

Full SAP Calculation Printout



Plot Reference	UNIT 02			Issued on Date	08/07/2026
Assessment Reference	001	Plot Type Ref	UNIT 02		
Plot Address	UNIT 02, Stoney Wood Quarter, 34 The Fairway, LONDON, NW7 3HS			SAP Version	10.2
SAP Rating	85 B	DER	12.12	TER	14.31
Environmental	90 B	% DER < TER			15.30
CO ₂ Emissions (t/year)	0.93	DFEE	34.22	TFEE	37.79
Compliance Check	See BREL	% DFEE < TFEE			9.44
% DPER < TPER	10.67	DPER	69.12	TPER	77.38
Assessor Details	Mr. Ondrej Gajdos			Assessor ID	W452-0001
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)
Main dwelling			
Basement floor	49.2000 (1a)	x 2.6500 (2a)	= 130.3800 (1a) - (3a)
Ground floor	33.2000 (1b)	x 2.8000 (2b)	= 92.9600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 223.3400 (5)

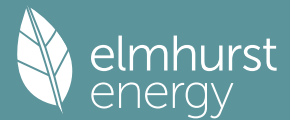
2. Ventilation rate

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	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) =	
Pressure test	0.0000 / (5) =	0.0000 (8)
Pressure Test Method	Yes	
Measured/design AP50	Blower Door	
Infiltration rate		3.0000 (17)
Number of sides sheltered		0.1500 (18)
		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000	(22)
Wind factor	1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1250 1.1750	(22a)
Adj infilt rate	0.1339 0.1313 0.1286 0.1155 0.1129 0.0997 0.0997 0.0971 0.1050 0.1129 0.1181 0.1234	(22b)
Balanced mechanical ventilation with heat recovery		
If mechanical ventilation		
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		
Effective ac	0.2289 0.2262 0.2236 0.2105 0.2079 0.1947 0.1947 0.1921 0.2000 0.2079 0.2131 0.2184	(25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
1			27.6700	0.7940	21.9688		(27)
1rl			0.4400	0.7940	0.3493		(27a)
parking below			49.2000	0.1000	4.9200	75.0000	3690.0001 (28b)
exposed wall	32.9200	27.6700	5.2500	0.1500	0.7875	60.0000	314.9999 (29a)
basement wall	14.0450		14.0450	0.1500	2.1068	9.0000	126.4050 (29a)
garage wall	11.0000		11.0000	0.3000	3.3000	9.0000	99.0000 (29a)
terrace above LGF	13.8000	0.4400	13.3600	0.1000	1.3360	9.0000	120.2400 (30)
terrace above GF	1.5000		1.5000	0.1000	0.1500	9.0000	13.5000 (30)
Total net area of external elements A _{um} (A, m ²)			122.4650				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.9184		(33)
Main dwelling							
pw			97.2300	0.0000	0.0000	110.0000	10695.3004 (32)
pc			31.7000			30.0000	951.0000 (32b)
iw			162.2900			9.0000	1460.6099 (32c)

Full SAP Calculation Printout



if 33.2000 18.0000 597.6000 (32d)
ic 33.2000 9.0000 298.8000 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K (28)...(30) + (32) + (32a)...(32e) = 18367.4553 (34)
List of Thermal Bridges 222.9060 (35)

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.4200	0.0500	0.5210
E3 Sill	10.4200	0.0500	0.5210
E4 Jamb	31.8000	0.0500	1.5900
E20 Exposed floor (normal)	16.6000	0.3200	5.3120
E6 Intermediate floor within a dwelling	1.3000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	0.9000	0.0700	0.0630
E24 Eaves (insulation at ceiling level - inverted)	2.6000	0.1600	0.4160
E24 Eaves (insulation at ceiling level - inverted)	3.0000	0.2400	0.7200
E14 Flat roof	11.0000	0.1600	1.7600
E16 Corner (normal)	8.1000	0.0900	0.7290
E17 Corner (inverted - internal area greater than external area)	10.7500	-0.0900	-0.9675
E18 Party wall between dwellings	5.4500	0.0600	0.3270
E25 Staggered party wall between dwellings	7.6500	0.0600	0.4590

