverter	-26.4985	-23.4355	-24.5403	-20.3204	-18.9378	-16.2052	-15.1898	-16.1529	-16.7666	-19.7659	-22.3924		-26.0078 (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)													210.4151 (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		2169 (64)
Heat gains from water heating, kWh/month	103.6695	92.1860	98.9682	89.2110	88.0297	80.9871	81.0190	83.2228	83.0387	90.6257	93.9952		102.8021 (65)

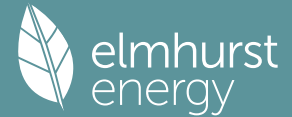
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279		100.6279 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	100.1777	110.9110	100.1777	103.5169	100.1777	103.5169	100.1777	100.1777	103.5169	100.1777	103.5169		100.1777 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.7124	177.5357	172.9410	163.1592	150.8116	139.2065	131.4536	129.6303	134.2250	144.0068	156.3544		167.9595 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628		33.0628 (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)	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024		-80.5024 (71)
Water heating gains (Table 5)	139.3407	137.1815	133.0218	123.9042	118.3195	112.4821	108.8966	111.8586	115.3315	121.8087	130.5489		138.1749 (72)
Total internal gains	471.4192	481.8166	462.3288	446.7687	425.4972	408.3940	393.7163	394.8550	406.2619	422.1816	446.6087		462.5005 (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
East	2.2500				19.6403	0.6300	0.7000	0.7700	13.5052 (76)
South	4.5000				46.7521	0.6300	0.7000	0.7700	64.2962 (78)

Solar gains	77.8014	131.7196	177.6427	215.0553	235.7433	231.6390	224.3336	209.3590	190.7212	144.9250	93.0523	66.6638 (83)
Total gains	549.2206	613.5363	639.9715	661.8240	661.2405	640.0329	618.0498	604.2140	596.9831	567.1066	539.6610	529.1644 (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	40.1090	40.2182	40.3258	40.8391	40.9365	41.3966	41.3966	41.4829	41.2182	40.9365	40.7398	40.5361
alpha	3.6739	3.6812	3.6884	3.7226	3.7291	3.7598	3.7598	3.7655	3.7479	3.7291	3.7160	3.7024
util living area	0.9531	0.9298	0.8978	0.8318	0.7269	0.5664	0.4212	0.4471	0.6352	0.8323	0.9251	0.9581 (86)
MIT	19.6005	19.8335	20.1185	20.4785	20.7577	20.9305	20.9822	20.9775	20.8887	20.5525	20.0373	19.5649 (87)
Th 2	20.0628	20.0651	20.0674	20.0780	20.0800	20.0893	20.0893	20.0910	20.0857	20.0800	20.0760	20.0718 (88)
util rest of house	0.9449	0.9180	0.8804	0.8029	0.6802	0.4979	0.3384	0.3642	0.5694	0.7983	0.9106	0.9507 (89)
MIT 2	18.4534	18.7444	19.0979	19.5388	19.8576	20.0396	20.0807	20.0794	19.9999	19.6344	19.0105	18.4153 (90)
Living area fraction									FLA = Living area / (4) =			0.6219 (91)
MIT	19.1668	19.4217	19.7326	20.1233	20.4174	20.5937	20.6414	20.6379	20.5527	20.2054	19.6491	19.1303 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1668	19.4217	19.7326	20.1233	20.4174	20.5937	20.6414	20.6379	20.5527	20.2054	19.6491	19.1303 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9355	0.9085	0.8734	0.8044	0.6981	0.5367	0.3892	0.4147	0.6040	0.8034	0.9029	0.9416 (94)
Useful gains	513.7954	557.4162	558.9282	532.3885	461.6093	343.4881	240.5256	250.5778	360.5995	455.5905	487.2485	498.2850 (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	930.7885	906.7175	824.0220	690.1115	534.7525	363.5837	245.1547	256.5432	393.1225	589.2254	773.5168	924.9119 (97)
Space heating kWh	310.2428	234.7305	197.2298	113.5606	54.4185	0.0000	0.0000	0.0000	0.0000	99.4243	206.1132	317.4104 (98a)
Space heating requirement - total per year (kWh/year)												1533.1301
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	310.2428	234.7305	197.2298	113.5606	54.4185	0.0000	0.0000	0.0000	0.0000	99.4243	206.1132	317.4104 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1533.1301
Space heating per m2												(98c) / (4) = 25.0921 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	310.2428	234.7305	197.2298	113.5606	54.4185	0.0000	0.0000	0.0000	0.0000	99.4243	206.1132	317.4104 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	336.1244	254.3125	213.6835	123.0342	58.9583	0.0000	0.0000	0.0000	0.0000	107.7187	223.3079	343.8899 (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	212.5329	188.1000	200.3519	177.5739	173.0568	156.9556	155.7200	161.3849	162.5643	180.0360	189.8905	210.4151 (64)
Efficiency of water heater (217)m	84.9069	84.5576	84.0246	83.0846	81.7829	79.8000	79.8000	79.8000	79.8000	82.7851	84.2440	79.8000 (216)
Fuel for water heating, kWh/month	250.3129	222.4520	238.4444	213.7266	211.6050	196.6862	195.1378	202.2367	203.7147	217.4740	225.4054	84.9793 (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	20.8149	16.6985	15.0352	11.0154	8.5086	6.9516	7.7618	10.0891	13.1048	17.1942	19.4208	21.3935 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-6.2624	-9.7552	-15.4731	-19.2558	-22.4699	-21.6156	-21.3598	-19.3013	-16.0097	-11.9255	-7.2070	-5.3121 (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	-1.1928	-2.6229	-5.4353	-8.5042	-11.5900	-11.7722	-11.6286	-9.6793	-6.8854	-3.8519	-1.6237	-0.9347 (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												1661.0294 (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	79.8000	
Water heating fuel used	2624.8031 (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)	167.9885 (232)	
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-251.6684 (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	4288.1526 (238)	

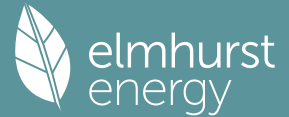
 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1661.0294	0.2100	348.8162 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2624.8031	0.2100	551.2086 (264)
Space and water heating			900.0248 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	167.9885	0.1443	24.2459 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-175.9475	0.1326	-23.3243
PV Unit electricity exported	-75.7209	0.1247	-9.4449
Total			-32.7693 (269)
Total CO2, kg/year			903.4308 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.7900 (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	1661.0294	1.1300	1876.9632 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2624.8031	1.1300	2966.0275 (278)
Space and water heating			4842.9907 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	167.9885	1.5338	257.6664 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-175.9475	1.4898	-262.1297
PV Unit electricity exported	-75.7209	0.4578	-34.6650
Total			-296.7947 (283)
Total Primary energy kWh/year			4933.9632 (286)
Target Primary Energy Rate (TPER)			80.7500 (287)

