

Full SAP Calculation Printout



Property Reference	Unit 1		Issued on Date	25/01/2024	
Assessment Reference	Be Green_Copy_Copy	Prop Type Ref	Unit 1		
Property					
SAP Rating	78 C	DER	5.03	TER	13.92
Environmental	96 A	% DER < TER			63.86
CO ₂ Emissions (t/year)	0.32	DFEE	31.13	TFEE	32.01
Compliance Check	See BREL	% DFEE < TFEE			2.77
% DPER < TPER	29.49	DPER	53.37	TPER	75.69
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	70.3000 (1b)	2.6500 (2b)	186.2950 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.3000		186.2950 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 186.2950 (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
Window (Uw = 1.20)			13.6500	1.1450	15.6298		(27)
Door			1.8900	1.0000	1.8900		(26)
External Wall 1	44.0000	13.6500	30.3500	0.1500	4.5525	14.0000	424.9000 (29a)
Corridor Wall 2	13.2500	1.8900	11.3600	0.1400	1.5904	150.0000	1704.0000 (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) =	23.6627	(33)
Party Floor 1			70.3000			40.0000	2812.0000 (32a)
Party Ceiling 1			70.3000			30.0000	2109.0000 (32b)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	7049.9000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.2831 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				9.5300	0.2500	2.3825	
E3 Sill				8.6300	0.0400	0.3452	

Full SAP Calculation Printout



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			0.0000 (36a) =
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)
---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------------

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)
---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------------

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)
---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------------

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):												0.6000 (49)
Temperature factor from Table 2b												0.7380 (55)
Enter (49) or (54) in (55)												
Total storage loss	22.8780	20.6640	22.8780	22.1400	22.8780	22.1400	22.8780	22.8780	22.1400	22.8780	22.1400	22.8780 (56)
If cylinder contains dedicated solar storage												
Primary loss	22.8780	20.6640	22.8780	22.1400	22.8780	22.1400	22.8780	22.8780	22.1400	22.8780	22.1400	22.8780 (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	246.4766	217.9557	231.3513	202.7693	196.1613	176.3122	173.6074	180.6973	182.9128	204.5133	218.1612	243.6863 (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	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)
Total per year (kWh/year)	246.4766	217.9557	231.3513	202.7693	196.1613	176.3122	173.6074	180.6973	182.9128	204.5133	218.1612	243.6863 (64)
Electric shower(s)												2475 (64)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												2475 (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)
	103.5241	91.9534	98.4950	88.2956	86.7943	79.4986	79.2951	81.6525	81.6933	89.5713	93.4134	102.5963 (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	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), 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)
Cooking gains (calculated in Appendix L, equation L15 or L15a), 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)
Pumps, fans	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)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-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)
Total internal gains	139.1453	136.8354	132.3857	122.6328	116.6590	110.4147	106.5794	109.7480	113.4629	120.3916	129.7408	137.8983 (72)
	493.8190	504.2648	483.9365	466.4906	443.2739	427.2821	411.3814	412.4954	424.7171	439.3387	465.9308	483.8359 (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	532.9827	581.5793	617.0773	675.9859	717.6098	716.8336	683.4013	633.6812	584.0003	532.2419	514.7907	516.0789 (84)

Full SAP Calculation Printout



7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	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	0.9131	0.8816	0.8289	0.7117	0.5601	0.3950	0.2882	0.3227	0.5131	0.7490	0.8709	0.9196 (86)
MIT	19.9344	20.1334	20.4011	20.7281	20.9097	20.9825	20.9960	20.9939	20.9521	20.7213	20.3148	19.9167 (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	0.9041	0.8700	0.8127	0.6877	0.5288	0.3594	0.2491	0.2812	0.4729	0.7221	0.8567	0.9112 (89)
MIT 2	19.1079	19.3561	19.6864	20.0858	20.2924	20.3792	20.3912	20.3921	20.3464	20.0870	19.5939	19.0934 (90)
Living area fraction									FLA = Living area / (4) =			0.6074 (91)
MIT	19.6099	19.8282	20.1205	20.4760	20.6673	20.7456	20.7586	20.7577	20.7143	20.4723	20.0318	19.5935 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6099	19.8282	20.1205	20.4760	20.6673	20.7456	20.7586	20.7577	20.7143	20.4723	20.0318	19.5935 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8922	0.8593	0.8059	0.6915	0.5435	0.3801	0.2727	0.3061	0.4946	0.7262	0.8482	0.8995 (94)
Useful gains	475.5113	499.7234	497.3171	467.4728	390.0104	272.4904	186.3470	193.9727	288.8235	386.5101	436.6301	464.2126 (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	728.2583	707.1778	642.5594	534.7634	412.4976	276.6772	187.2201	195.3289	300.3696	454.1266	599.9330	720.1672 (97)
Space heating kWh	188.0438	139.4094	108.0602	48.4493	16.7305	0.0000	0.0000	0.0000	0.0000	50.3067	117.5781	190.4302 (98a)
Space heating requirement - total per year (kWh/year)												859.0082
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	188.0438	139.4094	108.0602	48.4493	16.7305	0.0000	0.0000	0.0000	0.0000	50.3067	117.5781	190.4302 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												859.0082
Space heating per m2										(98c) / (4) =		12.2192 (99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space and Water												1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system												2.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	188.0438	139.4094	108.0602	48.4493	16.7305	0.0000	0.0000	0.0000	0.0000	50.3067	117.5781	190.4302 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 2.00	376.0876	278.8188	216.1205	96.8985	33.4610	0.0000	0.0000	0.0000	0.0000	100.6134	235.1563	380.8605
307a	376.0876	278.8188	216.1205	96.8985	33.4610	0.0000	0.0000	0.0000	0.0000	100.6134	235.1563	380.8605 (307)
Space heating requirement	376.0876	278.8188	216.1205	96.8985	33.4610	0.0000	0.0000	0.0000	0.0000	100.6134	235.1563	380.8605 (308)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
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 (309)
Water heating												
Annual water heating requirement	246.4766	217.9557	231.3513	202.7693	196.1613	176.3122	173.6074	180.6973	182.9128	204.5133	218.1612	243.6863 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 2.00	492.9531	435.9114	462.7027	405.5386	392.3225	352.6243	347.2147	361.3947	365.8256	409.0266	436.3224	487.3725
310a	492.9531	435.9114	462.7027	405.5386	392.3225	352.6243	347.2147	361.3947	365.8256	409.0266	436.3224	487.3725 (310)
Water heating fuel	492.9531	435.9114	462.7027	405.5386	392.3225	352.6243	347.2147	361.3947	365.8256	409.0266	436.3224	487.3725 (310)
492.9531	435.9114	462.7027	405.5386	392.3225	352.6243	347.2147	361.3947	365.8256	409.0266	436.3224	487.3725 (310)	
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	12.5278	11.3154	12.5278	12.1237	12.5278	12.1237	12.5278	12.5278	12.1237	12.5278	12.1237	12.5278 (331)
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 (332)
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 (333a)
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												1718.0164 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												4949.2092 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												17.1802 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6490)												
mechanical ventilation fans (SFP = 0.6490)												147.5047 (330a)
Total electricity for the above, kWh/year												147.5047 (331)
Electricity for lighting (calculated in Appendix L)												172.9741 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (333)
Wind generation												0.0000 (334)
Hydro-electric generation (Appendix N)												0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)
Appendix Q - special features												

Full SAP Calculation Printout



Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	6987.7044 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			324.0000 (367)
Space and Water heating from Heat pump	2057.7857	0.1563	82.8782 (367)
Electrical energy for heat distribution (space & water)	17.1802	0.0000	9.6611 (372)
Overall CO2 factor for heat network			0.0462 (386)
Total CO2 associated with community systems			307.8436 (373)
Space and water heating			307.8436 (376)
Pumps, fans and electric keep-hot	147.5047	0.1387	20.4607 (378)
Energy for lighting	172.9741	0.1443	24.9655 (379)
Total CO2, kg/year			353.2698 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.0300 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			324.0000 (467a)
Space and Water heating from Heat pump	2057.7857	1.5786	837.0787 (467)
Electrical energy for heat distribution (space & water)	17.1802	0.0000	102.4078 (472)
Overall CO2 factor for heat network			0.4894 (486)
Total CO2 associated with community systems			3263.1412 (473)
Space and water heating			3263.1412 (476)
Pumps, fans and electric keep-hot	147.5047	1.5128	223.1450 (478)
Energy for lighting	172.9741	1.5338	265.3134 (479)
Total Primary energy kWh/year			3751.5997 (483)
Dwelling Primary energy Rate (DPER)			53.3700 (484)

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

1. Overall dwelling characteristics

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

Full SAP Calculation Printout



Total net area of external elements Aum(A, m2) 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	Length	Psi-value	Total
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
E7 Party floor between dwellings (in blocks of flats)	38.7000	0.0700	2.7090
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
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	0.0600	0.1590

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5605 (36)
 Point Thermal bridges 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
Heat transfer coeff	36.8383	36.6014	36.3692	35.2788	35.0748	34.1250	34.1250	33.9491	34.4908	35.0748	35.4875	35.9190
Average = Sum(39)m / 12 =	68.4263	68.1895	67.9573	66.8668	66.6628	65.7131	65.7131	65.5372	66.0789	66.6628	67.0756	67.5071

HLP 0.9733 0.9700 0.9667 0.9512 0.9483 0.9348 0.9348 0.9323 0.9400 0.9483 0.9541 0.9603 (40)
 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 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)

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)

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)

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
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
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												0.9188
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	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	23.2624	22.5120	23.2624	22.5120	23.2624
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
Total 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
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693	112.6693
Appliances gains (calculated in Appendix L, equation L13 or L13a), 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
Cooking gains (calculated in Appendix L, equation L15 or L15a), 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
Pumps, fans	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669	34.2669
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
Water heating gains (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
Total internal gains	145.1734	142.8636	138.4139	128.6609	122.6871	116.4429	112.6076	115.7761	119.4911	126.4197	135.7690	143.9264

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
-------	---------	--------------------------	-----------------------------	------------------------------	------------------------	---------

Full SAP Calculation Printout



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 (92)
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)
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

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	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)
Ext temp.	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)
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	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 requirement - total per year (kWh/year)	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)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Space heating requirement after solar contribution - total per year (kWh/year)	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 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	79.8000 (216)
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)	-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)	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)	-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)	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												1912.7640 (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												2752.0097 (219)

Full SAP Calculation Printout



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)

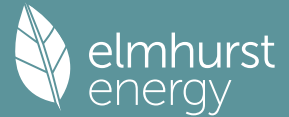
 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	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 Green_Copy	Prop Type Ref	Unit 2		
Property					
SAP Rating	81 B	DER	3.87	TER	11.23
Environmental	97 A	% DER < TER			65.54
CO ₂ Emissions (t/year)	0.33	DFEE	23.96	TFEE	24.63
Compliance Check	See BREL	% DFEE < TFEE			2.70
% DPER < TPER	32.45	DPER	41.24	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	

Full SAP Calculation Printout



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	
	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)
Heat transfer coeff	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)
Average = Sum(39)m / 12 =												47.2616	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6418	(42)
Hot water usage for mixer showers													68.2514	(42a)
Hot water usage for baths													29.4864	(42b)
Hot water usage for other uses													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		
	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):													0.6000	(49)
Temperature factor from Table 2b													0.7380	(55)
Enter (49) or (54) in (55)														
Total storage loss													22.8780	(56)
If cylinder contains dedicated solar storage													22.8780	(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	267.5256	236.4768	250.8103	219.3818	211.9229	190.1447	186.9996	194.8348	197.4397	221.1534	236.3916	264.4422	(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	267.5256	236.4768	250.8103	219.3818	211.9229	190.1447	186.9996	194.8348	197.4397	221.1534	236.3916	264.4422	(64)	
Total per year (kWh/year) = Sum(64)m =													2677.5234	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000	(64a)

Heat gains from water heating, kWh/month

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	110.5229	98.1117	104.9651	93.8192	92.0350	84.0979	83.7480	86.3532	86.5235	95.1041	99.4750	109.4977	(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	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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.6717	-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)	148.5523	145.9995	141.0821	130.3045	123.7030	116.8026	112.5645	116.0661	120.1715	127.8282	138.1597	147.1743	(72)
Total internal gains	580.7539	594.4519	569.4783	549.5464	521.7136	503.1554	483.9950	484.9930	499.6843	516.4952	548.0581	568.7305	(73)

6. Solar gains

[Jan]		Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
East		6.1200	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	656.3655	729.9859	769.4498	816.1605	833.5507	817.4816	785.1432	752.3822	723.1027	670.5322	639.9324	632.5469	(84)

Full SAP Calculation Printout



7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	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	0.9125	0.8647	0.7968	0.6647	0.5167	0.3586	0.2573	0.2792	0.4394	0.6863	0.8522	0.9209 (86)
MIT	20.4565	20.6189	20.7759	20.9246	20.9819	20.9980	20.9997	20.9996	20.9941	20.9260	20.7106	20.4401 (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	0.9034	0.8523	0.7799	0.6425	0.4910	0.3319	0.2291	0.2501	0.4093	0.6605	0.8371	0.9126 (89)
MIT 2	19.8511	20.0512	20.2417	20.4241	20.4885	20.5159	20.5174	20.5196	20.5078	20.4301	20.1751	19.8388 (90)
Living area fraction									fLA = Living area / (4) =			0.7105 (91)
MIT	20.2812	20.4546	20.6213	20.7797	20.8391	20.8585	20.8601	20.8606	20.8533	20.7824	20.5556	20.2660 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2812	20.4546	20.6213	20.7797	20.8391	20.8585	20.8601	20.8606	20.8533	20.7824	20.5556	20.2660 (93)

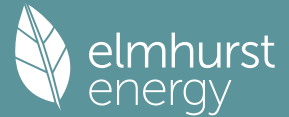
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8996	0.8514	0.7843	0.6549	0.5084	0.3508	0.2491	0.2707	0.4304	0.6751	0.8388	0.9086 (94)
Useful gains	590.4385	621.5299	603.4750	534.5292	423.7576	286.7526	195.5753	203.7060	311.2040	452.6817	536.8032	574.7021 (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	782.1545	757.6662	684.5788	562.1435	430.3387	287.4437	195.6614	203.8384	313.3016	479.4673	639.8298	771.4082 (97)
Space heating kWh	142.6367	91.4836	60.3412	19.8823	4.8963	0.0000	0.0000	0.0000	0.0000	19.9284	74.1792	146.3494 (98a)
Space heating requirement - total per year (kWh/year)												559.6971
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	142.6367	91.4836	60.3412	19.8823	4.8963	0.0000	0.0000	0.0000	0.0000	19.9284	74.1792	146.3494 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												559.6971
Space heating per m2										(98c) / (4) =		6.1370 (99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space and Water												1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system												2.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	142.6367	91.4836	60.3412	19.8823	4.8963	0.0000	0.0000	0.0000	0.0000	19.9284	74.1792	146.3494 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 2.00												
307a	285.2734	182.9672	120.6825	39.7645	9.7926	0.0000	0.0000	0.0000	0.0000	39.8569	148.3583	292.6988
Space heating requirement	285.2734	182.9672	120.6825	39.7645	9.7926	0.0000	0.0000	0.0000	0.0000	39.8569	148.3583	292.6988 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement	267.5256	236.4768	250.8103	219.3818	211.9229	190.1447	186.9996	194.8348	197.4397	221.1534	236.3916	264.4422 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 2.00												
310a	535.0512	472.9535	501.6207	438.7635	423.8458	380.2893	373.9993	389.6696	394.8794	442.3068	472.7831	528.8845
Water heating fuel	535.0512	472.9535	501.6207	438.7635	423.8458	380.2893	373.9993	389.6696	394.8794	442.3068	472.7831	528.8845 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	14.5995	13.1866	14.5995	14.1285	14.5995	14.1285	14.5995	14.5995	14.1285	14.5995	14.1285	14.5995 (331)
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 (332)
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 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												1119.3941 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												5355.0467 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												11.1939 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.5830)												
mechanical ventilation fans (SFP = 0.5830)												171.8973 (330a)
Total electricity for the above, kWh/year												171.8973 (331)
Electricity for lighting (calculated in Appendix L)												221.6122 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (333)
Wind generation												0.0000 (334)
Hydro-electric generation (Appendix N)												0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)
Appendix Q - special features												
Energy saved or generated												-0.0000 (336)
Energy used												0.0000 (337)