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.4505 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 46.3689 (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	16.8686	16.6751	16.4817	15.5143	15.3208	14.3535	14.3535	14.1600	14.7404	15.3208	15.7078	16.0947
Average = Sum(39)m / 12 =	63.2375	63.0440	62.8506	61.8832	61.6898	60.7224	60.7224	60.5289	61.1094	61.6898	62.0767	62.4636
	61.8349											
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7674	0.7651	0.7627	0.7510	0.7487	0.7369	0.7369	0.7346	0.7416	0.7487	0.7534	0.7581
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5068 (42)											
Hot water usage for mixer showers	66.2509	65.2553	63.8045	61.0286	58.9801	56.6956	55.3971	56.8369	58.4152	60.8681	63.7036	65.9971
Hot water usage for baths	28.6133	28.1883	27.5899	26.4865	25.6604	24.7442	24.2494	24.8436	25.4906	26.4709	27.5970	28.5165
Hot water usage for other uses	40.3024	38.8368	37.3713	35.9058	34.4402	32.9747	32.9747	34.4402	35.9058	37.3713	38.8368	40.3024
Average daily hot water use (litres/day)	124.2487	124.2487	124.2487	124.2487	124.2487	124.2487	124.2487	124.2487	124.2487	124.2487	124.2487	124.2487
	124.2487											
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	135.1666	132.2805	128.7657	123.4209	119.0806	114.4145	112.6211	116.1207	119.8116	124.7103	130.1374	134.8160
Energy content (annual)	214.0708	188.3656	197.9080	168.9570	160.3054	140.6860	136.2055	143.7817	147.7397	169.2307	185.4046	211.0893
Distribution loss (46)m = 0.15 x (45)m	32.1106	28.2548	29.6862	25.3436	24.0458	21.1029	20.4308	21.5673	22.1610	25.3846	27.8107	31.6634
Water storage loss (or HIU loss):												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589
Total heat required for water heating calculated for each month	265.0297	234.3930	248.8670	218.2721	211.2643	190.0010	187.1644	194.7406	197.0548	220.1896	234.7197	262.0482
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Output from w/h	265.0297	234.3930	248.8670	218.2721	211.2643	190.0010	187.1644	194.7406	197.0548	220.1896	234.7197	262.0482
12Total per year (kWh/year)	2663.7443 (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
Heat gains from water heating, kWh/month	83.9183	74.1384	78.5442	68.5070	66.0413	59.1068	58.0281	60.5472	61.4522	69.0089	73.9758	82.9269

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	125.3412	125.3412	125.3412	125.3412	125.3412	125.3412	125.3412	125.3412	125.3412	125.3412	125.3412	125.3412
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	113.1756	125.3015	113.1756	116.9481	113.1756	116.9481	113.1756	113.1756	116.9481	113.1756	116.9481	113.1756
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	224.3833	226.7117	220.8442	208.3530	192.5851	177.7656	167.8652	165.5368	171.4043	183.8954	199.6633	214.4829
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.5341	35.5341	35.5341	35.5341	35.5341	35.5341	35.5341	35.5341	35.5341	35.5341	35.5341	35.5341
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000
Losses e.g. evaporation (negative values) (Table 5)	-100.2729	-100.2729	-100.2729	-100.2729	-100.2729	-100.2729	-100.2729	-100.2729	-100.2729	-100.2729	-100.2729	-100.2729
Water heating gains (Table 5)	112.7934	110.3250	105.5701	95.1486	88.7652	82.0928	77.9947	81.3806	85.3503	92.7539	102.7442	111.4609
Total internal gains	513.9546	525.9406	503.1922	484.0520	458.1282	437.4089	419.6378	420.6953	434.3050	453.4273	482.9579	502.7217

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
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North	7.3800	10.6334	0.5300	0.7000	0.7700	20.1760 (74)
Northeast	14.9600	11.2829	0.5300	0.7000	0.7700	43.3971 (75)
Northwest	5.3300	11.2829	0.5300	0.7000	0.7700	15.4617 (81)
Horizontal	0.4400	26.0000	0.5300	0.7000	1.0000	3.8198 (82)