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Property Reference	Unit 12		Issued on Date	25/01/2024	
Assessment Reference	Be Lean_Copy_Copy	Prop Type Ref	Unit 9		
Property					
SAP Rating	84 B	DER	13.98	TER	15.48
Environmental	90 B	% DER < TER		9.69	
CO ₂ Emissions (t/year)	0.79	DFEE	33.44	TFEE	35.19
Compliance Check	See BREL	% DFEE < TFEE		4.98	
% DPER < TPER	4.67	DPER	80.52	TPER	84.47
Assessor Details	Dr. Alan Harries			Assessor ID	BC24-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.1000 (1b)	2.6500 (2b)	161.9150 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.1000		161.9150 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 161.9150 (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) =												78.3000 (23c)
Effective ac	0.2711	0.2679	0.2647	0.2488	0.2456	0.2296	0.2296	0.2264	0.2360	0.2456	0.2519	0.2583 (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
Window (Uw = 1.20)			6.7500	1.1450	7.7290		(27)
Door			7.8900	1.0000	7.8900		(26)
External Wall 1	40.3000	12.7500	27.5500	0.1500	4.1325	14.0000	385.7000 (29a)
Corridor Wall 2	27.0000	1.8900	25.1100	0.1400	3.5154	150.0000	3766.5000 (29a)
Total net area of external elements Aum(A, m ²)			67.3000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	23.2669	(33)
Party Floor 1			61.1000			40.0000	2444.0000 (32a)
Party Ceiling 1			61.1000			30.0000	1833.0000 (32b)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	8429.2000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							137.9574 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				6.0000	0.2500	1.5000	
E3 Sill				2.7000	0.0400	0.1080	

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E4 Jamb	29.2000	0.0400	1.1680	
E7 Party floor between dwellings (in blocks of flats)	46.3000	0.0500	2.3150	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	0.4500	1.0000	0.4500	
E16 Corner (normal)	15.9000	0.0900	1.4310	
E17 Corner (inverted - internal area greater than external area)	5.3000	-0.0900	-0.4770	
E18 Party wall between dwellings	2.6500	0.0600	0.1590	
E25 Staggered party wall between dwellings	2.6500	0.1200	0.3180	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				6.9720 (36)
Point Thermal bridges				0.0000 (36a) =
Total fabric heat loss				30.2389 (37) (33) + (36) + (36a) =

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	14.4834	14.3131	14.1428	13.2912	13.1209	12.2693	12.2693	12.0990	12.6099	13.1209	13.4615	13.8021 (38)
Average = Sum(39)m / 12 =	44.7223	44.5520	44.3817	43.5301	43.3598	42.5082	42.5082	42.3379	42.8488	43.3598	43.7004	44.0410 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7320	0.7292	0.7264	0.7124	0.7097	0.6957	0.6957	0.6929	0.7013	0.7097	0.7152	0.7208 (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 2.0126 (42)

Hot water usage for mixer showers	57.9636	57.0925	55.8232	53.3945	51.6022	49.6035	48.4674	49.7272	51.1081	53.2541	55.7349	57.7415 (42a)
Hot water usage for baths	25.0495	24.6774	24.1536	23.1876	22.4643	21.6623	21.2291	21.7493	22.3158	23.1739	24.1598	24.9648 (42b)
Hot water usage for other uses	35.2406	33.9591	32.6777	31.3962	30.1147	28.8332	28.8332	30.1147	31.3962	32.6777	33.9591	35.2406 (42c)
Average daily hot water use (litres/day)												108.7022 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	118.2537	115.7291	112.6544	107.9783	104.1813	100.0991	98.5298	101.5912	104.8200	109.1057	113.8538	117.9469 (44)
Energy content (annual)	187.2849	164.7967	173.1456	147.8169	140.2480	123.0835	119.1632	125.7911	129.2535	148.0554	162.2056	184.6763 (45)
Distribution loss (46)m = 0.15 x (45)m	28.0927	24.7195	25.9718	22.1725	21.0372	18.4625	17.8745	18.8687	19.3880	22.2083	24.3308	27.7014 (46)
Water storage loss:												210.0000 (47)
Store volume												1.2300 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.6642 (55)
Enter (49) or (54) in (55)												
Total storage loss	20.5902	18.5976	20.5902	19.9260	20.5902	19.9260	20.5902	20.5902	19.9260	20.5902	19.9260	20.5902 (56)
If cylinder contains dedicated solar storage												
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	231.1375	204.4055	216.9982	190.2549	184.1006	165.5215	163.0158	169.6437	171.6915	191.9080	204.6436	228.5289 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	231.1375	204.4055	216.9982	190.2549	184.1006	165.5215	163.0158	169.6437	171.6915	191.9080	204.6436	228.5289 (64)
Total per year (kWh/year)												2321.8498 (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	97.3543	86.4819	92.6530	83.0995	81.7146	74.8757	74.7039	76.9076	76.9272	84.3105	87.8838	96.4870 (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	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	97.2700	107.6918	97.2700	100.5124	97.2700	100.5124	97.2700	97.2700	100.5124	97.2700	100.5124	97.2700 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	175.7124	177.5357	172.9410	163.1592	150.8116	139.2065	131.4536	129.6303	134.2250	144.0068	156.3544	167.9595 (68)
Pumps, fans	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628 (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)	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024 (71)
Total internal gains	130.8526	128.6933	124.5336	115.4160	109.8314	103.9940	100.4084	103.3705	106.8433	113.3206	122.0608	129.6868 (72)
	460.0234	470.1093	450.9330	435.2760	414.1014	396.9012	382.3204	383.4591	394.7691	410.7857	435.1160	451.1047 (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	4.5000	10.6334	0.4000	0.8000	0.7700	10.6113 (74)
West	2.2500	19.6403	0.4000	0.8000	0.7700	9.7997 (80)
Solar gains	20.4110	39.4490	66.0292	101.3932	130.9890	137.5839
Total gains	480.4343	509.5583	516.9622	536.6692	545.0904	534.4851
						129.5158
						511.8362
						489.8217
						472.9174
						457.6720
						460.4254
						16.9049 (83)
						468.0096 (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	52.3552	52.5553	52.7570	53.7891	54.0004	55.0822	55.0822	55.3037	54.6443	54.0004	53.5795	53.1650	
alpha	4.4903	4.5037	4.5171	4.5859	4.6000	4.6721	4.6721	4.6869	4.6430	4.6000	4.5720	4.5443	
util living area	0.9460	0.9268	0.8957	0.8132	0.6807	0.4981	0.3633	0.3944	0.5967	0.8153	0.9133	0.9502 (86)	
MIT	20.0994	20.2445	20.4430	20.7201	20.9002	20.9819	20.9966	20.9951	20.9581	20.7586	20.4211	20.0875 (87)	
Th 2	20.3127	20.3151	20.3176	20.3299	20.3323	20.3446	20.3446	20.3471	20.3397	20.3323	20.3274	20.3225 (88)	
util rest of house	0.9383	0.9166	0.8811	0.7886	0.6432	0.4504	0.3101	0.3397	0.5472	0.7866	0.8999	0.9431 (89)	
MIT 2	19.2639	19.4459	19.6929	20.0342	20.2380	20.3308	20.3427	20.3442	20.3055	20.0855	19.6769	19.2567 (90)	
Living area fraction	fLA = Living area / (4) =											0.6219 (91)	
MIT	19.7835	19.9425	20.1594	20.4608	20.6498	20.7357	20.7494	20.7490	20.7114	20.5041	20.1397	19.7734 (92)	
Temperature adjustment													-0.1500
adjusted MIT	19.6335	19.7925	20.0094	20.3108	20.4998	20.5857	20.5994	20.5990	20.5614	20.3541	19.9897	19.6234 (93)	