Full SAP Calculation Printout



Total delivered energy for all uses

6867.9504 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			324.0000 (367)
Space and Water heating from Heat pump	1998.2842	0.1579	54.5525 (367)
Electrical energy for heat distribution (space & water)	11.1939	0.0000	9.3179 (372)
Overall CO2 factor for heat network			0.0459 (386)
Total CO2 associated with community systems			296.9087 (373)
Space and water heating			296.9087 (376)
Pumps, fans and electric keep-hot	171.8973	0.1387	23.8443 (378)
Energy for lighting	221.6122	0.1443	31.9855 (379)
Total CO2, kg/year			352.7384 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.8700 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			324.0000 (467a)
Space and Water heating from Heat pump	1998.2842	1.5845	547.4327 (467)
Electrical energy for heat distribution (space & water)	11.1939	0.0000	99.2063 (472)
Overall CO2 factor for heat network			0.4882 (486)
Total CO2 associated with community systems			3161.1299 (473)
Space and water heating			3161.1299 (476)
Pumps, fans and electric keep-hot	171.8973	1.5128	260.0463 (478)
Energy for lighting	221.6122	1.5338	339.9162 (479)
Total Primary energy kWh/year			3761.0924 (483)
Dwelling Primary energy Rate (DPER)			41.2400 (484)

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

1. Overall dwelling characteristics

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

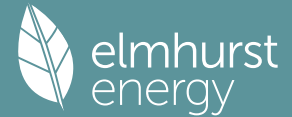
		Air changes per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (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 infilt 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)
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, m2)			64.9500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.9371		(33)

Full SAP Calculation Printout



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)

Point Thermal bridges 5.7678 (36)

Total fabric heat loss (36a) = 0.0000

(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	0.8184 (40)

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6418 (42)

Hot water usage for mixer showers

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage for baths	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 other uses	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)
Average daily hot water use (litres/day)	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)

Daily hot water use

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

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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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 (56)
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)	Total per year (kWh/year) = Sum(64)m = 2452.5035 (64)											
Electric shower(s)	2453 (64)											
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)

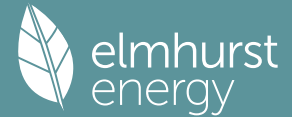
Metabolic gains (Table 5), Watts

(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.0896	132.0896	132.0896	132.0896	132.0896	132.0896	132.0896	132.0896	132.0896	132.0896	132.0896	132.0896 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), 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)
Cooking gains (calculated in Appendix L, equation L15 or L15a), 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)
Pumps, fans	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)
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)	-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)
Total internal gains	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)
	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 m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
East	6.1200	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)

Full SAP Calculation Printout



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	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)	
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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9393	0.9081	0.8615	0.7677	0.6362	0.4714	0.3429	0.3754	0.5708	0.7954	0.9062	0.9460 (94)
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	79.8000 (216)	
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)	-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)	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)	-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)	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												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)	
Space cooling fuel												0.0000 (221)	
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000 (231)	

Full SAP Calculation Printout



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)

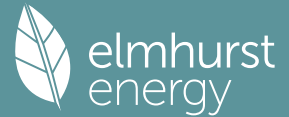
 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	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)

Full SAP Calculation Printout



Property Reference	Unit 3		Issued on Date	25/01/2024	
Assessment Reference	Be Green_Copy	Prop Type Ref	Unit 3		
Property					
SAP Rating	80 C	DER	4.39	TER	12.53
Environmental	96 A	% DER < TER		64.96	
CO ₂ Emissions (t/year)	0.31	DFEE	26.50	TFEE	27.35
Compliance Check	See BREL	% DFEE < TFEE		3.13	
% DPER < TPER	31.55	DPER	46.75	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)

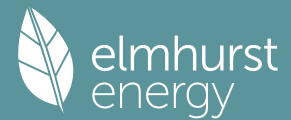
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	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	

Full SAP Calculation Printout



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) = 0.0000
 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
	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)
Heat transfer coeff	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)
Average = Sum(39)m / 12 =												43.7943

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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)
HLP (average)												0.5673
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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
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 conte	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)
Energy content (annual)												2011.8990
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:
 Store volume 210.0000 (47)
 a) If manufacturer declared loss factor is known (kWh/day):
 Temperature factor from Table 2b 1.2300 (48)
 Enter (49) or (54) in (55) 0.6000 (49)
 Total storage loss 0.7380 (55)

If cylinder contains dedicated solar storage

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
22.8780	20.6640	22.8780	22.1400	22.8780	22.1400	22.8780	22.8780	22.8780	22.1400	22.8780	22.1400	22.8780 (56)
22.8780	20.6640	22.8780	22.1400	22.8780	22.1400	22.8780	22.8780	22.8780	22.1400	22.8780	22.1400	22.8780 (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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
254.8332	225.3087	239.0767	209.3646	202.4188	181.8038	178.9242	186.3100	188.6801	211.1196	225.3988	251.9266 (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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
254.8332	225.3087	239.0767	209.3646	202.4188	181.8038	178.9242	186.3100	188.6801	211.1196	225.3988	251.9266 (64)	
												2555.1650 (64)
												2555 (64)

12Total per year (kWh/year) Total per year (kWh/year) = Sum(64)m = 2555 (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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
106.3027	94.3983	101.0636	90.4885	88.8749	81.3246	81.0629	83.5187	83.6109	91.7679	95.8199	105.3362 (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
120.3793	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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
116.6121	129.1063	116.6121	120.4992	116.6121	120.4992	116.6121	120.4992	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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
35.0379	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 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-96.3035	-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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
142.8799	140.4737	135.8382	125.6785	119.4555	112.9508	108.9556	112.2563	116.1263	123.3439	133.0832	141.5809 (72)	

Total internal gains

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
532.0951	544.3983	521.6861	503.5287	478.4163	461.6986	444.3966	445.4820	458.8217	474.0370	502.6656	521.3764 (73)	

6. Solar gains

[Jan]		Area	Solar flux	g	FF	Access	Gains
		m2	Table 6a	or Table 6b	Specific data	factor	W
			W/m2		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
Total gains	571.5552	621.5907	648.8110	688.9329	705.6360	694.2984	665.8411
							190.2176
							147.8515
							635.6996
							606.6732
							565.6323
							551.8678
							32.4501 (83)
							553.8265 (84)

Full SAP Calculation Printout



7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	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	0.9393	0.9060	0.8503	0.7225	0.5650	0.3923	0.2818	0.3071	0.4858	0.7450	0.8917	0.9453 (86)
MIT	20.4657	20.6040	20.7590	20.9193	20.9821	20.9983	20.9998	20.9997	20.9941	20.9199	20.7047	20.4525 (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	0.9312	0.8945	0.8333	0.6975	0.5346	0.3603	0.2481	0.2722	0.4496	0.7163	0.8771	0.9379 (89)
MIT 2	19.8220	19.9930	20.1815	20.3761	20.4449	20.4715	20.4727	20.4749	20.4635	20.3815	20.1278	19.8134 (90)
Living area fraction									fLA = Living area / (4) =			0.6438 (91)
MIT	20.2364	20.3863	20.5533	20.7258	20.7907	20.8106	20.8120	20.8127	20.8051	20.7281	20.4992	20.2248 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2364	20.3863	20.5533	20.7258	20.7907	20.8106	20.8120	20.8127	20.8051	20.7281	20.4992	20.2248 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9280	0.8932	0.8367	0.7100	0.5532	0.3808	0.2698	0.2947	0.4726	0.7308	0.8783	0.9346 (94)
Useful gains	530.3865	555.2269	542.8527	489.1435	390.3887	264.4152	179.6517	187.3113	286.7146	413.3657	484.7150	517.5856 (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	720.5936	697.2040	629.9297	518.4826	396.7841	264.9843	179.7111	187.4091	288.7130	442.0617	590.0946	712.0141 (97)
Space heating kWh	141.5141	95.4086	64.7853	21.1242	4.7581	0.0000	0.0000	0.0000	0.0000	21.3498	75.8733	144.6548 (98a)
Space heating requirement - total per year (kWh/year)												569.4682
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	141.5141	95.4086	64.7853	21.1242	4.7581	0.0000	0.0000	0.0000	0.0000	21.3498	75.8733	144.6548 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												569.4682
Space heating per m2										(98c) / (4) =		7.3765 (99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space and Water												1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system												2.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	141.5141	95.4086	64.7853	21.1242	4.7581	0.0000	0.0000	0.0000	0.0000	21.3498	75.8733	144.6548 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 2.00												
307a	283.0281	190.8172	129.5707	42.2483	9.5162	0.0000	0.0000	0.0000	0.0000	42.6995	151.7466	289.3096
Space heating requirement	283.0281	190.8172	129.5707	42.2483	9.5162	0.0000	0.0000	0.0000	0.0000	42.6995	151.7466	289.3096 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement	254.8332	225.3087	239.0767	209.3646	202.4188	181.8038	178.9242	186.3100	188.6801	211.1196	225.3988	251.9266 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 2.00												
310a	509.6664	450.6174	478.1534	418.7292	404.8375	363.6076	357.8484	372.6201	377.3602	422.2391	450.7976	503.8531
Water heating fuel	509.6664	450.6174	478.1534	418.7292	404.8375	363.6076	357.8484	372.6201	377.3602	422.2391	450.7976	503.8531 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	13.7574	12.4260	13.7574	13.3136	13.7574	13.3136	13.7574	13.7574	13.3136	13.7574	13.3136	13.7574 (331)
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 (332)
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 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												1138.9363 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												5110.3300 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												11.3894 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6490)												
mechanical ventilation fans (SFP = 0.6490)												161.9824 (330a)
Total electricity for the above, kWh/year												161.9824 (331)
Electricity for lighting (calculated in Appendix L)												203.2709 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (333)
Wind generation												0.0000 (334)
Hydro-electric generation (Appendix N)												0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)
Appendix Q - special features												
Energy saved or generated												-0.0000 (336)
Energy used												0.0000 (337)
Total delivered energy for all uses												6614.5195 (338)

Full SAP Calculation Printout



12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			324.0000 (367)
Space and Water heating from Heat pump	1928.7859	0.1577	55.4521 (367)
Electrical energy for heat distribution (space & water)	11.3894	0.0000	9.0006 (372)
Overall CO2 factor for heat network			0.0459 (386)
Total CO2 associated with community systems			286.7975 (373)
Space and water heating			286.7975 (376)
Pumps, fans and electric keep-hot	161.9824	0.1387	22.4689 (378)
Energy for lighting	203.2709	0.1443	29.3383 (379)
Total CO2, kg/year			338.6047 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.3900 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			324.0000 (467a)
Space and Water heating from Heat pump	1928.7859	1.5840	556.8007 (467)
Electrical energy for heat distribution (space & water)	11.3894	0.0000	95.7815 (472)
Overall CO2 factor for heat network			0.4884 (486)
Total CO2 associated with community systems			3052.0005 (473)
Space and water heating			3052.0005 (476)
Pumps, fans and electric keep-hot	161.9824	1.5128	245.0469 (478)
Energy for lighting	203.2709	1.5338	311.7836 (479)
Total Primary energy kWh/year			3608.8310 (483)
Dwelling Primary energy Rate (DPER)			46.7500 (484)

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

1. Overall dwelling characteristics

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

		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) =	0.1466 (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 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)
External Wall 1	35.0000	9.0600	25.9400	0.1800	4.6692		(29a)
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)

Full SAP Calculation Printout



Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 155.6433 (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	48.5000	0.0700	3.3950
E7 Party floor between dwellings (in blocks of flats)	0.6900	0.0200	0.0138
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	13.2500	0.0900	1.1925
E16 Corner (normal)	10.6000	-0.0900	-0.9540
E17 Corner (inverted - internal area greater than external area)	10.6000	0.0600	0.6360
E18 Party wall between dwellings	21.0000	0.0500	1.0500
E4 Jamb			

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)

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

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	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												1.7016 (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)
FV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	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)

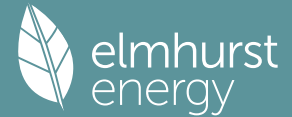
5. Internal gains (see Table 5 and 5a)

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						
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)

Full SAP Calculation Printout



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)												
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	fLA = Living area / (4) = 0.6438 (91)											
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 (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 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)											
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)											

Full SAP Calculation Printout



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)

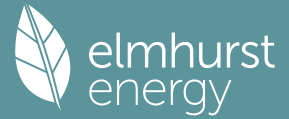
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	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)

Full SAP Calculation Printout



Property Reference	Unit 4		Issued on Date	25/01/2024	
Assessment Reference	Be Green_Copy	Prop Type Ref	Unit 4		
Property					
SAP Rating	78 C	DER	5.11	TER	14.01
Environmental	96 A	% DER < TER			63.53
CO ₂ Emissions (t/year)	0.29	DFEE	28.73	TFEE	29.38
Compliance Check	See BREL	% DFEE < TFEE			2.22
% DPER < TPER	28.71	DPER	54.42	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)

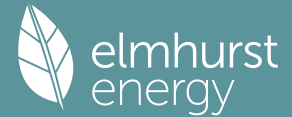
2. Ventilation rate

	m3 per hour												
Number of open chimneys	0 * 80 =											0.0000 (6a)	
Number of open flues	0 * 20 =											0.0000 (6b)	
Number of chimneys / flues attached to closed fire	0 * 10 =											0.0000 (6c)	
Number of flues attached to solid fuel boiler	0 * 20 =											0.0000 (6d)	
Number of flues attached to other heater	0 * 35 =											0.0000 (6e)	
Number of blocked chimneys	0 * 20 =											0.0000 (6f)	
Number of intermittent extract fans	0 * 10 =											0.0000 (7a)	
Number of passive vents	0 * 10 =											0.0000 (7b)	
Number of flueless gas fires	0 * 40 =											0.0000 (7c)	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =											0.0000 (8)	
Pressure test	Yes												
Pressure Test Method	Blower Door												
Measured/design AP50	3.0000											(17)	
Infiltration rate	0.1500											(18)	
Number of sides sheltered	2											(19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =											0.8500 (20)	
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =											0.1275 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Balanced mechanical ventilation with heat recovery	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)
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