Solar gains	82.8546	166.2997	295.4797	481.7766	646.4923	689.1670	644.7003	514.3481	358.6953	202.0099	103.7976	67.9720 (83)
Total gains	596.8092	692.2402	798.6720	965.8287	1104.6205	1126.5758	1064.3381	935.0434	793.0003	655.4372	586.7555	570.6937 (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	80.6811	80.9287	81.1778	82.4467	82.7053	84.0229	84.0229	84.2914	83.4908	82.7053	82.1898	81.6807
alpha	6.3787	6.3952	6.4119	6.4964	6.5137	6.6015	6.6015	6.6194	6.5661	6.5137	6.4793	6.4454
util living area	0.9884	0.9708	0.9150	0.7361	0.5159	0.3448	0.2510	0.2977	0.5278	0.8575	0.9721	0.9909 (86)
MIT	20.2820	20.4714	20.7216	20.9416	20.9940	20.9996	21.0000	20.9999	20.9951	20.8770	20.5482	20.2532 (87)
Th 2	20.2816	20.2837	20.2857	20.2960	20.2980	20.3083	20.3083	20.3104	20.3042	20.2980	20.2939	20.2898 (88)
util rest of house	0.9855	0.9639	0.8976	0.7020	0.4781	0.3076	0.2116	0.2531	0.4761	0.8242	0.9644	0.9886 (89)
MIT 2	19.4466	19.6853	19.9899	20.2419	20.2934	20.3081	20.3083	20.3104	20.3011	20.1829	19.7920	19.4168 (90)
Living area fraction	19.7031	19.9267	20.2146	20.4568	20.5085	20.5205	20.5207	20.5221	20.5142	20.3960	20.0242	19.6736 (92)
MIT	19.7031	19.9267	20.2146	20.4568	20.5085	20.5205	20.5207	20.5221	20.5142	20.3960	20.0242	19.6736 (92)
Temperature adjustment	19.5531	19.7767	20.0646	20.3068	20.3585	20.3705	20.3707	20.3721	20.3642	20.2460	19.8742	-0.1500
adjusted MIT	19.5531	19.7767	20.0646	20.3068	20.3585	20.3705	20.3707	20.3721	20.3642	20.2460	19.8742	19.5236 (93)

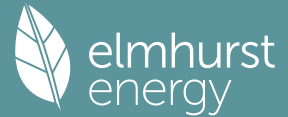
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9816	0.9580	0.8916	0.7025	0.4813	0.3109	0.2151	0.2571	0.4806	0.8216	0.9587	0.9853 (94)
Useful gains	585.8477	663.1661	712.0924	678.4941	531.7038	350.2877	228.9579	240.4030	381.1354	538.4766	562.5319	562.2925 (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	964.5689	937.8864	852.5402	705.8867	534.1422	350.3960	228.9649	240.4252	382.8012	595.0594	792.9804	957.1665 (97)
Space heating kWh	281.7686	184.6120	104.4931	19.7227	1.8142	0.0000	0.0000	0.0000	0.0000	42.0976	165.9230	293.7863 (98a)
Space heating requirement - total per year (kWh/year)												1094.2174
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	281.7686	184.6120	104.4931	19.7227	1.8142	0.0000	0.0000	0.0000	0.0000	42.0976	165.9230	293.7863 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1094.2174
Space heating per m2										(98c) / (4) =		13.2793 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												88.9000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	281.7686	184.6120	104.4931	19.7227	1.8142	0.0000	0.0000	0.0000	0.0000	42.0976	165.9230	293.7863 (98)
Space heating efficiency (main heating system 1)	88.9000	88.9000	88.9000	88.9000	88.9000	0.0000	0.0000	0.0000	0.0000	88.9000	88.9000	88.9000 (210)
Space heating fuel (main heating system)	316.9500	207.6626	117.5401	22.1852	2.0407	0.0000	0.0000	0.0000	0.0000	47.3539	186.6400	330.4683 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	265.0297	234.3930	248.8670	218.2721	211.2643	190.0010	187.1644	194.7406	197.0548	220.1896	234.7197	262.0482 (64)
Efficiency of water heater (217)m	84.5129	83.8749	82.6648	80.9489	80.3662	80.3000	80.3000	80.3000	80.3000	81.5665	83.6513	80.3000 (216)
Fuel for water heating, kWh/month	313.5966	279.4553	301.0557	269.6417	262.8771	236.6140	233.0814	242.5164	245.3982	269.9512	280.5928	84.6271 (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	19.5194	17.6304	19.5194	18.8897	19.5194	18.8897	19.5194	19.5194	18.8897	19.5194	18.8897	19.5194 (231)
Lighting	23.5157	18.8651	16.9860	12.4446	9.6126	7.8536	8.7689	11.3982	14.8051	19.4251	21.9406	24.1692 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1230.8407 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)