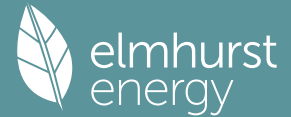
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9294	0.9078	0.8737	0.7878	0.6529	0.4682	0.3309	0.3609	0.5642	0.7876	0.8924	0.9345 (94)
Useful gains	446.5201	462.5581	451.6951	422.8040	355.8872	250.2220	169.3481	176.7957	266.8167	360.4443	410.8694	437.3408 (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	685.7505	663.4926	599.5708	496.7128	381.5581	254.4422	170.0083	177.7785	276.8622	422.9364	563.2868	679.2626 (97)
Space heating kWh	177.9874	135.0280	110.0196	53.2143	19.0991	0.0000	0.0000	0.0000	0.0000	46.4942	109.7405	179.9898 (98a)
Space heating requirement - total per year (kWh/year)												831.5729
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	177.9874	135.0280	110.0196	53.2143	19.0991	0.0000	0.0000	0.0000	0.0000	46.4942	109.7405	179.9898 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												831.5729
Space heating per m2												(98c) / (4) = 13.6100 (99)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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 %)												88.7000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	177.9874	135.0280	110.0196	53.2143	19.0991	0.0000	0.0000	0.0000	0.0000	46.4942	109.7405	179.9898 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	200.6622	152.2300	124.0356	59.9936	21.5323	0.0000	0.0000	0.0000	0.0000	52.4173	123.7210	202.9197 (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	231.1375	204.4055	216.9982	190.2549	184.1006	165.5215	163.0158	169.6437	171.6915	191.9080	204.6436	228.5289 (64)
Efficiency of water heater												79.7000 (216)
(217)m	83.3806	83.0523	82.5168	81.5076	80.4674	79.7000	79.7000	79.7000	79.7000	81.3090	82.6265	83.4297 (217)
Fuel for water heating, kWh/month	277.2078	246.1166	262.9745	233.4199	228.7891	207.6806	204.5368	212.8529	215.4223	236.0232	247.6732	273.9179 (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	21.5143	19.4322	21.5143	20.8203	21.5143	20.8203	21.5143	21.5143	20.8203	21.5143	20.8203	21.5143 (231)
Lighting	21.0589	16.8943	15.2114	11.1445	8.6084	7.0331	7.8528	10.2074	13.2584	17.3958	19.6485	21.6442 (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												937.5117 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.7000
Water heating fuel used												2846.6146 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8470)												
mechanical ventilation fans (SFP = 0.8470)												167.3132 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												253.3132 (231)
Electricity for lighting (calculated in Appendix L)												169.9577 (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	4207.3973 (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	937.5117	0.2100	196.8775 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2846.6146	0.2100	597.7891 (264)
Space and water heating			794.6665 (265)
Pumps, fans and electric keep-hot	253.3132	0.1387	35.1377 (267)
Energy for lighting	169.9577	0.1443	24.5301 (268)
Total CO2, kg/year			854.3343 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.9800 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	937.5117	1.1300	1059.3882 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2846.6146	1.1300	3216.6745 (278)
Space and water heating			4276.0627 (279)
Pumps, fans and electric keep-hot	253.3132	1.5128	383.2123 (281)
Energy for lighting	169.9577	1.5338	260.6868 (282)
Total Primary energy kWh/year			4919.9618 (286)
Dwelling Primary energy Rate (DPER)			80.5200 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	61.1000 (1b)	x 2.6500 (2b)	= 161.9150 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.1000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 161.9150 (5)

2. Ventilation rate

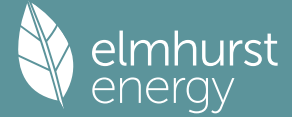
		m3 per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number 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) =	0.1235 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3735	(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) =	0.3175 (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	0.4048	0.3969	0.3889	0.3492	0.3413	0.3016	0.3016	0.2937	0.3175	0.3413	0.3572	0.3731 (22b)
Effective ac	0.5819	0.5788	0.5756	0.5610	0.5582	0.5455	0.5455	0.5431	0.5504	0.5582	0.5638	0.5696 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			7.8900	1.0000	7.8900		(26)

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TER Opening Type (Uw = 1.20)			6.7500	1.1450	7.7290	(27)
External Wall 1	40.3000	12.7500	27.5500	0.1800	4.9590	(29a)
Corridor Wall 2	27.0000	1.8900	25.1100	0.1800	4.5198	(29a)
Total net area of external elements Aum(A, m2)			67.3000			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	25.0978		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 147.9574 (35)