Full SAP Calculation Printout



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 (38)
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 (39)
												43.0814

HLP	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 (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 2.0154 (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
Energy conte	118.3492	115.8226	112.7454	108.0656	104.2655	100.1800	98.6094	101.6733	104.9047	109.1939	113.9458	118.0422 (44)
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 (45)
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 (46)
Water storage loss:												210.0000 (47)
Store volume												1.2300 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.6000 (49)
Temperature factor from Table 2b												0.7380 (55)
Enter (49) or (54) in (55)												
Total storage loss	22.8780	20.6640	22.8780	22.1400	22.8780	22.1400	22.8780	22.8780	22.1400	22.8780	22.1400	22.8780 (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	233.5766	206.6051	219.4259	192.5884	186.5018	167.8349	165.3999	172.0332	174.0100	194.3154	206.9887	230.9660 (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	233.5766	206.6051	219.4259	192.5884	186.5018	167.8349	165.3999	172.0332	174.0100	194.3154	206.9887	230.9660 (64)
Total per year (kWh/year)												2350.2460 (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	99.2349	88.1793	94.5298	84.9104	83.5825	76.6799	76.5661	78.7717	78.7331	86.1805	89.6986	98.3668 (65)

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

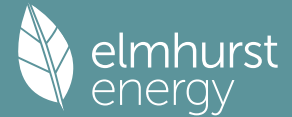
Metabolic gains (Table 5), Watts

(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	88.7362	98.2437	88.7362	91.6941	88.7362	91.6941	88.7362	88.7362	91.6941	88.7362	91.6941	88.7362 (67)
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 (68)
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 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-80.6141	-80.6141	-80.6141	-80.6141	-80.6141	-80.6141	-80.6141	-80.6141	-80.6141	-80.6141	-80.6141	-80.6141 (71)
Water heating gains (Table 5)	133.3802	131.2192	127.0561	117.9312	112.3420	106.4999	102.9114	105.8759	109.3516	115.8340	124.5813	132.2135 (72)
Total internal gains	451.3096	460.4820	442.2101	426.2474	405.3351	390.8292	376.5190	377.6575	388.6923	402.0126	426.0830	442.3789 (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						
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 (83)
Total gains	545.3189	621.9023	665.4304	705.0450	718.3790	701.6114	676.1700	651.9808	631.3122	581.1548	538.9447	522.6489 (84)

Full SAP Calculation Printout



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	0.9186	0.8692	0.8017	0.6812	0.5391	0.3814	0.2735	0.2952	0.4569	0.7005	0.8635	0.9279 (86)
MIT	20.2604	20.4732	20.6772	20.8708	20.9620	20.9942	20.9990	20.9986	20.9863	20.8766	20.5759	20.2300 (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	0.9081	0.8541	0.7807	0.6528	0.5045	0.3436	0.2334	0.2540	0.4157	0.6675	0.8455	0.9184 (89)
MIT 2	19.4674	19.7276	19.9728	20.2052	20.3046	20.3472	20.3510	20.3532	20.3358	20.2177	19.8665	19.4381 (90)
Living area fraction									FLA = Living area / (4) =			
MIT	19.9546	20.1857	20.4056	20.6141	20.7085	20.7447	20.7491	20.7497	20.7354	20.6225	20.3023	19.9246 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9546	20.1857	20.4056	20.6141	20.7085	20.7447	20.7491	20.7497	20.7354	20.6225	20.3023	19.9246 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9018	0.8509	0.7833	0.6649	0.5240	0.3666	0.2580	0.2792	0.4403	0.6820	0.8446	0.9120 (94)
Useful gains	491.7769	529.1594	521.2387	468.7792	376.4221	257.1881	174.4569	182.0604	277.9841	396.3395	455.2038	476.6408 (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	693.7848	674.8268	611.5250	505.1608	386.9468	258.6951	174.6809	182.3843	281.6183	430.5028	571.5887	686.1566 (97)
Space heating kWh	150.2939	97.8885	67.1730	26.1948	7.8304	0.0000	0.0000	0.0000	0.0000	25.4176	83.7971	155.8797 (98a)
Space heating requirement - total per year (kWh/year)												614.4750
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	150.2939	97.8885	67.1730	26.1948	7.8304	0.0000	0.0000	0.0000	0.0000	25.4176	83.7971	155.8797 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												614.4750
Space heating per m2												(98c) / (4) =
												10.0404 (99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space and Water												1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system												2.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	150.2939	97.8885	67.1730	26.1948	7.8304	0.0000	0.0000	0.0000	0.0000	25.4176	83.7971	155.8797 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 2.00												
307a	300.5878	195.7770	134.3460	52.3896	15.6608	0.0000	0.0000	0.0000	0.0000	50.8351	167.5942	311.7594
Space heating requirement	300.5878	195.7770	134.3460	52.3896	15.6608	0.0000	0.0000	0.0000	0.0000	50.8351	167.5942	311.7594 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement	233.5766	206.6051	219.4259	192.5884	186.5018	167.8349	165.3999	172.0332	174.0100	194.3154	206.9887	230.9660 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 2.00												
310a	467.1533	413.2101	438.8519	385.1768	373.0035	335.6699	330.7999	344.0664	348.0200	388.6309	413.9774	461.9320
Water heating fuel	467.1533	413.2101	438.8519	385.1768	373.0035	335.6699	330.7999	344.0664	348.0200	388.6309	413.9774	461.9320 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	10.9061	9.8507	10.9061	10.5543	10.9061	10.5543	10.9061	10.9061	10.5543	10.9061	10.5543	10.9061 (331)
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 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												1228.9500 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												4700.4920 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												12.2895 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6490)												
mechanical ventilation fans (SFP = 0.6490)												128.4109 (330a)
Total electricity for the above, kWh/year												128.4109 (331)
Electricity for lighting (calculated in Appendix L)												155.1290 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (333)
Wind generation												0.0000 (334)
Hydro-electric generation (Appendix N)												0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)
Appendix Q - special features												

Full SAP Calculation Printout



Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	6212.9818 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			324.0000 (367)
Space and Water heating from Heat pump	1830.0747	0.1574	59.7133 (367)
Electrical energy for heat distribution (space & water)	12.2895	0.0000	8.5584 (372)
Overall CO2 factor for heat network			0.0460 (386)
Total CO2 associated with community systems			272.7079 (373)
Space and water heating			272.7079 (376)
Pumps, fans and electric keep-hot	128.4109	0.1387	17.8122 (378)
Energy for lighting	155.1290	0.1443	22.3899 (379)
Total CO2, kg/year			312.9099 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.1100 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			324.0000 (467a)
Space and Water heating from Heat pump	1830.0747	1.5828	600.3527 (467)
Electrical energy for heat distribution (space & water)	12.2895	0.0000	90.9485 (472)
Overall CO2 factor for heat network			0.4887 (486)
Total CO2 associated with community systems			2898.0022 (473)
Space and water heating			2898.0022 (476)
Pumps, fans and electric keep-hot	128.4109	1.5128	194.2600 (478)
Energy for lighting	155.1290	1.5338	237.9420 (479)
Total Primary energy kWh/year			3330.2042 (483)
Dwelling Primary energy Rate (DPER)			54.4200 (484)

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

1. Overall dwelling characteristics

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

Full SAP Calculation Printout



Total net area of external elements Aum(A, m2) 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

K1 Element	Length	Psi-value	Total
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
E7 Party floor between dwellings (in blocks of flats)	45.9000	0.0700	3.2130
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	0.4500	0.0200	0.0090
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	0.0200	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.2905 (36)
 Point Thermal bridges 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
Heat transfer coeff	31.1400	30.9699	30.8032	30.0201	29.8736	29.1915	29.1915	29.0652	29.4542	29.8736	30.1699	30.4798
Average = Sum(39)m / 12 =	62.7005	62.5304	62.3637	61.5806	61.4341	60.7521	60.7521	60.6258	61.0148	61.4341	61.7305	62.0404

HLP 1.0245 1.0217 1.0190 1.0062 1.0038 0.9927 0.9927 0.9906 0.9970 1.0038 1.0087 1.0137 (40)
 HLP (average) 31 28 31 30 31 30 31 31 30 31 30 31
 Days in mont 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
Energy conte	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:												
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												
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	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	23.2624	22.5120	23.2624	22.5120	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	239.1828	211.6687	225.0321	198.0137	192.1080	173.2603	171.0061	177.6394	179.4353	199.9216	212.4141	236.5722
PV diverter	-26.5199	-23.4544	-24.5601	-20.3368	-18.9531	-16.2183	-15.2021	-16.1659	-16.7801	-19.7819	-22.4105	-26.0288
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
Total 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
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
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	100.7676	100.7676	100.7676	100.7676	100.7676	100.7676	100.7676	100.7676	100.7676	100.7676	100.7676	100.7676
Appliances gains (calculated in Appendix L, equation L13 or L13a), 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
Cooking gains (calculated in Appendix L, equation L15 or L15a), 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
Pumps, fans	33.0768	33.0768	33.0768	33.0768	33.0768	33.0768	33.0768	33.0768	33.0768	33.0768	33.0768	33.0768
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
Water heating gains (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
Total internal gains	139.4084	137.2474	133.0843	123.9593	118.3702	112.5281	108.9396	111.9041	115.3797	121.8622	130.6095	138.2416
	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

[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
-------	---------	--------------------------	-----------------------------	------------------------------	------------------------	---------

Full SAP Calculation Printout



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	19.2496	19.5709	19.9219	20.2901	20.5139	20.6190	20.6425	20.6406	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

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	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)
Ext temp.	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)
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	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 requirement - total per year (kWh/year)	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)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Space heating requirement after solar contribution - total per year (kWh/year)	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 per m2												1332.0533 (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	79.8000 (216)
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)	-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)	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)	-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)	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												1443.1780 (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												2634.8823 (219)

Full SAP Calculation Printout



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)

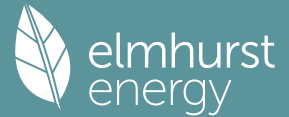
 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	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)

Full SAP Calculation Printout



Property Reference	Unit 5		Issued on Date	25/01/2024	
Assessment Reference	Be Green_Copy	Prop Type Ref	Unit 5		
Property					
SAP Rating	77 C	DER	5.44	TER	14.68
Environmental	96 A	% DER < TER		62.94	
CO ₂ Emissions (t/year)	0.31	DFEE	32.13	TFEE	32.48
Compliance Check	See BREL	% DFEE < TFEE		1.07	
% DPER < TPER	27.71	DPER	57.80	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	

Full SAP Calculation Printout



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	0.1200	0.3180
E2 Other lintels (including other steel lintels)	9.5300	0.2500	2.3825
E3 Sill	8.6300	0.0400	0.3452
E4 Jamb	41.2000	0.0400	1.6480
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.7527 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	30.3454 (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	14.0713	13.9001	13.7290	12.8732	12.7021	11.8463	11.8463	11.6752	12.1886	12.7021	13.0444	13.3867 (38)
Average = Sum(39)m / 12 =	44.4166	44.2455	44.0743	43.2186	43.0474	42.1917	42.1917	42.0205	42.5340	43.0474	43.3897	43.7320 (39)
												43.1758

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7234	0.7206	0.7178	0.7039	0.7011	0.6872	0.6872	0.6844	0.6927	0.7011	0.7067	0.7122 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	0.7032
												31

4. Water heating energy requirements (kWh/year)

Assumed occupancy

Hot water usage for mixer showers												2.0209 (42)
Hot water usage for baths	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 other uses	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)
Average daily hot water use (litres/day)	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)
												108.9655 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	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)
Distribution loss (46)m = 0.15 x (45)m	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)
Water storage loss:	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)
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.2300 (48)
Temperature factor from Table 2b												0.6000 (49)
Enter (49) or (54) in (55)												0.7380 (55)
Total storage loss	22.8780	20.6640	22.8780	22.1400	22.8780	22.1400	22.8780	22.8780	22.1400	22.8780	22.1400	22.8780 (56)
If cylinder contains dedicated solar storage	22.8780	20.6640	22.8780	22.1400	22.8780	22.1400	22.8780	22.8780	22.1400	22.8780	22.1400	22.8780 (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	233.8789	206.8710	219.7053	192.8269	186.7281	168.0336	165.5922	172.2362	174.2186	194.5544	207.2505	231.2640 (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	233.8789	206.8710	219.7053	192.8269	186.7281	168.0336	165.5922	172.2362	174.2186	194.5544	207.2505	231.2640 (64)
12Total per year (kWh/year)												2353.1595 (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	99.3354	88.2678	94.6227	84.9898	83.6577	76.7460	76.6300	78.8392	78.8025	86.2600	89.7856	98.4659 (65)

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

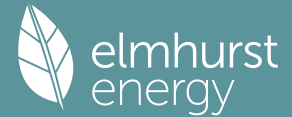
Metabolic gains (Table 5), Watts

(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464	101.0464 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	89.0055	98.5419	89.0055	91.9724	89.0055	91.9724	89.0055	89.0055	91.9724	89.0055	91.9724	89.0055 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), 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)
Pumps, fans	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)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-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)
Total internal gains	133.5153	131.3508	127.1810	118.0413	112.4432	106.5916	102.9974	105.9666	109.4479	115.9408	124.7022	132.3467 (72)
	452.2982	461.5012	443.1806	427.1843	406.2189	391.6795	377.3324	378.4705	389.5330	402.8826	427.0113	443.3436 (73)

6. Solar gains

[Jan]		Area	Solar flux	g	FF	Access	Gains
		m2	Table 6a	Specific data	Specific data	factor	W
			W/m2	or Table 6b	or Table 6c	Table 6d	
North		4.5900	10.6334	0.4000	0.8000	0.7700	10.8235 (74)
West		3.0600	19.6403	0.4000	0.8000	0.7700	13.3276 (80)
Northwest		6.0000	11.2829	0.4000	0.8000	0.7700	15.0126 (81)
Solar gains	39.1637	77.3145	133.1408	209.4954	274.3359	289.5515	272.0198
Total gains	491.4619	538.8157	576.3215	636.6797	680.5548	681.2310	649.3522
							221.1857
							159.2832
							548.8162
							92.9032
							48.8599
							475.8712
							32.2430 (83)
							475.5866 (84)