Full SAP Calculation Printout



Efficiency of water heater	80.3000	
Water heating fuel used	3244.4310 (219)	
Space cooling fuel	0.0000 (221)	
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6930)		
mechanical ventilation fans (SFP = 0.6930)	188.8250 (230a)	
central heating pump	41.0000 (230c)	
Total electricity for the above, kWh/year	229.8250 (231)	
Electricity for lighting (calculated in Appendix L)	189.7848 (232)	
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000 (233)	
Wind generation	0.0000 (234)	
Hydro-electric generation (Appendix N)	0.0000 (235a)	
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)	
Appendix Q - special features		
Energy saved or generated	-0.0000 (236)	
Energy used	0.0000 (237)	
Total delivered energy for all uses	4894.8815 (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	1230.8407	0.2100	258.4765 (261)	
Total CO2 associated with community systems			0.0000 (373)	
Water heating (other fuel)	3244.4310	0.2100	681.3305 (264)	
Space and water heating			939.8070 (265)	
Pumps, fans and electric keep-hot	229.8250	0.1387	31.8796 (267)	
Energy for lighting	189.7848	0.1443	27.3918 (268)	
Total CO2, kg/year			999.0784 (272)	
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.1200 (273)	

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1230.8407	1.1300	1390.8500 (275)	
Total CO2 associated with community systems			0.0000 (473)	
Water heating (other fuel)	3244.4310	1.1300	3666.2070 (278)	
Space and water heating			5057.0570 (279)	
Pumps, fans and electric keep-hot	229.8250	1.5128	347.6793 (281)	
Energy for lighting	189.7848	1.5338	291.0982 (282)	
Total Primary energy kWh/year			5695.8345 (286)	
Dwelling Primary energy Rate (DPER)			69.1200 (287)	

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Basement floor	49.2000 (1a)	x 2.6500 (2a)	= 130.3800 (1a) - (3a)	
Ground floor	33.2000 (1b)	x 2.8000 (2b)	= 92.9600 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.4000		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	223.3400 (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) =	0.1343 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3843	(18)
Number of sides sheltered	4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2690 (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	0.3430	0.3363	0.3296	0.2959	0.2892	0.2556	0.2556	0.2489	0.2690	0.2892	0.3027	0.3161 (22b)

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Effective ac 0.5588 0.5565 0.5543 0.5438 0.5418 0.5327 0.5327 0.5310 0.5362 0.5418 0.5458 0.5500 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opening Type			20.2900	1.1450	23.2328			(27)
TER Roof Window			0.3200	1.1450	0.5094			(27a)
parking below			49.2000	0.1300	6.3960			(28b)
exposed wall	32.9200	20.2900	12.6300	0.1800	2.2734			(29a)
basement wall	14.0450		14.0450	0.1800	2.5281			(29a)
garage wall	11.0000		11.0000	0.1800	1.9800			(29a)
terrace above LGF	13.8000	0.3200	13.4800	0.1100	1.4828			(30)
terrace above GF	1.5000		1.5000	0.1100	0.1650			(30)
Total net area of external elements Aum(A, m2)			122.4650					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		38.5675			(33)
Main dwelling								
pw			97.2300	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								222.9060 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	10.4200	0.0500	0.5210
E2 Other lintels (including other steel lintels)	10.4200	0.0500	0.5210
E3 Sill	31.8000	0.0500	1.5900
E4 Jamb	16.6000	0.3200	5.3120
E20 Exposed floor (normal)	1.3000	0.0000	0.0000
E6 Intermediate floor within a dwelling	0.9000	0.0700	0.0630
E7 Party floor between dwellings (in blocks of flats)	2.6000	0.2400	0.6240
E24 Eaves (insulation at ceiling level - inverted)	3.0000	0.2400	0.7200
E24 Eaves (insulation at ceiling level - inverted)	11.0000	0.0800	0.8800
E16 Flat roof	8.1000	0.0900	0.7290
E16 Corner (normal)	10.7500	-0.0900	-0.9675
E17 Corner (inverted - internal area greater than external area)	5.4500	0.0600	0.3270
E18 Party wall between dwellings	7.6500	0.0600	0.4590
E25 Staggered party wall between dwellings			