List of Thermal Bridges				
K1 Element		Length	Psi-value	Total
E2 Other lintels (including other steel lintels)		6.0000	0.0500	0.3000
E3 Sill		2.7000	0.0500	0.1350
E4 Jamb		29.2000	0.0500	1.4600
E7 Party floor between dwellings (in blocks of flats)		46.3000	0.0700	3.2410
E23 Balcony within or between dwellings, balcony support penetrates wall insulation		0.4500	0.0200	0.0090
E16 Corner (normal)		15.9000	0.0900	1.4310
E17 Corner (inverted - internal area greater than external area)		5.3000	-0.0900	-0.4770
E18 Party wall between dwellings		2.6500	0.0600	0.1590
E25 Staggered party wall between dwellings		2.6500	0.0600	0.1590

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.4170 (36)
 Total Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 31.5148 (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
	31.0938	30.9238	30.7572	29.9745	29.8281	29.1464	29.1464	29.0202	29.4090	29.8281	30.1243	30.4340
Heat transfer coeff	62.6086	62.4386	62.2720	61.4893	61.3429	60.6612	60.6612	60.5350	60.9238	61.3429	61.6391	61.9488
Average = Sum(39)m / 12 =												61.4886

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1.0247	1.0219	1.0192	1.0064	1.0040	0.9928	0.9928	0.9908	0.9971	1.0040	1.0088	1.0139
HLP (average)												1.0064
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0126 (42)

Hot water usage for mixer showers 57.7415 (42a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage for baths	57.9636	57.0925	55.8232	53.3945	51.6022	49.6035	48.4674	49.7272	51.1081	53.2541	55.7349	57.7415
Hot water usage for other uses	25.0495	24.6774	24.1536	23.1876	22.4643	21.6623	21.2291	21.7493	22.3158	23.1739	24.1598	24.9648
Average daily hot water use (litres/day)												108.7022

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	118.2537	115.7291	112.6544	107.9783	104.1813	100.0991	98.5298	101.5912	104.8200	109.1057	113.8538	117.9469
Energy conte	187.2849	164.7967	173.1456	147.8169	140.2480	123.0835	119.1632	125.7911	129.2535	148.0554	162.2056	184.6763
Energy content (annual)										Total = Sum(45)m =		1805.5208

Distribution loss (46)m = 0.15 x (45)m 27.7014 (46)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	28.0927	24.7195	25.9718	22.1725	21.0372	18.4625	17.8745	18.8687	19.3880	22.2083	24.3308	27.7014

Water storage loss:
 Store volume 210.0000 (47)
 a) If manufacturer declared loss factor is known (kWh/day): 1.7016 (48)
 Temperature factor from Table 2b 0.5400 (49)
 Enter (49) or (54) in (55) 0.9188 (55)

Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842
If cylinder contains dedicated solar storage												
Primary loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842
Combi loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624
Total heat required for water heating calculated for each 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

WWHRS	-26.4985	-23.4355	-24.5403	-20.3204	-18.9378	-16.2052	-15.1898	-16.1529	-16.7666	-19.7659	-22.3924	-26.0078
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
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Output from w/h	212.5329	188.1000	200.3519	177.5739	173.0568	156.9556	155.7200	161.3849	162.5643	180.0360	189.8905	210.4151
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2168.5819
Electric shower(s)												2169

Heat gains from water heating, kWh/month 102.8021 (65)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	103.6695	92.1860	98.9682	89.2110	88.0297	80.9871	81.0190	83.2228	83.0387	90.6257	93.9952	102.8021

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	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	100.1777	110.9110	100.1777	103.5169	100.1777	103.5169	100.1777	100.1777	103.5169	100.1777	103.5169	100.1777
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.7124	177.5357	172.9410	163.1592	150.8116	139.2065	131.4536	129.6303	134.2250	144.0068	156.3544	167.9595
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000
Losses e.g. evaporation (negative values) (Table 5)	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024
Water heating gains (Table 5)	139.3407	137.1815	133.0218	123.9042	118.3195	112.4821	108.8966	111.8586	115.3315	121.8087	130.5489	138.1749
Total internal gains	471.4192	481.8166	462.3288	446.7687	425.4972	408.3940	393.7163	394.8550	406.2619	422.1816	446.6087	462.5005

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	4.5000	10.6334	0.6300	0.7000	0.7700	14.6237 (74)
West	2.2500	19.6403	0.6300	0.7000	0.7700	13.5052 (80)

