

Full SAP Calculation Printout



Plot Reference	UNIT 05			Issued on Date	08/07/2026
Assessment Reference	001	Plot Type Ref	UNIT 05		
Plot Address	UNIT 05, Stoney Wood Quarter, 34 The Fairway, LONDON, NW7 3HS			SAP Version	10.2
SAP Rating	82 B	DER	3.62	TER	15.33
Environmental	97 A	% DER < TER			76.39
CO ₂ Emissions (t/year)	0.25	DFEE	34.97	TFEE	41.11
Compliance Check	See BREL	% DFEE < TFEE			14.93
% DPER < TPER	52.77	DPER	38.78	TPER	82.11
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			
Ground floor	73.5000	2.7500	202.1250
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5000		
Dwelling volume			202.1250

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	4	(19)

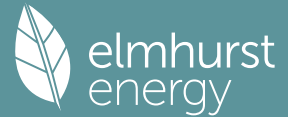
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1050 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.1339	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												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) =												81.0000 (23c)
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							
dl			2.1000	1.0000	2.1000		(26)
l			17.4700	0.7940	13.8704		(27)
exposed floor			55.0000	0.1000	5.5000	75.0000	4125.0000 (28b)
exposed wall	36.3000	17.4700	18.8300	0.1500	2.8245	60.0000	1129.8000 (29a)
stair wall	8.2500		8.2500	0.1700	1.4025	9.0000	74.2500 (29a)
corridor wall	5.5000	2.1000	3.4000	0.2500	0.8500	9.0000	30.6000 (29a)
terrace above 1F	6.3000		6.3000	0.1000	0.6300	9.0000	56.7000 (30)
Total net area of external elements A _{um} (A, m ²)			111.3500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.1774		(33)
Main dwelling							
pw			67.9250	0.0000	0.0000	110.0000	7471.7503 (32)
pf			18.5000			40.0000	740.0000 (32d)
pc			67.2000			30.0000	2015.9999 (32b)
iw			129.2500			9.0000	1163.2500 (32c)

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Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
List of Thermal Bridges

(28)...(30) + (32) + (32a)...(32e) = 16807.3502 (34)
228.6714 (35)