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

Point Thermal bridges

Total fabric heat loss (33) + (36) + (36a) = 49.3460 (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	41.1868	41.0185	40.8534	40.0783	39.9333	39.2582	39.2582	39.1332	39.5182	39.9333	40.2267	40.5334
Heat transfer coeff	90.5328	90.3645	90.1994	89.4243	89.2793	88.6042	88.6042	88.4791	88.8642	89.2793	89.5727	89.8794
Average = Sum(39)m / 12 =												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0987	1.0967	1.0947	1.0852	1.0835	1.0753	1.0753	1.0738	1.0784	1.0835	1.0870	1.0908
HLP (average)												1.0852
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5068 (42)
Hot water usage for mixer showers	66.2509	65.2553	63.8045	61.0286	58.9801	56.6956	55.3971	56.8369	58.4152	60.8681	63.7036	65.9971	(42a)
Hot water usage for baths	28.6133	28.1883	27.5899	26.4865	25.6604	24.7442	24.2494	24.8436	25.4906	26.4709	27.5970	28.5165	(42b)
Hot water usage for other uses	40.3024	38.8368	37.3713	35.9058	34.4402	32.9747	32.9747	34.4402	35.9058	37.3713	38.8368	40.3024	(42c)
Average daily hot water use (litres/day)													124.2487 (43)
Daily hot water use	135.1666	132.2805	128.7657	123.4209	119.0806	114.4145	112.6211	116.1207	119.8116	124.7103	130.1374	134.8160	(44)
Energy conte	214.0708	188.3656	197.9080	168.9570	160.3054	140.6860	136.2055	143.7817	147.7397	169.2307	185.4046	211.0893	(45)
Energy content (annual)										Total = Sum(45)m =			2063.7443
Distribution loss (46)m = 0.15 x (45)m	32.1106	28.2548	29.6862	25.3436	24.0458	21.1029	20.4308	21.5673	22.1610	25.3846	27.8107	31.6634	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	265.0297	234.3930	248.8670	218.2721	211.2643	190.0010	187.1644	194.7406	197.0548	220.1896	234.7197	262.0482	(62)
WWHRS	-30.2871	-26.7862	-28.0490	-23.2257	-21.6455	-18.5222	-17.3616	-18.4623	-19.1638	-22.5920	-25.5940	-29.7263	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	234.7425	207.6068	220.8180	195.0464	189.6188	171.4788	169.8028	176.2783	177.8910	197.5976	209.1257	232.3219	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =			2382.3288 (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	83.9183	74.1384	78.5442	68.5070	66.0413	59.1068	58.0281	60.5472	61.4522	69.0089	73.9758	82.9269	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	125.3412	125.3412	125.3412	125.3412	125.3412	125.3412	125.3412	125.3412	125.3412	125.3412	125.3412	125.3412	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	113.1756	125.3015	113.1756	116.9481	113.1756	116.9481	113.1756	113.1756	116.9481	113.1756	116.9481	113.1756	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	224.3833	226.7117	220.8442	208.3530	192.5851	177.7656	167.8652	165.5368	171.4043	183.8954	199.6633	214.4829	(68)

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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.5341	35.5341	35.5341	35.5341	35.5341	35.5341	35.5341	35.5341	35.5341	35.5341	35.5341	35.5341 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-100.2729	-100.2729	-100.2729	-100.2729	-100.2729	-100.2729	-100.2729	-100.2729	-100.2729	-100.2729	-100.2729	-100.2729 (71)
Water heating gains (Table 5)	112.7934	110.3250	105.5701	95.1486	88.7652	82.0928	77.9947	81.3806	85.3503	92.7539	102.7442	111.4609 (72)
Total internal gains	513.9546	525.9406	503.1922	484.0520	458.1282	437.4089	419.6378	420.6953	434.3050	453.4273	482.9579	502.7217 (73)

6. Solar gains

[Jan]			Area m2	Solar flux Table 6a W/m2	g		FF		Access factor Table 6d		Gains W	
					Specific data or Table 6b		Specific data or Table 6c					
North			5.4100		10.6334	0.6300	0.7000		0.7700		17.5809 (74)	
Northeast			10.9700		11.2829	0.6300	0.7000		0.7700		37.8269 (75)	
Northwest			3.9100		11.2829	0.6300	0.7000		0.7700		13.4825 (81)	
Horizontal			0.3200		26.0000	0.6300	0.7000		1.0000		3.3022 (82)	
Solar gains	72.1925	144.8982	257.4549	419.7850	563.3159	600.5049	561.7569	448.1687	312.5372	176.0127	90.4401	59.2253 (83)
Total gains	586.1471	670.8388	760.6471	903.8370	1021.4441	1037.9137	981.3948	868.8640	746.8423	629.4400	573.3980	561.9470 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	56.3560	56.4610	56.5643	57.0546	57.1473	57.5827	57.5827	57.6641	57.4142	57.1473	56.9601	56.7658
alpha	4.7571	4.7641	4.7710	4.8036	4.8098	4.8388	4.8388	4.8443	4.8276	4.8098	4.7973	4.7844
util living area	0.9932	0.9864	0.9670	0.8929	0.7326	0.5327	0.3945	0.4620	0.7380	0.9446	0.9868	0.9944 (86)
MIT	19.6635	19.8593	20.1766	20.6037	20.8818	20.9795	20.9961	20.9920	20.9105	20.5184	20.0213	19.6305 (87)
Th 2	20.0019	20.0036	20.0052	20.0129	20.0143	20.0211	20.0211	20.0223	20.0185	20.0143	20.0114	20.0084 (88)
util rest of house	0.9913	0.9825	0.9575	0.8645	0.6760	0.4567	0.3081	0.3670	0.6602	0.9232	0.9823	0.9928 (89)
MIT 2	18.4515	18.7012	19.1009	19.6200	19.9185	20.0094	20.0197	20.0193	19.9576	19.5344	18.9145	18.4141 (90)
Living area fraction									FLA = Living area / (4) =			0.3070 (91)
MIT	18.8236	19.0568	19.4312	19.9220	20.2143	20.3073	20.3195	20.3180	20.2502	19.8365	19.2543	18.7876 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8236	19.0568	19.4312	19.9220	20.2143	20.3073	20.3195	20.3180	20.2502	19.8365	19.2543	18.7876 (93)