Solar gains	28.1289	54.3656	90.9965	139.7325	180.5193	189.6078	178.4889	146.5809	107.6982	64.6152	34.8796	23.2970 (83)
Total gains	499.5481	536.1823	553.3253	586.5012	606.0165	598.0018	572.2052	541.4359	513.9600	486.7968	481.4883	485.7975 (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	40.1090	40.2182	40.3258	40.8391	40.9365	41.3966	41.3966	41.4829	41.2182	40.9365	40.7398	40.5361
alpha	3.6739	3.6812	3.6884	3.7226	3.7291	3.7598	3.7598	3.7655	3.7479	3.7291	3.7160	3.7024
util living area	0.9642	0.9513	0.9293	0.8706	0.7641	0.5978	0.4519	0.4930	0.7039	0.8802	0.9449	0.9673 (86)
MIT	19.4885	19.6715	19.9563	20.3711	20.7103	20.9168	20.9775	20.9688	20.8417	20.4352	19.9181	19.4653 (87)
Th 2	20.0628	20.0651	20.0674	20.0780	20.0800	20.0893	20.0893	20.0910	20.0857	20.0800	20.0760	20.0718 (88)
util rest of house	0.9578	0.9425	0.9160	0.8459	0.7194	0.5277	0.3643	0.4039	0.6387	0.8524	0.9336	0.9614 (89)
MIT 2	18.3139	18.5452	18.9029	19.4169	19.8099	20.0289	20.0782	20.0745	19.9595	19.5037	18.8656	18.2909 (90)
Living area fraction	FLA = Living area / (4) =											
MIT	19.0444	19.2457	19.5581	20.0103	20.3699	20.5811	20.6375	20.6307	20.5082	20.0830	19.5202	19.0213 (91)
Temperature adjustment	0.0000											
adjusted MIT	19.0444	19.2457	19.5581	20.0103	20.3699	20.5811	20.6375	20.6307	20.5082	20.0830	19.5202	19.0213 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9490	0.9333	0.9076	0.8438	0.7343	0.5665	0.4178	0.4577	0.6702	0.8525	0.9254	0.9530 (94)
Useful gains	474.0905	500.3983	502.1717	494.9154	445.0014	338.7921	239.0518	247.8179	344.4676	414.9966	445.5664	462.9872 (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	923.1280	895.7274	813.1518	683.1675	531.8376	362.8210	244.9205	256.1044	390.4101	581.7177	765.5696	918.1610 (97)
Space heating kWh	334.0839	265.6611	231.3692	135.5415	64.6062	0.0000	0.0000	0.0000	0.0000	124.0405	230.4023	338.6494 (98a)
Space heating requirement - total per year (kWh/year)	1724.3541											
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	334.0839	265.6611	231.3692	135.5415	64.6062	0.0000	0.0000	0.0000	0.0000	124.0405	230.4023	338.6494 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1724.3541											
Space heating per m2	(98c) / (4) = 28.2218 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	334.0839	265.6611	231.3692	135.5415	64.6062	0.0000	0.0000	0.0000	0.0000	124.0405	230.4023	338.6494 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	361.9544	287.8235	250.6709	146.8489	69.9958	0.0000	0.0000	0.0000	0.0000	134.3884	249.6233	366.9007 (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	212.5329	188.1000	200.3519	177.5739	173.0568	156.9556	155.7200	161.3849	162.5643	180.0360	189.8905	210.4151 (64)
Efficiency of water heater (217)m	85.0696	84.8338	84.3834	83.4617	82.0609	79.8000	79.8000	79.8000	79.8000	83.2415	84.4945	79.8000 (216)
Fuel for water heating, kWh/month	249.8342	221.7276	237.4304	212.7609	210.8883	196.6862	195.1378	202.2367	203.7147	216.2815	224.7371	247.1953 (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	20.8149	16.6985	15.0352	11.0154	8.5086	6.9516	7.7618	10.0891	13.1048	17.1942	19.4208	21.3935 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-6.2624	-9.7552	-15.4731	-19.2558	-22.4699	-21.6156	-21.3598	-19.3013	-16.0097	-11.9255	-7.2070	-5.3121 (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	-1.1928	-2.6229	-5.4353	-8.5042	-11.5900	-11.7722	-11.6286	-9.6793	-6.8854	-3.8519	-1.6237	-0.9347 (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	1868.2059 (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	79.8000	
Water heating fuel used	2618.6306	(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)	167.9885	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-251.6684	(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	4489.1567	(238)

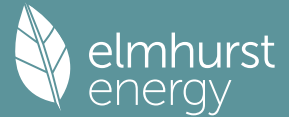
 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1868.2059	0.2100	392.3232 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2618.6306	0.2100	549.9124 (264)
Space and water heating			942.2357 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	167.9885	0.1443	24.2459 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-175.9475	0.1326	-23.3243
PV Unit electricity exported	-75.7209	0.1247	-9.4449
Total			-32.7693 (269)
Total CO2, kg/year			945.6416 (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	1868.2059	1.1300	2111.0727 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2618.6306	1.1300	2959.0526 (278)
Space and water heating			5070.1253 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	167.9885	1.5338	257.6664 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-175.9475	1.4898	-262.1297
PV Unit electricity exported	-75.7209	0.4578	-34.6650
Total			-296.7947 (283)
Total Primary energy kWh/year			5161.0978 (286)
Target Primary Energy Rate (TPER)			84.4700 (287)

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Property Reference	Unit 13		Issued on Date	25/01/2024	
Assessment Reference	Be Lean_Copy_Copy	Prop Type Ref	Unit 9		
Property					
SAP Rating	84 B	DER	13.57	TER	14.79
Environmental	90 B	% DER < TER		8.25	
CO ₂ Emissions (t/year)	0.77	DFEE	30.87	TFEE	31.85
Compliance Check	See BREL	% DFEE < TFEE		3.08	
% DPER < TPER	3.03	DPER	78.31	TPER	80.75
Assessor Details	Dr. Alan Harries			Assessor ID	BC24-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.1000 (1b)	2.6500 (2b)	161.9150 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.1000		161.9150 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 161.9150 (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)

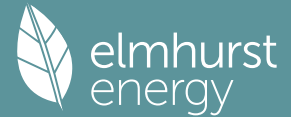
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (21)

	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) =												78.3000 (23c)
Effective ac	0.2711	0.2679	0.2647	0.2488	0.2456	0.2296	0.2296	0.2264	0.2360	0.2456	0.2519	0.2583 (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
Window (Uw = 1.20)			6.7500	1.1450	7.7290		(27)
Door			7.8900	1.0000	7.8900		(26)
External Wall 1	40.3000	12.7500	27.5500	0.1500	4.1325	14.0000	385.7000 (29a)
Corridor Wall 2	27.0000	1.8900	25.1100	0.1400	3.5154	150.0000	3766.5000 (29a)
Total net area of external elements Aum(A, m ²)			67.3000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	23.2669	(33)
Party Floor 1			61.1000			40.0000	2444.0000 (32a)
Party Ceiling 1			61.1000			30.0000	1833.0000 (32b)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	8429.2000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							137.9574 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				6.0000	0.2500	1.5000	
E3 Sill				2.7000	0.0400	0.1080	

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E4 Jamb	29.2000	0.0400	1.1680
E7 Party floor between dwellings (in blocks of flats)	46.3000	0.0500	2.3150
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	0.4500	1.0000	0.4500
E16 Corner (normal)	15.9000	0.0900	1.4310
E17 Corner (inverted - internal area greater than external area)	5.3000	-0.0900	-0.4770
E18 Party wall between dwellings	2.6500	0.0600	0.1590
E25 Staggered party wall between dwellings	2.6500	0.1200	0.3180
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.9720 (36)
Point Thermal bridges			0.0000 (36a) =
Total fabric heat loss			30.2389 (37) (33) + (36) + (36a) =

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	14.4834	14.3131	14.1428	13.2912	13.1209	12.2693	12.2693	12.0990	12.6099	13.1209	13.4615	13.8021 (38)
Average = Sum(39)m / 12 =	44.7223	44.5520	44.3817	43.5301	43.3598	42.5082	42.5082	42.3379	42.8488	43.3598	43.7004	44.0410 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7320	0.7292	0.7264	0.7124	0.7097	0.6957	0.6957	0.6929	0.7013	0.7097	0.7152	0.7208 (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 2.0126 (42)