Full SAP Calculation Printout



7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	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	0.8988	0.8654	0.8101	0.6931	0.5452	0.3868	0.2833	0.3182	0.5046	0.7338	0.8556	0.9059 (86)
MIT	19.7650	19.9859	20.2894	20.6609	20.8781	20.9726	20.9930	20.9895	20.9310	20.6514	20.1875	19.7431 (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	0.8890	0.8529	0.7930	0.6684	0.5133	0.3500	0.2425	0.2749	0.4632	0.7061	0.8405	0.8966 (89)
MIT 2	18.8693	19.1442	19.5185	19.9711	20.2192	20.3291	20.3475	20.3474	20.2857	19.9707	19.4076	18.8493 (90)
Living area fraction									FLA = Living area / (4) =			0.5814 (91)
MIT	19.3901	19.6336	19.9667	20.3722	20.6023	20.7033	20.7228	20.7208	20.6609	20.3665	19.8610	19.3690 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3901	19.6336	19.9667	20.3722	20.6023	20.7033	20.7228	20.7208	20.6609	20.3665	19.8610	19.3690 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8735	0.8388	0.7832	0.6697	0.5261	0.3700	0.2659	0.2995	0.4834	0.7073	0.8286	0.8814 (94)
Useful gains	429.3003	451.9454	451.3643	426.4009	358.0679	252.0765	172.6637	179.6223	265.2815	350.6481	394.2992	419.1907 (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	670.2502	651.8948	593.5379	495.8107	383.2228	257.5081	173.9484	181.5607	279.0599	420.4226	553.6983	663.3698 (97)
Space heating kWh	179.2668	134.3660	105.7772	49.9751	18.7152	0.0000	0.0000	0.0000	0.0000	51.9122	114.7674	181.6692 (98a)
Space heating requirement - total per year (kWh/year)												836.4490
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	179.2668	134.3660	105.7772	49.9751	18.7152	0.0000	0.0000	0.0000	0.0000	51.9122	114.7674	181.6692 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												836.4490
Space heating per m2										(98c) / (4) =		13.6229 (99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space and Water												1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system												2.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	179.2668	134.3660	105.7772	49.9751	18.7152	0.0000	0.0000	0.0000	0.0000	51.9122	114.7674	181.6692 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 2.00												
307a	358.5335	268.7319	211.5543	99.9501	37.4305	0.0000	0.0000	0.0000	0.0000	103.8245	229.5347	363.3384
Space heating requirement	358.5335	268.7319	211.5543	99.9501	37.4305	0.0000	0.0000	0.0000	0.0000	103.8245	229.5347	363.3384 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement	233.8789	206.8710	219.7053	192.8269	186.7281	168.0336	165.5922	172.2362	174.2186	194.5544	207.2505	231.2640 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 2.00												
310a	467.7577	413.7419	439.4106	385.6538	373.4562	336.0671	331.1844	344.4723	348.4371	389.1087	414.5009	462.5280
Water heating fuel	467.7577	413.7419	439.4106	385.6538	373.4562	336.0671	331.1844	344.4723	348.4371	389.1087	414.5009	462.5280 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	10.9418	9.8829	10.9418	10.5888	10.9418	10.5888	10.9418	10.5888	10.9418	10.5888	10.9418	10.5888 (331)
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 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												1672.8981 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												4706.3189 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												16.7290 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6490)												
mechanical ventilation fans (SFP = 0.6490)												128.8305 (330a)
Total electricity for the above, kWh/year												128.8305 (331)
Electricity for lighting (calculated in Appendix L)												151.1977 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (333)
Wind generation												0.0000 (334)
Hydro-electric generation (Appendix N)												0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)
Appendix Q - special features												
Energy saved or generated												-0.0000 (336)

Full SAP Calculation Printout



Energy used 0.0000 (337)
 Total delivered energy for all uses 6659.2452 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			324.0000 (367)
Space and Water heating from Heat pump			80.5690 (367)
Electrical energy for heat distribution (space & water)	1968.8941	0.1560	9.2424 (372)
Overall CO2 factor for heat network	16.7290	0.0000	0.0462 (386)
Total CO2 associated with community systems			294.5022 (373)
Space and water heating			294.5022 (376)
Pumps, fans and electric keep-hot	128.8305	0.1387	17.8704 (378)
Energy for lighting	151.1977	0.1443	21.8225 (379)
Total CO2, kg/year			334.1951 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.4400 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			324.0000 (467a)
Space and Water heating from Heat pump			814.6058 (467)
Electrical energy for heat distribution (space & water)	1968.8941	1.5777	97.9791 (472)
Overall CO2 factor for heat network	16.7290	0.0000	0.4894 (486)
Total CO2 associated with community systems			3122.0259 (473)
Space and water heating			3122.0259 (476)
Pumps, fans and electric keep-hot	128.8305	1.5128	194.8948 (478)
Energy for lighting	151.1977	1.5338	231.9120 (479)
Total Primary energy kWh/year			3548.8327 (483)
Dwelling Primary energy Rate (DPER)			57.8000 (484)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	61.4000 (1b)	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)
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)

Full SAP Calculation Printout



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	33.1000	0.0700	2.3170
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	5.3000	0.0900	0.4770
E16 Corner (normal)	7.9500	0.0600	0.4770
E18 Party wall between dwellings	2.6500	0.0600	0.1590
E25 Staggered party wall between dwellings	9.5300	0.0500	0.4765
E2 Other lintels (including other steel lintels)	8.6300	0.0500	0.4315
E3 Sill	41.2000	0.0500	2.0600
E4 Jamb			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.4070 (36)
Point Thermal bridges			0.0000 (36a)
Total fabric heat loss			(33) + (36) + (36a) = 29.9199 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	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	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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage for mixer showers	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)												108.9655 (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 conte	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)
Energy content (annual)												Total = Sum(45)m = 1809.8935
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)												2172.3585 (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)

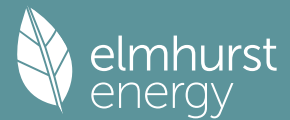
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	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	3.0000	3.0000	3.0000	3.0000	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 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	4.5300	10.6334	0.6300	0.7000	0.7700	14.7212 (74)
West	3.0200	19.6403	0.6300	0.7000	0.7700	18.1270 (80)

Full SAP Calculation Printout



Northwest	5.9200		11.2829		0.6300		0.7000		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 (92)
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

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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	84.9378 (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	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)											
Efficiency of water heater	79.8000											
Water heating fuel used	2629.5977 (219)											
Space cooling fuel	0.0000 (221)											

Full SAP Calculation Printout



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)

Full SAP Calculation Printout



Property Reference	Unit 6		Issued on Date	25/01/2024	
Assessment Reference	Be Green_Copy	Prop Type Ref	Unit 6		
Property					
SAP Rating	79 C	DER	4.84	TER	13.48
Environmental	96 A	% DER < TER			64.09
CO ₂ Emissions (t/year)	0.27	DFEE	25.93	TFEE	26.67
Compliance Check	See BREL	% DFEE < TFEE			2.80
% DPER < TPER	29.80	DPER	51.68	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) = 8682.4600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							142.3354 (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	

Full SAP Calculation Printout



7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	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	0.9238	0.8844	0.8186	0.6824	0.5259	0.3642	0.2616	0.2866	0.4575	0.7137	0.8705	0.9310 (86)
MIT	20.4549	20.6026	20.7665	20.9236	20.9830	20.9982	20.9998	20.9996	20.9938	20.9198	20.6997	20.4386 (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	0.9142	0.8711	0.7997	0.6565	0.4957	0.3329	0.2286	0.2522	0.4214	0.6837	0.8540	0.9222 (89)
MIT 2	19.7839	19.9653	20.1628	20.3519	20.4165	20.4422	20.4434	20.4456	20.4340	20.3527	20.0953	19.7716 (90)
Living area fraction	20.0754	20.2421	20.4251	20.6003	20.6626	20.6837	20.6851	20.6863	20.6772	20.5990	20.3579	20.0614 (91)
MIT	20.0754	20.2421	20.4251	20.6003	20.6626	20.6837	20.6851	20.6863	20.6772	20.5990	20.3579	20.0614 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0754	20.2421	20.4251	20.6003	20.6626	20.6837	20.6851	20.6863	20.6772	20.5990	20.3579	20.0614 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9081	0.8668	0.7999	0.6644	0.5080	0.3464	0.2429	0.2671	0.4368	0.6927	0.8519	0.9161 (94)
Useful gains	447.3362	467.9146	456.9067	407.7047	322.3550	216.6908	145.7384	152.2232	235.2693	343.2956	406.5895	436.6920 (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	594.7693	576.0562	520.6900	428.4308	326.7947	217.1095	145.7841	152.2993	236.7603	364.5857	487.5205	588.1760 (97)
Space heating kWh	109.6903	72.6712	47.4548	14.9227	3.3031	0.0000	0.0000	0.0000	0.0000	15.8399	58.2703	112.7041 (98a)
Space heating requirement - total per year (kWh/year)												434.8564
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	109.6903	72.6712	47.4548	14.9227	3.3031	0.0000	0.0000	0.0000	0.0000	15.8399	58.2703	112.7041 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												434.8564
Space heating per m2										(98c) / (4) =		7.1288 (99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space and Water												1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system												2.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	109.6903	72.6712	47.4548	14.9227	3.3031	0.0000	0.0000	0.0000	0.0000	15.8399	58.2703	112.7041 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 2.00												
307a	219.3805	145.3424	94.9096	29.8455	6.6062	0.0000	0.0000	0.0000	0.0000	31.6797	116.5407	225.4082
Space heating requirement	219.3805	145.3424	94.9096	29.8455	6.6062	0.0000	0.0000	0.0000	0.0000	31.6797	116.5407	225.4082 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement	233.2737	206.3385	219.1459	192.3493	186.2750	167.6359	165.2072	171.8297	173.8010	194.0760	206.7264	230.6673 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 2.00												
310a	466.5475	412.6771	438.2918	384.6987	372.5499	335.2718	330.4144	343.6595	347.6019	388.1520	413.4527	461.3346
Water heating fuel	466.5475	412.6771	438.2918	384.6987	372.5499	335.2718	330.4144	343.6595	347.6019	388.1520	413.4527	461.3346 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	10.8705	9.8185	10.8705	10.5198	10.8705	10.5198	10.8705	10.8705	10.5198	10.8705	10.5198	10.8705 (331)
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 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												869.7128 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												4694.6519 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												8.6971 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6490)												
mechanical ventilation fans (SFP = 0.6490)												127.9912 (330a)
Total electricity for the above, kWh/year												127.9912 (331)
Electricity for lighting (calculated in Appendix L)												159.4438 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (333)
Wind generation												0.0000 (334)
Hydro-electric generation (Appendix N)												0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)
Appendix Q - special features												
Energy saved or generated												-0.0000 (336)

Full SAP Calculation Printout



Energy used 0.0000 (337)
 Total delivered energy for all uses 5851.7997 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			324.0000 (367)
Space and Water heating from Heat pump	1717.3965	0.1579	42.3835 (367)
Electrical energy for heat distribution (space & water)	8.6971	0.0000	7.9887 (372)
Overall CO2 factor for heat network			0.0457 (386)
Total CO2 associated with community systems			254.5531 (373)
Space and water heating			254.5531 (376)
Pumps, fans and electric keep-hot	127.9912	0.1387	17.7540 (378)
Energy for lighting	159.4438	0.1443	23.0127 (379)
Total CO2, kg/year			295.3197 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.8400 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			324.0000 (467a)
Space and Water heating from Heat pump	1717.3965	1.5845	425.3255 (467)
Electrical energy for heat distribution (space & water)	8.6971	0.0000	85.1887 (472)
Overall CO2 factor for heat network			0.4878 (486)
Total CO2 associated with community systems			2714.4690 (473)
Space and water heating			2714.4690 (476)
Pumps, fans and electric keep-hot	127.9912	1.5128	193.6251 (478)
Energy for lighting	159.4438	1.5338	244.5602 (479)
Total Primary energy kWh/year			3152.6543 (483)
Dwelling Primary energy Rate (DPER)			51.6800 (484)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	61.0000 (1b)	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	5.0000	(17)
Infiltration rate	0.3737	(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) =	0.2896 (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	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)
Effective ac	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)
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)

Full SAP Calculation Printout



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

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
E4 Jamb	21.0000	0.0500	1.0500
E7 Party floor between dwellings (in blocks of flats)	37.2000	0.0700	2.6040
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	0.5600	0.0200	0.0112
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	0.0600	0.3180
E19 Ground floor (inverted)	0.0000	0.0700	0.0000

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
(38)m	30.3096	30.1684	30.0299	29.3796	29.2580	28.6916	28.6916	28.5867	28.9098	29.2580	29.5041	29.7614 (38)
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 (39)
Average = Sum(39)m / 12 =												54.5768

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9100	0.9076	0.9054	0.8947	0.8927	0.8834	0.8834	0.8817	0.8870	0.8927	0.8968	0.9010 (40)
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
Hot water usage for mixer showers	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
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 (44)
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 (45)
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 (46)

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)

Total heat required for water heating calculated for each month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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 (62)
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 (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	212.4028	187.9856	200.2316	177.4708	172.9586	156.8691	155.6359	161.2961	162.4733	179.9322	189.7774	210.2867 (64)
Total per year (kWh/year)												2167.3202 (64)

12Total per year (kWh/year) = Sum(64)m = 2167.3202 (64)

Electric shower(s) 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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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 (65)

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

Metabolic gains (Table 5), Watts

(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	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	93.7480	103.7924	93.7480	96.8729	93.7480	96.8729	93.7480	93.7480	96.8729	93.7480	96.8729	93.7480 (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	3.0000	3.0000	3.0000	3.0000	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)	139.2730	137.1155	132.9591	123.8489	118.2688	112.4361	108.8535	111.8131	115.2832	121.7552	130.4883	138.1082 (72)
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 (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
-------	---------	--------------------------	-----------------------------	------------------------------	------------------------	---------

Full SAP Calculation Printout



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	305.1782	262.1436	203.7579	126.2298	67.8067	44.7203 (83)
Total gains	519.0102	580.7177	630.7419	695.3049	731.8969	722.0151	692.1922	650.2965	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) =				0.4344 (91)
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 (92)	
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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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)	
Efficiency of water heater												79.8000	
Water heating fuel used												2637.5324 (219)	
Space cooling fuel												0.0000 (221)	

Full SAP Calculation Printout



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)

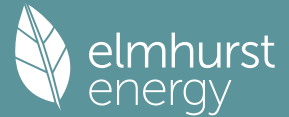
 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	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 Green_Copy	Prop Type Ref	Unit 7		
Property					
SAP Rating	79 C	DER	4.82	TER	14.41
Environmental	96 A	% DER < TER			66.55
CO ₂ Emissions (t/year)	0.31	DFEE	30.09	TFEE	34.11
Compliance Check	See BREL	% DFEE < TFEE			11.76
% DPER < TPER	34.64	DPER	51.31	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)

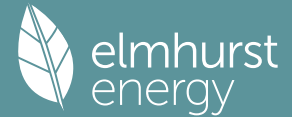
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (21)

	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 = 1.00)			9.0600	0.9615	8.7115		(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) =	21.8579	(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) = 11334.0600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							160.9952 (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