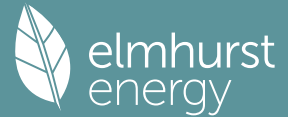
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	579.1209	655.7402	723.0357	778.6417	702.9146	497.5725	328.4483	344.2153	507.7869	578.1156	560.5607	556.3304 (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	1314.8635	1279.2693	1166.3833	985.6359	760.1491	505.6881	329.5647	346.6571	546.5289	824.6290	1088.6946	1311.1200 (97)
Space heating kWh	547.3925	419.0116	329.8506	149.0358	42.5825	0.0000	0.0000	0.0000	0.0000	183.4059	380.2564	561.5635 (98a)
Space heating requirement - total per year (kWh/year)												2613.0987
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	547.3925	419.0116	329.8506	149.0358	42.5825	0.0000	0.0000	0.0000	0.0000	183.4059	380.2564	561.5635 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2613.0987
Space heating per m2										(98c) / (4) =		31.7124 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
547.3925	419.0116	329.8506	149.0358	42.5825	0.0000	0.0000	0.0000	0.0000	0.0000	183.4059	380.2564	561.5635 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	592.4161	453.4757	356.9812	161.2942	46.0849	0.0000	0.0000	0.0000	0.0000	198.4913	411.5329	607.7527 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	234.7425	207.6068	220.8180	195.0464	189.6188	171.4788	169.8028	176.2783	177.8910	197.5976	209.1257	232.3219 (64)
Efficiency of water heater (217)m	86.1314	85.8536	85.2393	83.8118	81.7503	80.3000	80.3000	80.3000	80.3000	84.2220	85.6454	86.1984 (217)
Fuel for water heating, kWh/month	272.5399	241.8148	259.0566	232.7195	231.9489	213.5477	211.4605	219.5247	221.5330	234.6152	244.1762	269.5198 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	23.5157	18.8651	16.9860	12.4446	9.6126	7.8536	8.7689	11.3982	14.8051	19.4251	21.9406	24.1692 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												

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(233a)m	-9.8385	-15.1899	-23.8829	-29.4526	-34.1227	-32.7281	-32.3277	-29.3198	-24.4867	-18.4463	-11.2729	-8.3592	(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	-2.1679	-4.7447	-9.7895	-15.2540	-20.7299	-21.0421	-20.7991	-17.3528	-12.3853	-6.9628	-2.9488	-1.7012	(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												2828.0289	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2852.4570	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												189.7848	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-405.3056	(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												5550.9651	(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	2828.0289	0.2100	593.8861	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2852.4570	0.2100	599.0160	(264)
Space and water heating			1192.9020	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	189.7848	0.1443	27.3918	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-269.4273	0.1327	-35.7645	
PV Unit electricity exported	-135.8782	0.1248	-16.9621	
Total			-52.7266	(269)
Total CO2, kg/year			1179.4965	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.3100	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2828.0289	1.1300	3195.6727	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2852.4570	1.1300	3223.2764	(278)
Space and water heating			6418.9491	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	189.7848	1.5338	291.0982	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-269.4273	1.4905	-401.5781	
PV Unit electricity exported	-135.8782	0.4582	-62.2555	
Total			-463.8335	(283)
Total Primary energy kWh/year			6376.3146	(286)
Target Primary Energy Rate (TPER)			77.3800	(287)