Hot water usage for mixer showers	57.9636	57.0925	55.8232	53.3945	51.6022	49.6035	48.4674	49.7272	51.1081	53.2541	55.7349	57.7415 (42a)
Hot water usage for baths	25.0495	24.6774	24.1536	23.1876	22.4643	21.6623	21.2291	21.7493	22.3158	23.1739	24.1598	24.9648 (42b)
Hot water usage for other uses	35.2406	33.9591	32.6777	31.3962	30.1147	28.8332	28.8332	30.1147	31.3962	32.6777	33.9591	35.2406 (42c)
Average daily hot water use (litres/day)												108.7022 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	118.2537	115.7291	112.6544	107.9783	104.1813	100.0991	98.5298	101.5912	104.8200	109.1057	113.8538	117.9469 (44)
Energy content (annual)	187.2849	164.7967	173.1456	147.8169	140.2480	123.0835	119.1632	125.7911	129.2535	148.0554	162.2056	184.6763 (45)
Distribution loss (46)m = 0.15 x (45)m	28.0927	24.7195	25.9718	22.1725	21.0372	18.4625	17.8745	18.8687	19.3880	22.2083	24.3308	27.7014 (46)
Water storage loss:												210.0000 (47)
Store volume												1.2300 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.6642 (55)
Enter (49) or (54) in (55)												
Total storage loss	20.5902	18.5976	20.5902	19.9260	20.5902	19.9260	20.5902	20.5902	19.9260	20.5902	19.9260	20.5902 (56)
If cylinder contains dedicated solar storage												
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	231.1375	204.4055	216.9982	190.2549	184.1006	165.5215	163.0158	169.6437	171.6915	191.9080	204.6436	228.5289 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	231.1375	204.4055	216.9982	190.2549	184.1006	165.5215	163.0158	169.6437	171.6915	191.9080	204.6436	228.5289 (64)
Total per year (kWh/year)												2321.8498 (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	97.3543	86.4819	92.6530	83.0995	81.7146	74.8757	74.7039	76.9076	76.9272	84.3105	87.8838	96.4870 (65)

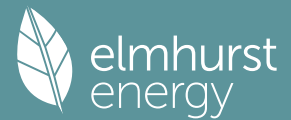
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	97.2700	107.6918	97.2700	100.5124	97.2700	100.5124	97.2700	97.2700	100.5124	97.2700	100.5124	97.2700 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.7124	177.5357	172.9410	163.1592	150.8116	139.2065	131.4536	129.6303	134.2250	144.0068	156.3544	167.9595 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628 (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)	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024 (71)
Water heating gains (Table 5)	130.8526	128.6933	124.5336	115.4160	109.8314	103.9940	100.4084	103.3705	106.8433	113.3206	122.0608	129.6868 (72)
Total internal gains	460.0234	470.1093	450.9330	435.2760	414.1014	396.9012	382.3204	383.4591	394.7691	410.7857	435.1160	451.1047 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
South	4.5000	46.7521	0.4000	0.8000	0.7700	46.6548 (78)						
West	2.2500	19.6403	0.4000	0.8000	0.7700	9.7997 (80)						
Solar gains	56.4545	95.5789	128.9017	156.0492	171.0609	168.0827	162.7817	151.9158	138.3918	105.1610	67.5210	48.3729 (83)
Total gains	516.4779	565.6882	579.8347	591.3252	585.1622	564.9839	545.1022	535.3750	533.1609	515.9467	502.6369	499.4775 (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	52.3552	52.5553	52.7570	53.7891	54.0004	55.0822	55.0822	55.3037	54.6443	54.0004	53.5795	53.1650
alpha	4.4903	4.5037	4.5171	4.5859	4.6000	4.6721	4.6721	4.6869	4.6430	4.6000	4.5720	4.5443
util living area	0.9322	0.9005	0.8587	0.7705	0.6450	0.4732	0.3416	0.3617	0.5380	0.7621	0.8887	0.9386 (86)
MIT	20.1824	20.3591	20.5505	20.7796	20.9199	20.9853	20.9974	20.9966	20.9725	20.8209	20.5021	20.1619 (87)
Th 2	20.3127	20.3151	20.3176	20.3299	20.3323	20.3446	20.3446	20.3471	20.3397	20.3323	20.3274	20.3225 (88)
util rest of house	0.9229	0.8878	0.8409	0.7437	0.6075	0.4273	0.2914	0.3112	0.4911	0.7304	0.8728	0.9301 (89)
MIT 2	19.3662	19.5850	19.8200	20.1001	20.2574	20.3335	20.3432	20.3451	20.3177	20.1527	19.7736	19.3487 (90)
Living area fraction									FLA = Living area / (4) =			0.6219 (91)
MIT	19.8738	20.0665	20.2743	20.5227	20.6694	20.7389	20.7501	20.7503	20.7249	20.5682	20.2267	19.8545 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.7238	19.9165	20.1243	20.3727	20.5194	20.5889	20.6001	20.6003	20.5749	20.4182	20.0767	19.7045 (93)