Full SAP Calculation Printout



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	68.8055	69.1018	69.4007	70.9350	71.2500	72.8681	72.8681	73.2005	72.2121	71.2500	70.6227	70.0064
alpha	5.5870	5.6068	5.6267	5.7290	5.7500	5.8579	5.8579	5.8800	5.8141	5.7500	5.7082	5.6671
util living area	0.9568	0.9340	0.8921	0.7789	0.6164	0.4289	0.3095	0.3408	0.5408	0.8001	0.9212	0.9611 (86)
MIT	20.3733	20.5072	20.6772	20.8799	20.9720	20.9972	20.9997	20.9994	20.9897	20.8824	20.6305	20.3624 (87)
Th 2	20.3852	20.3877	20.3902	20.4027	20.4052	20.4177	20.4177	20.4202	20.4127	20.4052	20.4002	20.3952 (88)
util rest of house	0.9500	0.9241	0.8765	0.7526	0.5811	0.3905	0.2686	0.2980	0.4972	0.7704	0.9081	0.9549 (89)
MIT 2	19.6574	19.8248	20.0338	20.2800	20.3800	20.4157	20.4175	20.4199	20.4048	20.2886	19.9889	19.6520 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	20.0957	20.2426	20.4277	20.6473	20.7424	20.7717	20.7739	20.7747	20.7629	20.6521	20.3817	20.0869 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0957	20.2426	20.4277	20.6473	20.7424	20.7717	20.7739	20.7747	20.7629	20.6521	20.3817	20.0869 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9463	0.9215	0.8775	0.7637	0.6013	0.4138	0.2936	0.3242	0.5234	0.7831	0.9076	0.9513 (94)
Useful gains	500.3686	523.5388	516.4344	478.2790	389.6877	265.7477	180.2411	187.9848	287.0525	402.6353	461.2507	488.6126 (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	722.7691	699.0241	631.8266	521.3868	399.5603	266.6558	180.3386	188.1546	290.4924	444.1765	592.0953	714.4724 (97)
Space heating kWh	165.4660	117.9261	85.8519	31.0376	7.3452	0.0000	0.0000	0.0000	0.0000	30.9066	94.2081	168.0397 (98a)
Space heating requirement - total per year (kWh/year)												700.7812
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	165.4660	117.9261	85.8519	31.0376	7.3452	0.0000	0.0000	0.0000	0.0000	30.9066	94.2081	168.0397 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												700.7812
Space heating per m2										(98c) / (4) =		9.9543 (99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space and Water												1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system												2.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	165.4660	117.9261	85.8519	31.0376	7.3452	0.0000	0.0000	0.0000	0.0000	30.9066	94.2081	168.0397 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 2.00												
307a	330.9319	235.8522	171.7037	62.0752	14.6904	0.0000	0.0000	0.0000	0.0000	61.8133	188.4162	336.0794
Space heating requirement	330.9319	235.8522	171.7037	62.0752	14.6904	0.0000	0.0000	0.0000	0.0000	61.8133	188.4162	336.0794 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement	246.6072	218.0706	231.4721	202.8724	196.2591	176.3980	173.6905	180.7851	183.0030	204.6166	218.2743	243.8151 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 2.00												
310a	493.2144	436.1413	462.9442	405.7448	392.5182	352.7960	347.3810	361.5702	366.0059	409.2332	436.5486	487.6302
Water heating fuel	493.2144	436.1413	462.9442	405.7448	392.5182	352.7960	347.3810	361.5702	366.0059	409.2332	436.5486	487.6302 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	12.5456	11.3315	12.5456	12.1409	12.5456	12.1409	12.5456	12.5456	12.1409	12.5456	12.1409	12.5456 (331)
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 (332)
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 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												1401.5623 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												4951.7280 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												14.0156 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6490)												
mechanical ventilation fans (SFP = 0.6490)												147.7145 (330a)
Total electricity for the above, kWh/year												147.7145 (331)
Electricity for lighting (calculated in Appendix L)												183.8953 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (333)
Wind generation												0.0000 (334)
Hydro-electric generation (Appendix N)												0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)
Appendix Q - special features												
Energy saved or generated												-0.0000 (336)
Energy used												0.0000 (337)

Full SAP Calculation Printout



Total delivered energy for all uses

6684.9000 (338)

 12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			324.0000 (367)
Space and Water heating from Heat pump	1960.8921	0.1573	68.4257 (367)
Electrical energy for heat distribution (space & water)	14.0156	0.0000	9.1835 (372)
Overall CO2 factor for heat network			0.0461 (386)
Total CO2 associated with community systems			292.6235 (373)
Space and water heating			292.6235 (376)
Pumps, fans and electric keep-hot	147.7145	0.1387	20.4898 (378)
Energy for lighting	183.8953	0.1443	26.5418 (379)
Total CO2, kg/year			339.6551 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.8200 (384)

 13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			324.0000 (467a)
Space and Water heating from Heat pump	1960.8921	1.5822	684.4159 (467)
Electrical energy for heat distribution (space & water)	14.0156	0.0000	97.4999 (472)
Overall CO2 factor for heat network			0.4890 (486)
Total CO2 associated with community systems			3106.7549 (473)
Space and water heating			3106.7549 (476)
Pumps, fans and electric keep-hot	147.7145	1.5128	223.4625 (478)
Energy for lighting	183.8953	1.5338	282.0648 (479)
Total Primary energy kWh/year			3612.2822 (483)
Dwelling Primary energy Rate (DPER)			51.3100 (484)

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

 1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
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) =	Air changes per hour 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)
TER Opening Type (Uw = 1.20)			9.0600	1.1450	10.3740		(27)
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)

Full SAP Calculation Printout



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)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	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)
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)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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)
12Total per year (kWh/year)												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
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)

Full SAP Calculation Printout



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	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) =			
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)	
Space heating requirement - total per year (kWh/year)	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 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)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating efficiency (main heating system 1)	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 fuel (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 efficiency (main heating system 2)	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 fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Water heating	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	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	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)	-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)	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)	-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)	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													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)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year													86.0000 (231)

Full SAP Calculation Printout



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)

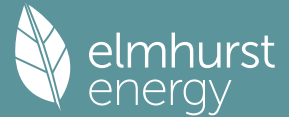
 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	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)

Full SAP Calculation Printout



Property Reference	Unit 8		Issued on Date	25/01/2024	
Assessment Reference	Be Green_Copy	Prop Type Ref	Unit 8		
Property					
SAP Rating	79 C	DER	4.71	TER	13.74
Environmental	96 A	% DER < TER			65.72
CO ₂ Emissions (t/year)	0.3	DFEE	28.21	TFEE	31.38
Compliance Check	See BREL	% DFEE < TFEE			10.10
% DPER < TPER	32.96	DPER	50.14	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

	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)

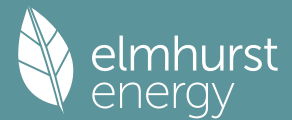
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (21)

	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												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) =
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							11291.2200 (34)
List of Thermal Bridges							160.3866 (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

Full SAP Calculation Printout



7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	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	0.9413	0.8978	0.8341	0.7106	0.5610	0.3941	0.2821	0.3039	0.4715	0.7272	0.8908	0.9490 (86)
MIT	20.3951	20.5790	20.7517	20.9115	20.9782	20.9976	20.9997	20.9995	20.9933	20.9159	20.6673	20.3699 (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	0.9324	0.8840	0.8138	0.6820	0.5262	0.3568	0.2428	0.2636	0.4305	0.6940	0.8741	0.9411 (89)
MIT 2	19.6579	19.8834	20.0909	20.2828	20.3544	20.3844	20.3859	20.3883	20.3761	20.2927	20.0041	19.6351 (90)
Living area fraction									FLA = Living area / (4) =			0.6122 (91)
MIT	20.1092	20.3092	20.4954	20.6677	20.7363	20.7598	20.7617	20.7625	20.7540	20.6742	20.4101	20.0849 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1092	20.3092	20.4954	20.6677	20.7363	20.7598	20.7617	20.7625	20.7540	20.6742	20.4101	20.0849 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9287	0.8830	0.8183	0.6957	0.5465	0.3796	0.2668	0.2882	0.4553	0.7103	0.8753	0.9373 (94)
Useful gains	547.1343	589.0281	579.7589	519.4171	414.0133	280.6373	190.0574	198.3314	304.4009	440.1901	507.7763	529.9443 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	762.6461	740.3270	669.6549	551.5138	421.7303	281.4370	190.1457	198.4658	306.6293	470.1706	626.4153	753.8288 (97)
Space heating kWh	160.3408	101.6728	66.8827	23.1096	5.7415	0.0000	0.0000	0.0000	0.0000	22.3056	85.4201	166.5701 (98a)
Space heating requirement - total per year (kWh/year)												632.0432
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	160.3408	101.6728	66.8827	23.1096	5.7415	0.0000	0.0000	0.0000	0.0000	22.3056	85.4201	166.5701 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												632.0432
Space heating per m2												(98c) / (4) = 8.9779 (99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space and Water												1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system												2.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	160.3408	101.6728	66.8827	23.1096	5.7415	0.0000	0.0000	0.0000	0.0000	22.3056	85.4201	166.5701 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 2.00	320.6816	203.3457	133.7653	46.2193	11.4830	0.0000	0.0000	0.0000	0.0000	44.6111	170.8401	333.1402
Space heating requirement	320.6816	203.3457	133.7653	46.2193	11.4830	0.0000	0.0000	0.0000	0.0000	44.6111	170.8401	333.1402 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement	246.6072	218.0706	231.4721	202.8724	196.2591	176.3980	173.6905	180.7851	183.0030	204.6166	218.2743	243.8151 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 2.00	493.2144	436.1413	462.9442	405.7448	392.5182	352.7960	347.3810	361.5702	366.0059	409.2332	436.5486	487.6302
Water heating fuel	493.2144	436.1413	462.9442	405.7448	392.5182	352.7960	347.3810	361.5702	366.0059	409.2332	436.5486	487.6302 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	12.5456	11.3315	12.5456	12.1409	12.5456	12.1409	12.5456	12.5456	12.1409	12.5456	12.1409	12.5456 (331)
Lighting	21.6559	17.3731	15.6426	11.4604	8.8524	7.2325	8.0754	10.4967	13.6342	17.8889	20.2054	22.2578 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												1264.0863 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												4951.7280 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												12.6409 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6490)												
mechanical ventilation fans (SFP = 0.6490)												147.7145 (330a)
Total electricity for the above, kWh/year												147.7145 (331)
Electricity for lighting (calculated in Appendix L)												174.7753 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (333)
Wind generation												0.0000 (334)
Hydro-electric generation (Appendix N)												0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)
Appendix Q - special features												
Energy saved or generated												-0.0000 (336)

Full SAP Calculation Printout



Energy used 0.0000 (337)
 Total delivered energy for all uses 6538.3041 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			324.0000 (367)
Space and Water heating from Heat pump	1918.4612	0.1579	61.5937 (367)
Electrical energy for heat distribution (space & water)	12.6409	0.0000	8.9751 (372)
Overall CO2 factor for heat network			0.0460 (386)
Total CO2 associated with community systems			285.9831 (373)
Space and water heating			285.9831 (376)
Pumps, fans and electric keep-hot	147.7145	0.1387	20.4898 (378)
Energy for lighting	174.7753	0.1443	25.2255 (379)
Total CO2, kg/year			331.6984 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.7100 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			324.0000 (467a)
Space and Water heating from Heat pump	1918.4612	1.5844	618.1535 (467)
Electrical energy for heat distribution (space & water)	12.6409	0.0000	95.3530 (472)
Overall CO2 factor for heat network			0.4888 (486)
Total CO2 associated with community systems			3038.3456 (473)
Space and water heating			3038.3456 (476)
Pumps, fans and electric keep-hot	147.7145	1.5128	223.4625 (478)
Energy for lighting	174.7753	1.5338	268.0762 (479)
Total Primary energy kWh/year			3529.8843 (483)
Dwelling Primary energy Rate (DPER)			50.1400 (484)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	70.4000 (1b)	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

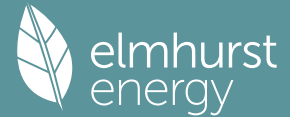
		m3 per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number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

Full SAP Calculation Printout



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 (36a) = 0.0000

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)

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 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 baths 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)

Hot water usage for other uses 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)

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

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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 23.2624 23.2624 22.5120 23.2624 (59)

Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (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)

Total per year (kWh/year) = Sum(64)m = 2278.3353 (64)

2278 (64)

12Total per year (kWh/year)

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

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

Heat gains from water heating, kWh/month 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	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)
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	3.0000	3.0000	3.0000	3.0000	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	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 m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
South	3.0600	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)

Full SAP Calculation Printout



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	19.2694	19.5611	19.8952	20.2689	20.5026	20.6136	20.6365	20.6351	20.5815	20.2895	19.7416	19.2292	(91)
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)

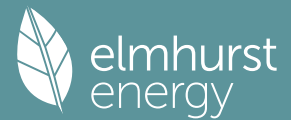
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	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)
Ext temp.	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)
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	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 requirement - total per year (kWh/year)	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)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Space heating requirement after solar contribution - total per year (kWh/year)	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 per m2												1711.7603	(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 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	85.2649	(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)
Efficiency of water heater													79.8000
Water heating fuel used													2756.8640 (219)
Space cooling fuel													0.0000 (221)

Full SAP Calculation Printout



Electricity for pumps and fans:	86.0000 (231)
Total electricity for the above, kWh/year	172.5328 (232)
Electricity for lighting (calculated in Appendix L)	
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)

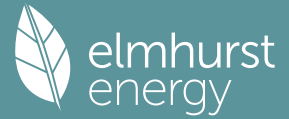
 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	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)

Full SAP Calculation Printout



Property Reference	Unit 9		Issued on Date	25/01/2024	
Assessment Reference	Be Green_Copy	Prop Type Ref	Unit 9		
Property					
SAP Rating	77 C	DER	5.53	TER	15.48
Environmental	96 A	% DER < TER			64.28
CO ₂ Emissions (t/year)	0.31	DFEE	32.30	TFEE	35.19
Compliance Check	See BREL	% DFEE < TFEE			8.22
% DPER < TPER	30.45	DPER	58.75	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												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 = 1.00)			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	

Full SAP Calculation Printout



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):												0.6000 (49)
Temperature factor from Table 2b												0.7380 (55)
Enter (49) or (54) in (55)												
Total storage loss	22.8780	20.6640	22.8780	22.1400	22.8780	22.1400	22.8780	22.8780	22.1400	22.8780	22.1400	22.8780 (56)
If cylinder contains dedicated solar storage	22.8780	20.6640	22.8780	22.1400	22.8780	22.1400	22.8780	22.8780	22.1400	22.8780	22.1400	22.8780 (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	233.4253	206.4719	219.2860	192.4689	186.3884	167.7355	165.3036	171.9315	173.9055	194.1958	206.8576	230.8167 (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	233.4253	206.4719	219.2860	192.4689	186.3884	167.7355	165.3036	171.9315	173.9055	194.1958	206.8576	230.8167 (64)
Total per year (kWh/year)												2348.7868 (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	99.1845	88.1351	94.4832	84.8707	83.5448	76.6469	76.5341	78.7379	78.6984	86.1407	89.6550	98.3172 (65)

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

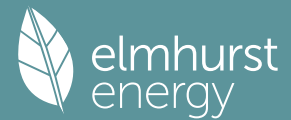
Metabolic gains (Table 5), Watts

(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-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)	133.3126	131.1533	126.9936	117.8760	112.2914	106.4540	102.8684	105.8305	109.3033	115.7806	124.5208	132.1468 (72)
Total internal gains	459.4834	469.5693	450.3930	434.7360	413.5614	399.3612	384.7804	385.9191	397.2291	410.2457	434.5760	450.5647 (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	479.8943	509.0183	516.4222	536.1292	544.5504	536.9451
						129.5158
						514.2962
						492.2817
						475.3774
						46.8863
						25.3095
						16.9049 (83)
						467.4696 (84)