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	7.9000	0.0500	0.3950
E3 Sill	6.9000	0.0500	0.3450
E4 Jamb	27.7000	0.0500	1.3850
E20 Exposed floor (normal)	11.3000	0.3200	3.6160
E21 Exposed floor (inverted)	7.6000	0.3200	2.4320
E7 Party floor between dwellings (in blocks of flats)	9.1000	0.0700	0.6370
E24 Eaves (insulation at ceiling level - inverted)	7.3000	0.1600	1.1680
E14 Flat roof	7.2000	0.1600	1.1520
E16 Corner (normal)	5.5000	0.0900	0.4950
E17 Corner (inverted - internal area greater than external area)	2.7500	-0.0900	-0.2475
E18 Party wall between dwellings	8.2500	0.0600	0.4950
E25 Staggered party wall between dwellings	2.7500	0.0600	0.1650
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			12.0375 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	39.2149 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	15.2662	15.0912	14.9161	14.0406	13.8655	12.9901	12.9901	12.8150	13.3402	13.8655	14.2157	14.5659	(38)
Average = Sum(39)m / 12 =	54.4812	54.3061	54.1310	53.2556	53.0805	52.2050	52.2050	52.0299	52.5552	53.0805	53.4307	53.7808	(39)
												53.2118	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.7412	0.7389	0.7365	0.7246	0.7222	0.7103	0.7103	0.7079	0.7150	0.7222	0.7269	0.7317	(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													2.3280 (42)
Hot water usage for mixer showers	63.2528	62.3022	60.9171	58.2668	56.3110	54.1299	52.8901	54.2648	55.7717	58.1136	60.8207	63.0104	(42a)
Hot water usage for baths	27.3240	26.9182	26.3467	25.2931	24.5041	23.6293	23.1568	23.7242	24.3421	25.2782	26.3535	27.2316	(42b)
Hot water usage for other uses	38.4712	37.0722	35.6733	34.2743	32.8754	31.4764	31.4764	32.8754	34.2743	35.6733	37.0722	38.4712	(42c)
Average daily hot water use (litres/day)												118.6244	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	129.0480	126.2927	122.9371	117.8342	113.6905	109.2356	107.5233	110.8644	114.3881	119.0650	124.2465	128.7132	(44)
Energy content (annual)	204.3804	179.8391	188.9497	161.3092	153.0492	134.3179	130.0401	137.2733	141.0519	161.5701	177.0119	201.5338	(45)
Distribution loss (46)m = 0.15 x (45)m	30.6571	26.9759	28.3425	24.1964	22.9574	20.1477	19.5060	20.5910	21.1578	24.2355	26.5518	30.2301	(46)
Water storage loss (or HIU loss):												110.0000	(47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	259.6572	229.7665	244.2265	214.8028	208.3260	187.8116	185.3169	192.5501	194.5456	216.8469	230.5056	256.8106	(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	259.6572	229.7665	244.2265	214.8028	208.3260	187.8116	185.3169	192.5501	194.5456	216.8469	230.5056	256.8106	(64)
12Total per year (kWh/year)												2621.1664	(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	112.1779	99.7384	107.0472	96.4302	95.1103	87.4556	87.4598	89.8648	89.6947	97.9435	101.6514	111.2314	(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	116.4006	116.4006	116.4006	116.4006	116.4006	116.4006	116.4006	116.4006	116.4006	116.4006	116.4006	116.4006	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	103.5625	114.6585	103.5625	107.0146	103.5625	107.0146	103.5625	103.5625	107.0146	103.5625	107.0146	103.5625	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	205.3242	207.4549	202.0858	190.6556	176.2270	162.6662	153.6068	151.4762	156.8453	168.2754	182.7040	196.2648	(68)
Pumps, fans	34.6401	34.6401	34.6401	34.6401	34.6401	34.6401	34.6401	34.6401	34.6401	34.6401	34.6401	34.6401	(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)	-93.1205	-93.1205	-93.1205	-93.1205	-93.1205	-93.1205	-93.1205	-93.1205	-93.1205	-93.1205	-93.1205	-93.1205	(71)
Total internal gains	150.7768	148.4203	143.8807	133.9309	127.8364	121.4662	117.5535	120.7860	124.5760	131.6445	141.1825	149.5046	(72)
	517.5837	528.4538	507.4491	489.5213	465.5462	449.0672	432.6429	433.7449	446.3560	461.4026	488.8213	507.2521	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
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	m2		Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		factor Table 6d		W	
North	6.6000		10.6334		0.5300		0.7000		0.7700		18.0436 (74)	
Northeast	10.8700		11.2829		0.5300		0.7000		0.7700		31.5325 (75)	
Solar gains	49.5761	98.6676	174.2354	284.0334	382.0691	407.8870	381.3186	303.5051	211.3598	119.4862	61.9352	40.7931 (83)
Total gains	567.1599	627.1215	681.6845	773.5546	847.6153	856.9542	813.9615	737.2500	657.7159	580.8888	550.7565	548.0452 (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	85.6939	85.9702	86.2483	87.6661	87.9553	89.4303	89.4303	89.7312	88.8344	87.9553	87.3788	86.8099