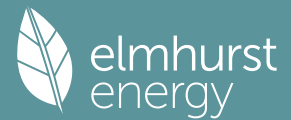
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9139	0.8796	0.8355	0.7455	0.6183	0.4446	0.3110	0.3309	0.5080	0.7347	0.8662	0.9212 (94)
Useful gains	472.0066	497.6034	484.4421	440.8423	361.7813	251.1658	169.5288	177.1526	270.8668	379.0709	435.4029	460.1414 (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	689.7900	669.0135	604.6710	499.4075	382.4090	254.5768	170.0357	177.8320	277.4429	425.7169	567.0865	682.8328 (97)
Space heating kWh	162.0308	115.1876	89.4502	42.1669	15.3471	0.0000	0.0000	0.0000	0.0000	34.7047	94.8122	165.6824 (98a)
Space heating requirement - total per year (kWh/year)												719.3818
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	162.0308	115.1876	89.4502	42.1669	15.3471	0.0000	0.0000	0.0000	0.0000	34.7047	94.8122	165.6824 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												719.3818
Space heating per m2												(98c) / (4) = 11.7738 (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 %)												88.7000 (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	162.0308	115.1876	89.4502	42.1669	15.3471	0.0000	0.0000	0.0000	0.0000	34.7047	94.8122	165.6824 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	182.6729	129.8620	100.8458	47.5388	17.3022	0.0000	0.0000	0.0000	0.0000	39.1259	106.8909	186.7896 (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	231.1375	204.4055	216.9982	190.2549	184.1006	165.5215	163.0158	169.6437	171.6915	191.9080	204.6436	228.5289 (64)
Efficiency of water heater	83.1781	82.7253	82.1325	81.1947	80.3272	79.7000	79.7000	79.7000	79.7000	80.9580	82.3454	79.7000 (216)
Fuel for water heating, kWh/month	277.8825	247.0895	264.2049	234.3195	229.1885	207.6806	204.5368	212.8529	215.4223	237.0463	248.5186	83.2502 (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 (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	21.5143	19.4322	21.5143	20.8203	21.5143	20.8203	21.5143	21.5143	20.8203	21.5143	20.8203	21.5143 (231)
Lighting	21.0589	16.8943	15.2114	11.1445	8.6084	7.0331	7.8528	10.2074	13.2584	17.3958	19.6485	21.6442 (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												811.0280 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.7000
Water heating fuel used												2853.2510 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8470)												
mechanical ventilation fans (SFP = 0.8470)												167.3132 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												253.3132 (231)
Electricity for lighting (calculated in Appendix L)												169.9577 (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	4087.5499 (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	811.0280	0.2100	170.3159 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2853.2510	0.2100	599.1827 (264)
Space and water heating			769.4986 (265)
Pumps, fans and electric keep-hot	253.3132	0.1387	35.1377 (267)
Energy for lighting	169.9577	0.1443	24.5301 (268)
Total CO2, kg/year			829.1664 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.5700 (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	811.0280	1.1300	916.4616 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2853.2510	1.1300	3224.1737 (278)
Space and water heating			4140.6353 (279)
Pumps, fans and electric keep-hot	253.3132	1.5128	383.2123 (281)
Energy for lighting	169.9577	1.5338	260.6868 (282)
Total Primary energy kWh/year			4784.5343 (286)
Dwelling Primary energy Rate (DPER)			78.3100 (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)
Ground floor	61.1000 (1b)	x 2.6500 (2b)	= 161.9150 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.1000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 161.9150 (5)

2. Ventilation rate

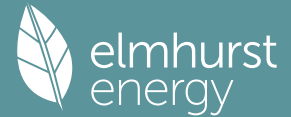
		m3 per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number 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) =	0.1235 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3735	(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) =	0.3175 (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	0.4048	0.3969	0.3889	0.3492	0.3413	0.3016	0.3016	0.2937	0.3175	0.3413	0.3572	0.3731 (22b)
Effective ac	0.5819	0.5788	0.5756	0.5610	0.5582	0.5455	0.5455	0.5431	0.5504	0.5582	0.5638	0.5696 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			7.8900	1.0000	7.8900		(26)

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TER Opening Type (Uw = 1.20)			6.7500	1.1450	7.7290	(27)
External Wall 1	40.3000	12.7500	27.5500	0.1800	4.9590	(29a)
Corridor Wall 2	27.0000	1.8900	25.1100	0.1800	4.5198	(29a)
Total net area of external elements Aum(A, m2)			67.3000			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	25.0978		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 147.9574 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.0000	0.0500	0.3000
E3 Sill	2.7000	0.0500	0.1350
E4 Jamb	29.2000	0.0500	1.4600
E7 Party floor between dwellings (in blocks of flats)	46.3000	0.0700	3.2410
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	0.4500	0.0200	0.0090
E16 Corner (normal)	15.9000	0.0900	1.4310
E17 Corner (inverted - internal area greater than external area)	5.3000	-0.0900	-0.4770
E18 Party wall between dwellings	2.6500	0.0600	0.1590
E25 Staggered party wall between dwellings	2.6500	0.0600	0.1590

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.4170 (36)
 Total Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 31.5148 (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	31.0938	30.9238	30.7572	29.9745	29.8281	29.1464	29.1464	29.0202	29.4090	29.8281	30.1243	30.4340 (38)
Average = Sum(39)m / 12 =	62.6086	62.4386	62.2720	61.4893	61.3429	60.6612	60.6612	60.5350	60.9238	61.3429	61.6391	61.9488 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0247	1.0219	1.0192	1.0064	1.0040	0.9928	0.9928	0.9908	0.9971	1.0040	1.0088	1.0139 (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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage for mixer showers												2.0126 (42)
Hot water usage for baths	57.9636	57.0925	55.8232	53.3945	51.6022	49.6035	48.4674	49.7272	51.1081	53.2541	55.7349	57.7415 (42a)
Hot water usage for other uses	25.0495	24.6774	24.1536	23.1876	22.4643	21.6623	21.2291	21.7493	22.3158	23.1739	24.1598	24.9648 (42b)
Average daily hot water use (litres/day)	35.2406	33.9591	32.6777	31.3962	30.1147	28.8332	28.8332	30.1147	31.3962	32.6777	33.9591	35.2406 (42c)
Daily hot water use	118.2537	115.7291	112.6544	107.9783	104.1813	100.0991	98.5298	101.5912	104.8200	109.1057	113.8538	117.9469 (44)
Energy content (annual)	187.2849	164.7967	173.1456	147.8169	140.2480	123.0835	119.1632	125.7911	129.2535	148.0554	162.2056	184.6763 (45)
Distribution loss (46)m = 0.15 x (45)m	28.0927	24.7195	25.9718	22.1725	21.0372	18.4625	17.8745	18.8687	19.3880	22.2083	24.3308	27.7014 (46)
Water storage loss:												210.0000 (47)
Store volume												1.7016 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.9188 (55)
Enter (49) or (54) in (55)												
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (56)
If cylinder contains dedicated solar storage												
Primary loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (57)
Combi loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	22.5120	23.2624 (59)
Total heat required for water heating calculated for each 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 (61)
WWHRS	239.0315	211.5355	224.8922	197.8943	191.9946	173.1608	170.9098	177.5377	179.3309	199.8020	212.2830	236.4229 (62)
PV diverter	-26.4985	-23.4355	-24.5403	-20.3204	-18.9378	-16.2052	-15.1898	-16.1529	-16.7666	-19.7659	-22.3924	-26.0078 (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	212.5329	188.1000	200.3519	177.5739	173.0568	156.9556	155.7200	161.3849	162.5643	180.0360	189.8905	210.4151 (64)
12Total per year (kWh/year)												2168.5819 (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	103.6695	92.1860	98.9682	89.2110	88.0297	80.9871	81.0190	83.2228	83.0387	90.6257	93.9952	102.8021 (65)