Full SAP Calculation Printout



7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	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	0.9438	0.9235	0.8909	0.8046	0.6688	0.4834	0.3515	0.3816	0.5809	0.8067	0.9092	0.9481 (86)
MIT	20.1528	20.2947	20.4859	20.7492	20.9140	20.9856	20.9975	20.9963	20.9657	20.7836	20.4636	20.1416 (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	0.9359	0.9131	0.8759	0.7798	0.6319	0.4378	0.3012	0.3299	0.5331	0.7779	0.8955	0.9408 (89)
MIT 2	19.3441	19.5220	19.7593	20.0832	20.2691	20.3516	20.3612	20.3629	20.3297	20.1294	19.7430	19.3380 (90)
Living area fraction									FLA = Living area / (4) =			0.6219 (91)
MIT	19.8470	20.0026	20.2112	20.4974	20.6702	20.7459	20.7569	20.7568	20.7252	20.5363	20.1912	19.8378 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8470	20.0026	20.2112	20.4974	20.6702	20.7459	20.7569	20.7568	20.7252	20.5363	20.1912	19.8378 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9294	0.9074	0.8729	0.7857	0.6504	0.4654	0.3324	0.3619	0.5608	0.7865	0.8920	0.9345 (94)
Useful gains	446.0215	461.8744	450.7967	421.2453	354.1834	249.8849	170.9526	178.1692	266.5836	359.5342	410.2253	436.8422 (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	676.0425	654.1431	591.5433	490.4721	377.8351	253.6397	171.5532	179.0615	275.6768	418.5283	555.8738	669.3367 (97)
Space heating kWh	171.1356	129.2045	104.7155	49.8433	17.5969	0.0000	0.0000	0.0000	0.0000	43.8916	104.8669	172.9759 (98a)
Space heating requirement - total per year (kWh/year)												794.2303
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	171.1356	129.2045	104.7155	49.8433	17.5969	0.0000	0.0000	0.0000	0.0000	43.8916	104.8669	172.9759 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												794.2303
Space heating per m2										(98c) / (4) =		12.9989 (99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space and Water												1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system												2.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	171.1356	129.2045	104.7155	49.8433	17.5969	0.0000	0.0000	0.0000	0.0000	43.8916	104.8669	172.9759 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 2.00												
307a	342.2713	258.4091	209.4310	99.6865	35.1938	0.0000	0.0000	0.0000	0.0000	87.7833	209.7337	345.9518
Space heating requirement	342.2713	258.4091	209.4310	99.6865	35.1938	0.0000	0.0000	0.0000	0.0000	87.7833	209.7337	345.9518 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement	233.4253	206.4719	219.2860	192.4689	186.3884	167.7355	165.3036	171.9315	173.9055	194.1958	206.8576	230.8167 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 2.00												
310a	466.8506	412.9437	438.5720	384.9379	372.7769	335.4710	330.6073	343.8631	347.8111	388.3916	413.7152	461.6334
Water heating fuel	466.8506	412.9437	438.5720	384.9379	372.7769	335.4710	330.6073	343.8631	347.8111	388.3916	413.7152	461.6334 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	14.2102	12.8350	14.2102	13.7518	14.2102	13.7518	14.2102	14.2102	13.7518	14.2102	13.7518	14.2102 (331)
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 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												1588.4605 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												4697.5736 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												15.8846 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8470)												
mechanical ventilation fans (SFP = 0.8470)												167.3132 (330a)
Total electricity for the above, kWh/year												167.3132 (331)
Electricity for lighting (calculated in Appendix L)												169.9577 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (333)
Wind generation												0.0000 (334)
Hydro-electric generation (Appendix N)												0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)
Appendix Q - special features												
Energy saved or generated												-0.0000 (336)

Full SAP Calculation Printout



Energy used 0.0000 (337)
 Total delivered energy for all uses 6623.3050 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			324.0000 (367)
Space and Water heating from Heat pump			76.5672 (367)
Electrical energy for heat distribution (space & water)	1940.1340	0.1562	9.1004 (372)
Overall CO2 factor for heat network	15.8846	0.0000	0.0461 (386)
Total CO2 associated with community systems			289.9762 (373)
Space and water heating			289.9762 (376)
Pumps, fans and electric keep-hot	167.3132	0.1387	23.2084 (378)
Energy for lighting	169.9577	0.1443	24.5301 (379)
Total CO2, kg/year			337.7148 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.5300 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			324.0000 (467a)
Space and Water heating from Heat pump			773.7357 (467)
Electrical energy for heat distribution (space & water)	1940.1340	1.5782	96.5217 (472)
Overall CO2 factor for heat network	15.8846	0.0000	0.4893 (486)
Total CO2 associated with community systems			3075.5860 (473)
Space and water heating			3075.5860 (476)
Pumps, fans and electric keep-hot	167.3132	1.5128	253.1115 (478)
Energy for lighting	169.9577	1.5338	260.6868 (479)
Total Primary energy kWh/year			3589.3843 (483)
Dwelling Primary energy Rate (DPER)			58.7500 (484)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	61.1000 (1b)	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)
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)

Full SAP Calculation Printout



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)
Point Thermal bridges			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 2.0126 (42)

Hot water usage for mixer showers

	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 (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

	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:

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)

Total heat required for water heating calculated for each month

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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 (56)
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)
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) 2168.5819 (64)

Electric shower(s) 2169 (64)

Heat gains from water heating, kWh/month

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	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
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	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)
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	0.0000	0.0000	0.0000	0.0000	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	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)
	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 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	0.6300	0.7000	0.7700	14.6237 (74)

Full SAP Calculation Printout



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 (92)
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

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	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)
Ext temp.	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)
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	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 requirement - total per year (kWh/year)	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)
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)	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)
Efficiency of water heater												79.8000
Water heating fuel used												2618.6306 (219)
Space cooling fuel												0.0000 (221)

Full SAP Calculation Printout



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)

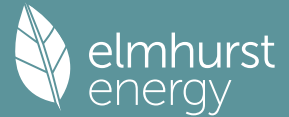
 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	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)

Full SAP Calculation Printout



Property Reference	Unit 10		Issued on Date	25/01/2024	
Assessment Reference	Be Green_Copy	Prop Type Ref	Unit 10		
Property					
SAP Rating	79 C	DER	5.28	TER	14.73
Environmental	96 A	% DER < TER			64.15
CO ₂ Emissions (t/year)	0.25	DFEE	26.45	TFEE	27.17
Compliance Check	See BREL	% DFEE < TFEE			2.66
% DPER < TPER	29.89	DPER	56.47	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	

Full SAP Calculation Printout



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)

	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	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)
Energy content (annual)												1638.5940
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):

Temperature factor from Table 2b 1.2300 (48)

Enter (49) or (54) in (55) 0.6000 (49)

Total storage loss 0.7380 (55)

22.8780 20.6640 22.8780 22.1400 22.8780 22.1400 22.8780 22.8780 22.1400 22.8780 22.1400 22.8780 (56)

If cylinder contains dedicated solar storage

22.8780	20.6640	22.8780	22.1400	22.8780	22.1400	22.8780	22.8780	22.1400	22.8780	22.1400	22.8780 (57)
---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	--------------

Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 22.5120 23.2624 22.5120 23.2624 (59)

Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)

Total heat required for water heating calculated for each month

216.1097	191.2359	203.2785	178.8031	173.4225	156.3565	154.2868	160.3016	161.9553	180.5072	191.8608	213.7423 (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

216.1097	191.2359	203.2785	178.8031	173.4225	156.3565	154.2868	160.3016	161.9553	180.5072	191.8608	213.7423 (64)
----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	---------------

Total per year (kWh/year) = Sum(64)m = 2181.8600 (64)

2182 (64)

12Total per year (kWh/year)

Electric shower(s)

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

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

Heat gains from water heating, kWh/month

93.4271	83.0691	89.1607	80.3268	79.2336	72.8633	72.8710	74.8709	74.7249	81.5893	84.6685	92.6399 (65)
---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	--------------

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

Metabolic gains (Table 5), Watts

(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
84.6523	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)

Lighting gains (calculated in Appendix L, equation L9 or L9a), 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)
---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	--------------

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 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

-67.7218	-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)

125.5741	123.6147	119.8397	111.5650	106.4968	101.1991	97.9449	100.6330	103.7846	109.6630	117.5952	124.5160 (72)
----------	----------	----------	----------	----------	----------	---------	----------	----------	----------	----------	---------------

Total internal gains

396.9410	404.5991	388.8803	374.9108	356.9619	344.4388	332.1608	333.3184	342.8429	354.4161	375.2289	389.3752 (73)
----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	---------------

6. Solar gains

[Jan]		Area	Solar flux	g	FF	Access	Gains
		m2	Table 6a	Specific data	Specific data	factor	W
			W/m2	or Table 6b	or Table 6c	Table 6d	
East		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	201.6465	173.2114	134.6330	83.4063	44.8033	29.5489 (83)
Total gains	432.8733	474.8902	504.6398	543.7390	563.8673	556.2432	533.8073	506.5298	477.4759	437.8224	420.0322	418.9241 (84)

Full SAP Calculation Printout



7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	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	0.9047	0.8607	0.7895	0.6516	0.4992	0.3455	0.2481	0.2721	0.4353	0.6839	0.8457	0.9129 (86)
MIT	20.4550	20.6047	20.7698	20.9237	20.9823	20.9980	20.9997	20.9995	20.9933	20.9196	20.7013	20.4381 (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	0.8936	0.8461	0.7695	0.6257	0.4697	0.3150	0.2159	0.2385	0.4000	0.6537	0.8278	0.9026 (89)
MIT 2	19.7719	19.9548	20.1527	20.3376	20.4014	20.4275	20.4289	20.4311	20.4191	20.3381	20.0838	19.7591 (90)
Living area fraction									fLA = Living area / (4) =			0.5289 (91)
MIT	20.1332	20.2985	20.4791	20.6476	20.7086	20.7292	20.7308	20.7318	20.7228	20.6456	20.4104	20.1182 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1332	20.2985	20.4791	20.6476	20.7086	20.7292	20.7308	20.7318	20.7228	20.6456	20.4104	20.1182 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8883	0.8434	0.7721	0.6361	0.4845	0.3311	0.2329	0.2563	0.4184	0.6657	0.8277	0.8971 (94)
Useful gains	384.5231	400.5306	389.6526	345.8729	273.2079	184.1651	124.3409	129.8090	199.7588	291.4715	347.6676	375.8096 (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	502.9924	487.2216	440.5308	362.7292	277.0113	184.5688	124.3908	129.8900	201.1182	308.8983	412.6788	497.5844 (97)
Space heating kWh	88.1411	58.2564	37.8534	12.1365	2.8297	0.0000	0.0000	0.0000	0.0000	12.9656	46.8081	90.6005 (98a)
Space heating requirement - total per year (kWh/year)												349.5912
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	88.1411	58.2564	37.8534	12.1365	2.8297	0.0000	0.0000	0.0000	0.0000	12.9656	46.8081	90.6005 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												349.5912
Space heating per m2												(98c) / (4) = 6.9779 (99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (301)
Fraction of space heat from community system												1.0000 (302)
Fraction of heat from community Heat pump-Space and Water												1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system												2.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	88.1411	58.2564	37.8534	12.1365	2.8297	0.0000	0.0000	0.0000	0.0000	12.9656	46.8081	90.6005 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 2.00												
307a	176.2823	116.5127	75.7068	24.2730	5.6594	0.0000	0.0000	0.0000	0.0000	25.9312	93.6161	181.2009
Space heating requirement	176.2823	116.5127	75.7068	24.2730	5.6594	0.0000	0.0000	0.0000	0.0000	25.9312	93.6161	181.2009 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement	216.1097	191.2359	203.2785	178.8031	173.4225	156.3565	154.2868	160.3016	161.9553	180.5072	191.8608	213.7423 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 2.00												
310a	432.2194	382.4718	406.5570	357.6061	346.8449	312.7130	308.5736	320.6033	323.9106	361.0143	383.7216	427.4845
Water heating fuel	432.2194	382.4718	406.5570	357.6061	346.8449	312.7130	308.5736	320.6033	323.9106	361.0143	383.7216	427.4845 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	8.9281	8.0641	8.9281	8.6401	8.9281	8.6401	8.9281	8.9281	8.6401	8.9281	8.6401	8.9281 (331)
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 (332)
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 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												699.1824 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												4363.7200 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												6.9918 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6490)												
mechanical ventilation fans (SFP = 0.6490)												105.1207 (330a)
Total electricity for the above, kWh/year												105.1207 (331)
Electricity for lighting (calculated in Appendix L)												131.9735 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (333)
Wind generation												0.0000 (334)
Hydro-electric generation (Appendix N)												0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)
Appendix Q - special features												
Energy saved or generated												-0.0000 (336)
Energy used												0.0000 (337)

Full SAP Calculation Printout



Total delivered energy for all uses

5299.9967 (338)

 12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			324.0000 (367)
Space and Water heating from Heat pump	1562.6242	0.1579	34.0666 (367)
Electrical energy for heat distribution (space & water)	6.9918	0.0000	7.2507 (372)
Overall CO2 factor for heat network			0.0456 (386)
Total CO2 associated with community systems			231.0375 (373)
Space and water heating			231.0375 (376)
Pumps, fans and electric keep-hot	105.1207	0.1387	14.5815 (378)
Energy for lighting	131.9735	0.1443	19.0479 (379)
Total CO2, kg/year			264.6669 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.2800 (384)

 13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			324.0000 (467a)
Space and Water heating from Heat pump	1562.6242	1.5844	341.9047 (467)
Electrical energy for heat distribution (space & water)	6.9918	0.0000	77.4440 (472)
Overall CO2 factor for heat network			0.4874 (486)
Total CO2 associated with community systems			2467.6900 (473)
Space and water heating			2467.6900 (476)
Pumps, fans and electric keep-hot	105.1207	1.5128	159.0266 (478)
Energy for lighting	131.9735	1.5338	202.4254 (479)
Total Primary energy kWh/year			2829.1420 (483)
Dwelling Primary energy Rate (DPER)			56.4700 (484)

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

 1. Overall dwelling characteristics

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

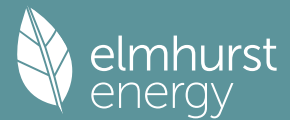
		m3 per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number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

Full SAP Calculation Printout



Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K													145.9162 (35)
List of Thermal Bridges													
K1 Element													
E1 Steel lintel with perforated steel base plate													
E3 Sill													
E4 Jamb													
E7 Party floor between dwellings (in blocks of flats)													
E23 Balcony within or between dwellings, balcony support penetrates wall insulation													
E16 Corner (normal)													
E17 Corner (inverted - internal area greater than external area)													
E18 Party wall between dwellings													
E25 Staggered party wall between dwellings													
Thermal bridges (Sum(L x Psi) calculated using Appendix K)													4.1103 (36)
Point Thermal bridges													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	0.9143 (40)
													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:													
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)
WWHS	-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)
FGHS	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) = Sum(64)m = 2024.4114 (64)
													2024 (64)
12Total per year (kWh/year)													
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
													Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month	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)

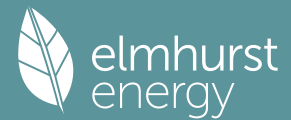
5. Internal gains (see Table 5 and 5a)													

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	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)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.1818	85.4513	77.1818	79.7545	77.1818	79.7545	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	3.0000	3.0000	3.0000	3.0000	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	Solar flux	g	FF	Access	Gains						
		m2	Table 6a	Specific data	Specific data	factor	W						
			W/m2	or Table 6b	or Table 6c	Table 6d							
East		8.2500	19.6403	0.6300	0.7000	0.7700	49.5191						(76)

Full SAP Calculation Printout



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	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

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	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 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)	(233b)m	-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 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1													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)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year													86.0000 (231)

Full SAP Calculation Printout



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)

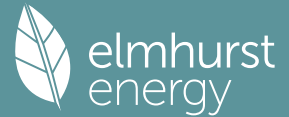
 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	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)

Full SAP Calculation Printout



Property Reference	Unit 11		Issued on Date	25/01/2024	
Assessment Reference	Be Green_Copy	Prop Type Ref	Unit 9		
Property					
SAP Rating	77 C	DER	5.45	TER	14.79
Environmental	96 A	% DER < TER		63.15	
CO ₂ Emissions (t/year)	0.3	DFEE	30.87	TFEE	31.85
Compliance Check	See BREL	% DFEE < TFEE		3.08	
% DPER < TPER	28.27	DPER	57.92	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	

Full SAP Calculation Printout



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) =	30.2389 (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 =	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

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)	108.7022 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	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)	
Distribution loss (46)m = 0.15 x (45)m	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)	
Water storage loss:													210.0000 (47)
Store volume													1.2300 (48)
a) If manufacturer declared loss factor is known (kWh/day):													0.6000 (49)
Temperature factor from Table 2b													0.7380 (55)
Enter (49) or (54) in (55)													
Total storage loss	22.8780	20.6640	22.8780	22.1400	22.8780	22.1400	22.8780	22.8780	22.1400	22.8780	22.1400	22.8780 (56)	
If cylinder contains dedicated solar storage													
Primary loss	22.8780	20.6640	22.8780	22.1400	22.8780	22.1400	22.8780	22.8780	22.1400	22.8780	22.1400	22.8780 (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	233.4253	206.4719	219.2860	192.4689	186.3884	167.7355	165.3036	171.9315	173.9055	194.1958	206.8576	230.8167 (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	233.4253	206.4719	219.2860	192.4689	186.3884	167.7355	165.3036	171.9315	173.9055	194.1958	206.8576	230.8167 (64)	
Total per year (kWh/year)													2348.7868 (64)
Electric shower(s)													2349 (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)
Heat gains from water heating, kWh/month	99.1845	88.1351	94.4832	84.8707	83.5448	76.6469	76.5341	78.7379	78.6984	86.1407	89.6550	98.3172 (65)	

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

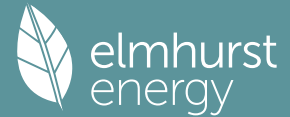
Metabolic gains (Table 5), Watts

(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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-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	133.3126	131.1533	126.9936	117.8760	112.2914	106.4540	102.8684	105.8305	109.3033	115.7806	124.5208	132.1468 (72)
	459.4834	469.5693	450.3930	434.7360	413.5614	399.3612	384.7804	385.9191	397.2291	410.2457	434.5760	450.5647 (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
Total gains	515.9379	565.1482	579.2947	590.7852	584.6222	567.4439
						162.7817
						547.5622
						537.8350
						535.6209
						105.1610
						67.5210
						498.9375 (83)
						498.9375 (84)

Full SAP Calculation Printout



7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	52.3552	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	0.9324	0.9008	0.8590	0.7709	0.6455	0.4713	0.3401	0.3601	0.5358	0.7626	0.8890	0.9388 (86)
MIT	20.1812	20.3581	20.5497	20.7790	20.9197	20.9855	20.9975	20.9967	20.9729	20.8204	20.5012	20.1607 (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	0.9232	0.8881	0.8413	0.7442	0.6080	0.4255	0.2901	0.3098	0.4890	0.7310	0.8731	0.9303 (89)
MIT 2	19.3647	19.5838	19.8190	20.0996	20.2572	20.3337	20.3432	20.3452	20.3180	20.1522	19.7724	19.3472 (90)
Living area fraction									fLA = Living area / (4) =			0.6219 (91)
MIT	19.8725	20.0654	20.2734	20.5222	20.6692	20.7391	20.7501	20.7504	20.7253	20.5677	20.2256	19.8531 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8725	20.0654	20.2734	20.5222	20.6692	20.7391	20.7501	20.7504	20.7253	20.5677	20.2256	19.8531 (93)

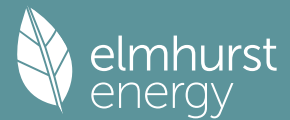
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9165	0.8831	0.8400	0.7521	0.6272	0.4532	0.3211	0.3410	0.5166	0.7425	0.8705	0.9237 (94)
Useful gains	472.8769	499.0641	486.6293	444.3278	366.6717	257.1757	175.8109	183.3853	276.6878	382.6848	437.0816	460.8850 (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	696.4398	675.6466	611.2885	505.9135	388.9029	260.9625	176.4137	184.1849	283.8884	432.1989	573.5960	689.3795 (97)
Space heating kWh	166.3308	118.6634	92.7465	44.3417	16.5400	0.0000	0.0000	0.0000	0.0000	36.8385	98.2903	169.9999 (98a)
Space heating requirement - total per year (kWh/year)												743.7511
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	166.3308	118.6634	92.7465	44.3417	16.5400	0.0000	0.0000	0.0000	0.0000	36.8385	98.2903	169.9999 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												743.7511
Space heating per m2												(98c) / (4) = 12.1727 (99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (301)
Fraction of space heat from community system													1.0000 (302)
Fraction of heat from community Heat pump-Space and Water													1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating													1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating													1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system													2.0000 (306)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	166.3308	118.6634	92.7465	44.3417	16.5400	0.0000	0.0000	0.0000	0.0000	36.8385	98.2903	169.9999	98 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 2.00	332.6616	237.3269	185.4929	88.6833	33.0800	0.0000	0.0000	0.0000	0.0000	73.6770	196.5807	339.9998	
Space heating requirement	332.6616	237.3269	185.4929	88.6833	33.0800	0.0000	0.0000	0.0000	0.0000	73.6770	196.5807	339.9998	307 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)													0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	309 (309)
Water heating													
Annual water heating requirement	233.4253	206.4719	219.2860	192.4689	186.3884	167.7355	165.3036	171.9315	173.9055	194.1958	206.8576	230.8167	64 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 2.00	466.8506	412.9437	438.5720	384.9379	372.7769	335.4710	330.6073	343.8631	347.8111	388.3916	413.7152	461.6334	
Water heating fuel	466.8506	412.9437	438.5720	384.9379	372.7769	335.4710	330.6073	343.8631	347.8111	388.3916	413.7152	461.6334	310 (310)
Cooling System Energy Efficiency Ratio													0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	315 (315)
Pumps and Fa	14.2102	12.8350	14.2102	13.7518	14.2102	13.7518	14.2102	14.2102	13.7518	14.2102	13.7518	14.2102	331 (331)
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	332 (332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	333a (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	334a (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	335a (335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	333b (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	334b (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	335b (335b)
Annual totals kWh/year													
Space heating fuel - community heating													1487.5021 (307)
Space heating fuel - secondary													0.0000 (309)
Water heating fuel - community heating													4697.5736 (310)
Efficiency of water heater													0.0000 (311)
Electricity used for heat distribution													14.8750 (313)
Space cooling fuel													0.0000 (321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8470)													
mechanical ventilation fans (SFP = 0.8470)													167.3132 (330a)
Total electricity for the above, kWh/year													167.3132 (331)
Electricity for lighting (calculated in Appendix L)													169.9577 (332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													0.0000 (333)
Wind generation													0.0000 (334)
Hydro-electric generation (Appendix N)													0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (335)
Appendix Q - special features													
Energy saved or generated													-0.0000 (336)

Full SAP Calculation Printout



Energy used 0.0000 (337)
 Total delivered energy for all uses 6522.3467 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			324.0000 (367)
Space and Water heating from Heat pump			71.8360 (367)
Electrical energy for heat distribution (space & water)	1908.9740	0.1565	8.9471 (372)
Overall CO2 factor for heat network	14.8750	0.0000	0.0461 (386)
Total CO2 associated with community systems			285.0917 (373)
Space and water heating			285.0917 (376)
Pumps, fans and electric keep-hot	167.3132	0.1387	23.2084 (378)
Energy for lighting	169.9577	0.1443	24.5301 (379)
Total CO2, kg/year			332.8302 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.4500 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			324.0000 (467a)
Space and Water heating from Heat pump			725.0483 (467)
Electrical energy for heat distribution (space & water)	1908.9740	1.5793	94.9442 (472)
Overall CO2 factor for heat network	14.8750	0.0000	0.4891 (486)
Total CO2 associated with community systems			3025.3212 (473)
Space and water heating			3025.3212 (476)
Pumps, fans and electric keep-hot	167.3132	1.5128	253.1115 (478)
Energy for lighting	169.9577	1.5338	260.6868 (479)
Total Primary energy kWh/year			3539.1194 (483)
Dwelling Primary energy Rate (DPER)			57.9200 (484)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	61.1000 (1b)	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

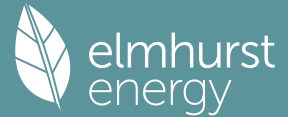
		m3 per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number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

Full SAP Calculation Printout



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)

Element	Length	Psi-value	Total
E1 Sill	6.0000	0.0500	0.3000
E2 Other lintels (including other steel lintels)	2.7000	0.0500	0.1350
E3 Sill	29.2000	0.0500	1.4600
E4 Jamb	46.3000	0.0700	3.2410
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	15.9000	0.0900	1.4310
E16 Corner (normal)	5.3000	-0.0900	-0.4770
E17 Corner (inverted - internal area greater than external area)	2.6500	0.0600	0.1590
E18 Party wall between dwellings	2.6500	0.0600	0.1590
E25 Staggered party wall between dwellings			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.4170 (36)
Point Thermal bridges			0.0000 (36a)
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	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)
HLP (average)	31	28	31	30	31	30	31	31	30	31	30	1.0064
Days in mont												31

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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)	28.0927	24.7195	25.9718	22.1725	21.0372	18.4625	17.8745	18.8687	19.3880	22.2083	24.3308	27.7014 (43)
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 cont	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)										Total = Sum(45)m =		1805.5208
Distribution loss (46)m = 0.15 x (45)m												
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	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)
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 (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	212.5329	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)									Total per year (kWh/year) = Sum(64)m =			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)
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)

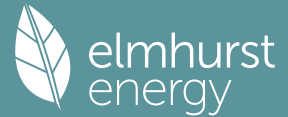
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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 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	0.6300	0.7000	0.7700	13.5052 (76)

Full SAP Calculation Printout



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) =											
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												
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)

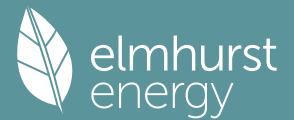
8. Space heating requirement

	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)											
Efficiency of water heater	79.8000											
Water heating fuel used	2624.8031 (219)											
Space cooling fuel	0.0000 (221)											

Full SAP Calculation Printout



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)

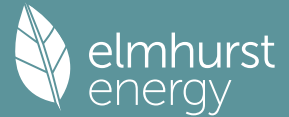
 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	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)

Full SAP Calculation Printout



Property Reference	Unit 12		Issued on Date	25/01/2024	
Assessment Reference	Be Green_Copy	Prop Type Ref	Unit 9		
Property					
SAP Rating	77 C	DER	5.63	TER	15.48
Environmental	96 A	% DER < TER			63.63
CO ₂ Emissions (t/year)	0.31	DFEE	33.44	TFEE	35.19
Compliance Check	See BREL	% DFEE < TFEE			4.98
% DPER < TPER	29.21	DPER	59.80	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												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	

Full SAP Calculation Printout



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)
												43.4875
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
Hot water usage for baths													25.0495
Hot water usage for other uses													35.2406
Average daily hot water use (litres/day)													108.7022 (43)
Daily hot water use													118.2537
Energy content (annual)													187.2849
Distribution loss (46)m = 0.15 x (45)m													28.0927
Water storage loss:													210.0000 (47)
Store volume													1.2300 (48)
a) If manufacturer declared loss factor is known (kWh/day):													0.6000 (49)
Temperature factor from Table 2b													0.7380 (55)
Enter (49) or (54) in (55)													
Total storage loss													22.8780
If cylinder contains dedicated solar storage													22.8780
Primary loss													23.2624
Combi loss													0.0000
Total heat required for water heating calculated for each month													233.4253
WWHRs													0.0000
PV diverter													0.0000
Solar input													0.0000
FGHRs													0.0000
Output from w/h													233.4253
Total per year (kWh/year)													2348.7868 (64)
Electric shower(s)													2349 (64)
Heat gains from water heating, kWh/month													99.1845
													88.1351
													94.4832
													84.8707
													83.5448
													76.6469
													76.5341
													78.7379
													78.6984
													86.1407
													89.6550
													98.3172 (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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-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	133.3126	131.1533	126.9936	117.8760	112.2914	106.4540	102.8684	105.8305	109.3033	115.7806	124.5208	132.1468 (72)
	459.4834	469.5693	450.3930	434.7360	413.5614	399.3612	384.7804	385.9191	397.2291	410.2457	434.5760	450.5647 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
	m ²	Table 6a	Specific data	Specific data	factor	W
		W/m ²	or Table 6b	or Table 6c	Table 6d	
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	479.8943	509.0183	516.4222	536.1292	544.5504	536.9451
						129.5158
						514.2962
						492.2817
						475.3774
						457.1320
						459.8854
						16.9049 (83)
						467.4696 (84)

Full SAP Calculation Printout



7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	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	0.9462	0.9270	0.8960	0.8136	0.6812	0.4960	0.3616	0.3925	0.5941	0.8158	0.9136	0.9504 (86)	
MIT	20.0981	20.2433	20.4420	20.7195	20.8999	20.9822	20.9967	20.9952	20.9588	20.7579	20.4200	20.0862 (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	0.9385	0.9168	0.8814	0.7890	0.6437	0.4485	0.3086	0.3380	0.5447	0.7871	0.9002	0.9433 (89)	
MIT 2	19.2623	19.4444	19.6916	20.0334	20.2377	20.3311	20.3428	20.3443	20.3061	20.0847	19.6755	19.2551 (90)	
Living area fraction										fLA = Living area / (4) =			0.6219 (91)
MIT	19.7821	19.9413	20.1583	20.4601	20.6495	20.7360	20.7495	20.7491	20.7121	20.5034	20.1386	19.7720 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.7821	19.9413	20.1583	20.4601	20.6495	20.7360	20.7495	20.7491	20.7121	20.5034	20.1386	19.7720 (93)	