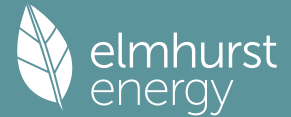
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279	100.6279 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	100.1777	110.9110	100.1777	103.5169	100.1777	103.5169	100.1777	100.1777	103.5169	100.1777	103.5169	100.1777 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.7124	177.5357	172.9410	163.1592	150.8116	139.2065	131.4536	129.6303	134.2250	144.0068	156.3544	167.9595 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628	33.0628 (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)	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024	-80.5024 (71)
Water heating gains (Table 5)	139.3407	137.1815	133.0218	123.9042	118.3195	112.4821	108.8966	111.8586	115.3315	121.8087	130.5489	138.1749 (72)
Total internal gains	471.4192	481.8166	462.3288	446.7687	425.4972	408.3940	393.7163	394.8550	406.2619	422.1816	446.6087	462.5005 (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
South	4.5000		46.7521	0.6300	0.7000	0.7700	64.2962 (78)
West	2.2500		19.6403	0.6300	0.7000	0.7700	13.5052 (80)

Solar gains	77.8014	131.7196	177.6427	215.0553	235.7433	231.6390	224.3336	209.3590	190.7212	144.9250	93.0523	66.6638 (83)
Total gains	549.2206	613.5363	639.9715	661.8240	661.2405	640.0329	618.0498	604.2140	596.9831	567.1066	539.6610	529.1644 (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	40.1090	40.2182	40.3258	40.8391	40.9365	41.3966	41.3966	41.4829	41.2182	40.9365	40.7398	40.5361
alpha	3.6739	3.6812	3.6884	3.7226	3.7291	3.7598	3.7598	3.7655	3.7479	3.7291	3.7160	3.7024
util living area	0.9531	0.9298	0.8978	0.8318	0.7269	0.5664	0.4212	0.4471	0.6352	0.8323	0.9251	0.9581 (86)
MIT	19.6005	19.8335	20.1185	20.4785	20.7577	20.9305	20.9822	20.9775	20.8887	20.5525	20.0373	19.5649 (87)
Th 2	20.0628	20.0651	20.0674	20.0780	20.0800	20.0893	20.0893	20.0910	20.0857	20.0800	20.0760	20.0718 (88)
util rest of house	0.9449	0.9180	0.8804	0.8029	0.6802	0.4979	0.3384	0.3642	0.5694	0.7983	0.9106	0.9507 (89)
MIT 2	18.4534	18.7444	19.0979	19.5388	19.8576	20.0396	20.0807	20.0794	19.9999	19.6344	19.0105	18.4153 (90)
Living area fraction	FLA = Living area / (4) = 0.6219 (91)											
MIT	19.1668	19.4217	19.7326	20.1233	20.4174	20.5937	20.6414	20.6379	20.5527	20.2054	19.6491	19.1303 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.1668	19.4217	19.7326	20.1233	20.4174	20.5937	20.6414	20.6379	20.5527	20.2054	19.6491	19.1303 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9355	0.9085	0.8734	0.8044	0.6981	0.5367	0.3892	0.4147	0.6040	0.8034	0.9029	0.9416 (94)
Useful gains	513.7954	557.4162	558.9282	532.3885	461.6093	343.4881	240.5256	250.5778	360.5995	455.5905	487.2485	498.2850 (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	930.7885	906.7175	824.0220	690.1115	534.7525	363.5837	245.1547	256.5432	393.1225	589.2254	773.5168	924.9119 (97)
Space heating kWh	310.2428	234.7305	197.2298	113.5606	54.4185	0.0000	0.0000	0.0000	0.0000	99.4243	206.1132	317.4104 (98a)
Space heating requirement - total per year (kWh/year)	1533.1301											
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	310.2428	234.7305	197.2298	113.5606	54.4185	0.0000	0.0000	0.0000	0.0000	99.4243	206.1132	317.4104 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1533.1301											
Space heating per m2	(98c) / (4) = 25.0921 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)												
Fraction of space heat from main system(s) 1.0000 (202)												
Efficiency of main space heating system 1 (in %) 92.3000 (206)												
Efficiency of main space heating system 2 (in %) 0.0000 (207)												
Efficiency of secondary/supplementary heating system, % 0.0000 (208)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	310.2428	234.7305	197.2298	113.5606	54.4185	0.0000	0.0000	0.0000	0.0000	99.4243	206.1132	317.4104 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	336.1244	254.3125	213.6835	123.0342	58.9583	0.0000	0.0000	0.0000	0.0000	107.7187	223.3079	343.8899 (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	212.5329	188.1000	200.3519	177.5739	173.0568	156.9556	155.7200	161.3849	162.5643	180.0360	189.8905	210.4151 (64)
Efficiency of water heater (217)m	84.9069	84.5576	84.0246	83.0846	81.7829	79.8000	79.8000	79.8000	79.8000	82.7851	84.2440	79.8000 (216)
Fuel for water heating, kWh/month	250.3129	222.4520	238.4444	213.7266	211.6050	196.6862	195.1378	202.2367	203.7147	217.4740	225.4054	247.6074 (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	20.8149	16.6985	15.0352	11.0154	8.5086	6.9516	7.7618	10.0891	13.1048	17.1942	19.4208	21.3935 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-6.2624	-9.7552	-15.4731	-19.2558	-22.4699	-21.6156	-21.3598	-19.3013	-16.0097	-11.9255	-7.2070	-5.3121 (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	-1.1928	-2.6229	-5.4353	-8.5042	-11.5900	-11.7722	-11.6286	-9.6793	-6.8854	-3.8519	-1.6237	-0.9347 (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	1661.0294 (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	79.8000	
Water heating fuel used	2624.8031 (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)	167.9885 (232)	
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-251.6684 (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	4288.1526 (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	1661.0294	0.2100	348.8162 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2624.8031	0.2100	551.2086 (264)
Space and water heating			900.0248 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	167.9885	0.1443	24.2459 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-175.9475	0.1326	-23.3243
PV Unit electricity exported	-75.7209	0.1247	-9.4449
Total			-32.7693 (269)
Total CO2, kg/year			903.4308 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.7900 (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	1661.0294	1.1300	1876.9632 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2624.8031	1.1300	2966.0275 (278)
Space and water heating			4842.9907 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	167.9885	1.5338	257.6664 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-175.9475	1.4898	-262.1297
PV Unit electricity exported	-75.7209	0.4578	-34.6650
Total			-296.7947 (283)
Total Primary energy kWh/year			4933.9632 (286)
Target Primary Energy Rate (TPER)			80.7500 (287)