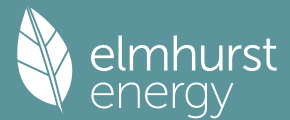
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9317	0.9106	0.8777	0.7940	0.6619	0.4771	0.3414	0.3717	0.5730	0.7948	0.8961	0.9366 (94)	
Useful gains	447.1192	463.5346	453.2519	425.7010	360.4419	256.1558	175.6040	182.9803	272.3753	363.3342	412.1074	437.8536 (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	692.3962	670.1188	606.1800	503.2123	388.0491	260.8305	176.3868	184.1327	283.3193	429.4105	569.7901	685.8057 (97)	
Space heating kWh	182.4861	138.8246	113.7785	55.8081	20.5398	0.0000	0.0000	0.0000	0.0000	49.1608	113.5315	184.4763 (98a)	
Space heating requirement - total per year (kWh/year)												858.6056	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)	
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	182.4861	138.8246	113.7785	55.8081	20.5398	0.0000	0.0000	0.0000	0.0000	49.1608	113.5315	184.4763 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												858.6056	
Space heating per m2												(98c) / (4) =	14.0525 (99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (301)
Fraction of space heat from community system													1.0000 (302)
Fraction of heat from community Heat pump-Space and Water													1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating													1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating													1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system													2.0000 (306)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating:													
Space heating requirement	182.4861	138.8246	113.7785	55.8081	20.5398	0.0000	0.0000	0.0000	0.0000	49.1608	113.5315	184.4763 (98)	
Space heat from Heat pump = (98) x 1.00 x 1.00 x 2.00													
307a	364.9722	277.6491	227.5570	111.6162	41.0795	0.0000	0.0000	0.0000	0.0000	98.3215	227.0631	368.9527	
Space heating requirement	364.9722	277.6491	227.5570	111.6162	41.0795	0.0000	0.0000	0.0000	0.0000	98.3215	227.0631	368.9527 (307)	
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)													0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)	
Water heating													
Annual water heating requirement	233.4253	206.4719	219.2860	192.4689	186.3884	167.7355	165.3036	171.9315	173.9055	194.1958	206.8576	230.8167 (64)	
Water heat from Heat pump = (64) x 1.00 x 1.00 x 2.00													
310a	466.8506	412.9437	438.5720	384.9379	372.7769	335.4710	330.6073	343.8631	347.8111	388.3916	413.7152	461.6334	
Water heating fuel	466.8506	412.9437	438.5720	384.9379	372.7769	335.4710	330.6073	343.8631	347.8111	388.3916	413.7152	461.6334 (310)	
Cooling System Energy Efficiency Ratio													0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)	
Pumps and Fa	14.2102	12.8350	14.2102	13.7518	14.2102	13.7518	14.2102	14.2102	13.7518	14.2102	13.7518	14.2102 (331)	
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 (332)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)	
Annual totals kWh/year													
Space heating fuel - community heating													1717.2113 (307)
Space heating fuel - secondary													0.0000 (309)
Water heating fuel - community heating													4697.5736 (310)
Efficiency of water heater													0.0000 (311)
Electricity used for heat distribution													17.1721 (313)
Space cooling fuel													0.0000 (321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8470)													
mechanical ventilation fans (SFP = 0.8470)													167.3132 (330a)
Total electricity for the above, kWh/year													167.3132 (331)
Electricity for lighting (calculated in Appendix L)													169.9577 (332)
Energy saving/generation technologies (Appendices M, N and Q)													
PV generation													0.0000 (333)
Wind generation													0.0000 (334)
Hydro-electric generation (Appendix N)													0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (335)
Appendix Q - special features													
Energy saved or generated													-0.0000 (336)

Full SAP Calculation Printout



Energy used 0.0000 (337)
 Total delivered energy for all uses 6752.0558 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			324.0000 (367)
Space and Water heating from Heat pump			82.6888 (367)
Electrical energy for heat distribution (space & water)	1979.8719	0.1560	9.2987 (372)
Overall CO2 factor for heat network	17.1721	0.0000	0.0462 (386)
Total CO2 associated with community systems			296.2961 (373)
Space and water heating			296.2961 (376)
Pumps, fans and electric keep-hot	167.3132	0.1387	23.2084 (378)
Energy for lighting	169.9577	0.1443	24.5301 (379)
Total CO2, kg/year			344.0347 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.6300 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			324.0000 (467a)
Space and Water heating from Heat pump			836.1382 (467)
Electrical energy for heat distribution (space & water)	1979.8719	1.5776	98.5435 (472)
Overall CO2 factor for heat network	17.1721	0.0000	0.4895 (486)
Total CO2 associated with community systems			3140.0104 (473)
Space and water heating			3140.0104 (476)
Pumps, fans and electric keep-hot	167.3132	1.5128	253.1115 (478)
Energy for lighting	169.9577	1.5338	260.6868 (479)
Total Primary energy kWh/year			3653.8087 (483)
Dwelling Primary energy Rate (DPER)			59.8000 (484)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	61.1000 (1b)	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

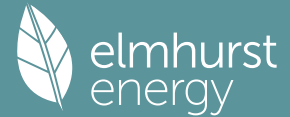
		m3 per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number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

Full SAP Calculation Printout



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)
Point Thermal bridges			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 2.0126 (42)

Hot water usage for mixer showers

	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 (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

	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:

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)

Total heat required for water heating calculated for each month

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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 (56)
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)
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) 2168.5819 (64)

Electric shower(s) 2169 (64)

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

Heat gains from water heating, kWh/month

	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 (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	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)
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	0.0000	0.0000	0.0000	0.0000	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	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)
	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 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	0.6300	0.7000	0.7700	14.6237 (74)

Full SAP Calculation Printout



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 (92)
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

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	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)
Ext temp.	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)
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	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 requirement - total per year (kWh/year)	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)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Space heating requirement after solar contribution - total per year (kWh/year)	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 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 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	85.1210 (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												1868.2059 (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												2618.6306 (219)
Space cooling fuel												0.0000 (221)

Full SAP Calculation Printout



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)

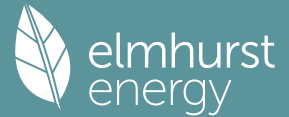
 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	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)

Full SAP Calculation Printout



Property Reference	Unit 13		Issued on Date	25/01/2024	
Assessment Reference	Be Green_Copy	Prop Type Ref	Unit 9		
Property					
SAP Rating	77 C	DER	5.45	TER	14.79
Environmental	96 A	% DER < TER			63.15
CO ₂ Emissions (t/year)	0.3	DFEE	30.87	TFEE	31.85
Compliance Check	See BREL	% DFEE < TFEE			3.08
% DPER < TPER	28.27	DPER	57.92	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	

Full SAP Calculation Printout



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) =	30.2389 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	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)
Heat transfer coeff	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)
Average = Sum(39)m / 12 =												43.4875
HLP	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)
HLP (average)												0.7117
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0126 (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	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	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)													Total = Sum(45)m = 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:													
Store volume													210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.2300 (48)
Temperature factor from Table 2b													0.6000 (49)
Enter (49) or (54) in (55)													0.7380 (55)
Total storage loss	22.8780	20.6640	22.8780	22.1400	22.8780	22.1400	22.8780	22.8780	22.1400	22.8780	22.1400	22.8780 (56)	
If cylinder contains dedicated solar storage	22.8780	20.6640	22.8780	22.1400	22.8780	22.1400	22.8780	22.8780	22.1400	22.8780	22.1400	22.8780 (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	233.4253	206.4719	219.2860	192.4689	186.3884	167.7355	165.3036	171.9315	173.9055	194.1958	206.8576	230.8167 (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	233.4253	206.4719	219.2860	192.4689	186.3884	167.7355	165.3036	171.9315	173.9055	194.1958	206.8576	230.8167 (64)	
Total per year (kWh/year) = Sum(64)m													2348.7868 (64)
Electric shower(s)													2349 (64)
Heat gains from water heating, kWh/month	99.1845	88.1351	94.4832	84.8707	83.5448	76.6469	76.5341	78.7379	78.6984	86.1407	89.6550	98.3172 (65)	

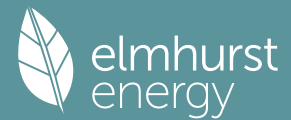
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-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)	133.3126	131.1533	126.9936	117.8760	112.2914	106.4540	102.8684	105.8305	109.3033	115.7806	124.5208	132.1468 (72)
Total internal gains	459.4834	469.5693	450.3930	434.7360	413.5614	399.3612	384.7804	385.9191	397.2291	410.2457	434.5760	450.5647 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
South	4.5000	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
Total gains	515.9379	565.1482	579.2947	590.7852	584.6222	567.4439
						162.7817
						547.5622
						537.8350
						535.6209
						515.4067
						502.0969
						498.9375 (84)

Full SAP Calculation Printout



7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)														
tau	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	0.9324	0.9008	0.8590	0.7709	0.6455	0.4713	0.3401	0.3601	0.5358	0.7626	0.8890	0.9388	(86)	
MIT	20.1812	20.3581	20.5497	20.7790	20.9197	20.9855	20.9975	20.9967	20.9729	20.8204	20.5012	20.1607	(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	0.9232	0.8881	0.8413	0.7442	0.6080	0.4255	0.2901	0.3098	0.4890	0.7310	0.8731	0.9303	(89)	
MIT 2	19.3647	19.5838	19.8190	20.0996	20.2572	20.3337	20.3432	20.3452	20.3180	20.1522	19.7724	19.3472	(90)	
Living area fraction									fLA = Living area / (4) =				0.6219	(91)
MIT	19.8725	20.0654	20.2734	20.5222	20.6692	20.7391	20.7501	20.7504	20.7253	20.5677	20.2256	19.8531	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.8725	20.0654	20.2734	20.5222	20.6692	20.7391	20.7501	20.7504	20.7253	20.5677	20.2256	19.8531	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9165	0.8831	0.8400	0.7521	0.6272	0.4532	0.3211	0.3410	0.5166	0.7425	0.8705	0.9237	(94)
Useful gains	472.8769	499.0641	486.6293	444.3278	366.6717	257.1757	175.8109	183.3853	276.6878	382.6848	437.0816	460.8850	(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	696.4398	675.6466	611.2885	505.9135	388.9029	260.9625	176.4137	184.1849	283.8884	432.1989	573.5960	689.3795	(97)
Space heating kWh	166.3308	118.6634	92.7465	44.3417	16.5400	0.0000	0.0000	0.0000	0.0000	36.8385	98.2903	169.9999	(98a)
Space heating requirement - total per year (kWh/year)												743.7511	
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	166.3308	118.6634	92.7465	44.3417	16.5400	0.0000	0.0000	0.0000	0.0000	36.8385	98.2903	169.9999	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												743.7511	
Space heating per m2												(98c) / (4) =	12.1727 (99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(301)
Fraction of space heat from community system													1.0000	(302)
Fraction of heat from community Heat pump-Space and Water													1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating													1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating													1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system													2.0000	(306)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating:														
Space heating requirement	166.3308	118.6634	92.7465	44.3417	16.5400	0.0000	0.0000	0.0000	0.0000	36.8385	98.2903	169.9999	(98)	
Space heat from Heat pump = (98) x 1.00 x 1.00 x 2.00														
307a	332.6616	237.3269	185.4929	88.6833	33.0800	0.0000	0.0000	0.0000	0.0000	73.6770	196.5807	339.9998		
Space heating requirement	332.6616	237.3269	185.4929	88.6833	33.0800	0.0000	0.0000	0.0000	0.0000	73.6770	196.5807	339.9998	(307)	
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)													0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)	
Water heating														
Annual water heating requirement	233.4253	206.4719	219.2860	192.4689	186.3884	167.7355	165.3036	171.9315	173.9055	194.1958	206.8576	230.8167	(64)	
Water heat from Heat pump = (64) x 1.00 x 1.00 x 2.00														
310a	466.8506	412.9437	438.5720	384.9379	372.7769	335.4710	330.6073	343.8631	347.8111	388.3916	413.7152	461.6334		
Water heating fuel	466.8506	412.9437	438.5720	384.9379	372.7769	335.4710	330.6073	343.8631	347.8111	388.3916	413.7152	461.6334	(310)	
Cooling System Energy Efficiency Ratio													0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)	
Pumps and Fa	14.2102	12.8350	14.2102	13.7518	14.2102	13.7518	14.2102	14.2102	13.7518	14.2102	13.7518	14.2102	(331)	
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	(332)	
Electricity generated by PVs (Appendix M) (negative quantity)														
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)														
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)	
Electricity generated by PVs (Appendix M) (negative quantity)														
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)														
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)	
Annual totals kWh/year														
Space heating fuel - community heating													1487.5021	(307)
Space heating fuel - secondary													0.0000	(309)
Water heating fuel - community heating													4697.5736	(310)
Efficiency of water heater													0.0000	(311)
Electricity used for heat distribution													14.8750	(313)
Space cooling fuel													0.0000	(321)
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8470)														
mechanical ventilation fans (SFP = 0.8470)													167.3132	(330a)
Total electricity for the above, kWh/year													167.3132	(331)
Electricity for lighting (calculated in Appendix L)													169.9577	(332)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													0.0000	(333)
Wind generation													0.0000	(334)
Hydro-electric generation (Appendix N)													0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)													0.0000	(335)
Appendix Q - special features														
Energy saved or generated													-0.0000	(336)

Full SAP Calculation Printout



Energy used 0.0000 (337)
 Total delivered energy for all uses 6522.3467 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			324.0000 (367)
Space and Water heating from Heat pump			71.8360 (367)
Electrical energy for heat distribution (space & water)	1908.9740	0.1565	8.9471 (372)
Overall CO2 factor for heat network	14.8750	0.0000	0.0461 (386)
Total CO2 associated with community systems			285.0917 (373)
Space and water heating			285.0917 (376)
Pumps, fans and electric keep-hot	167.3132	0.1387	23.2084 (378)
Energy for lighting	169.9577	0.1443	24.5301 (379)
Total CO2, kg/year			332.8302 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.4500 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			324.0000 (467a)
Space and Water heating from Heat pump			725.0483 (467)
Electrical energy for heat distribution (space & water)	1908.9740	1.5793	94.9442 (472)
Overall CO2 factor for heat network	14.8750	0.0000	0.4891 (486)
Total CO2 associated with community systems			3025.3212 (473)
Space and water heating			3025.3212 (476)
Pumps, fans and electric keep-hot	167.3132	1.5128	253.1115 (478)
Energy for lighting	169.9577	1.5338	260.6868 (479)
Total Primary energy kWh/year			3539.1194 (483)
Dwelling Primary energy Rate (DPER)			57.9200 (484)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	61.1000 (1b)	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)
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)

Full SAP Calculation Printout



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)
Point Thermal bridges			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)
												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 (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 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)		
													108.7022 (43)	
Daily hot water use														
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:														
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	239.0315	211.5355	224.8922	197.8943	191.9946	173.1608	170.9098	177.5377	179.3309	199.8020	212.2830	236.4229 (62)		
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 (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	212.5329	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)		
													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)		

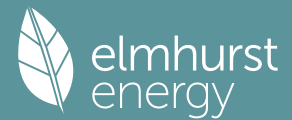
5. Internal gains (see Table 5 and 5a)

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 m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
South	4.5000	46.7521	0.6300	0.7000	0.7700	64.2962 (78)

Full SAP Calculation Printout



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) =											
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

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	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)
Ext temp.	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)
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	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 requirement - total per year (kWh/year)	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)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Space heating 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)											
Efficiency of water heater	79.8000											
Water heating fuel used	2624.8031 (219)											
Space cooling fuel	0.0000 (221)											

Full SAP Calculation Printout



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)