alpha	6.7129	6.7313	6.7499	6.8444	6.8637	6.9620	6.9620	6.9821	6.9223	6.8637	6.8253	6.7873
util living area	0.9838	0.9673	0.9236	0.7807	0.5764	0.3895	0.2822	0.3246	0.5473	0.8495	0.9628	0.9865 (86)
MIT	20.4020	20.5448	20.7358	20.9310	20.9913	20.9995	21.0000	20.9999	20.9954	20.9001	20.6379	20.3820 (87)
Th 2	20.3045	20.3066	20.3087	20.3192	20.3213	20.3318	20.3318	20.3339	20.3276	20.3213	20.3171	20.3129 (88)
util rest of house	0.9798	0.9597	0.9074	0.7480	0.5363	0.3490	0.2393	0.2776	0.4956	0.8157	0.9529	0.9831 (89)
MIT 2	19.6148	19.7942	20.0273	20.2546	20.3145	20.3315	20.3318	20.3338	20.3247	20.2289	19.9203	19.5966 (90)
Living area fraction	19.9971	20.1588	20.3714	20.5831	20.6432	20.6560	20.6563	20.6573	20.6505	20.5549	20.2689	0.4857 (91)
MIT	19.9971	20.1588	20.3714	20.5831	20.6432	20.6560	20.6563	20.6573	20.6505	20.5549	20.2689	19.9781 (92)
Temperature adjustment	19.9971	20.1588	20.3714	20.5831	20.6432	20.6560	20.6563	20.6573	20.6505	20.5549	20.2689	0.0000
adjusted MIT	19.9971	20.1588	20.3714	20.5831	20.6432	20.6560	20.6563	20.6573	20.6505	20.5549	20.2689	19.9781 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9777	0.9578	0.9090	0.7610	0.5554	0.3687	0.2601	0.3004	0.5206	0.8279	0.9521	0.9812 (94)
Useful gains	554.4997	600.6827	619.6468	588.6920	470.7631	315.9583	211.7464	221.4743	342.3938	480.9429	524.3960	537.7178 (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	855.1992	828.6442	750.8737	622.1901	474.7107	316.1511	211.7597	221.5093	344.2619	528.4106	703.6214	848.5589 (97)
Space heating kWh	223.7204	153.1902	97.6328	24.1186	2.9370	0.0000	0.0000	0.0000	0.0000	35.3160	129.0423	231.2658 (98a)
Space heating requirement - total per year (kWh/year)												897.2231
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	223.7204	153.1902	97.6328	24.1186	2.9370	0.0000	0.0000	0.0000	0.0000	35.3160	129.0423	231.2658 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												897.2231
Space heating per m2										(98c) / (4) =		12.2071 (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												1.5000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement												
	223.7204	153.1902	97.6328	24.1186	2.9370	0.0000	0.0000	0.0000	0.0000	35.3160	129.0423	231.2658 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	335.5806	229.7852	146.4492	36.1779	4.4055	0.0000	0.0000	0.0000	0.0000	52.9740	193.5634	346.8987
Space heating requirement	335.5806	229.7852	146.4492	36.1779	4.4055	0.0000	0.0000	0.0000	0.0000	52.9740	193.5634	346.8987 (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												
	259.6572	229.7665	244.2265	214.8028	208.3260	187.8116	185.3169	192.5501	194.5456	216.8469	230.5056	256.8106 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	389.4859	344.6497	366.3398	322.2043	312.4891	281.7174	277.9754	288.8251	291.8184	325.2703	345.7584	385.2160
Water heating fuel	389.4859	344.6497	366.3398	322.2043	312.4891	281.7174	277.9754	288.8251	291.8184	325.2703	345.7584	385.2160 (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	14.5138	13.1093	14.5138	14.0456	14.5138	14.0456	14.5138	14.5138	14.0456	14.5138	14.0456	14.5138 (331)
Lighting	21.5182	17.2627	15.5432	11.3876	8.7961	7.1865	8.0241	10.4300	13.5476	17.7752	20.0770	22.1163 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-3.1881	-5.6898	-10.5626	-14.9683	-18.8126	-18.5914	-18.1957	-15.6044	-11.6657	-7.4439	-3.8363	-2.6000 (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	-0.3711	-0.9872	-2.5795	-4.9037	-7.4714	-7.9046	-7.6776	-5.8883	-3.5695	-1.5912	-0.5356	-0.2748 (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												1345.8347 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												3931.7496 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												13.4583 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6930)												

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mechanical ventilation fans (SFP = 0.6930) 170.8886 (330a)
 Total electricity for the above, kWh/year 170.8886 (331)
 Electricity for lighting (calculated in Appendix L) 173.6645 (332)

Energy saving/generation technologies (Appendices M ,N and Q)
 PV generation -174.9133 (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 5447.2241 (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			330.0000 (367)
Space and Water heating from Heat pump	1599.2680	0.1580	64.4255 (367)
Electrical energy for heat distribution (space & water)	13.4583	0.0000	7.6646 (372)
Overall CO2 factor for heat network			0.0455 (386)
Total CO2 associated with community systems			239.9240 (373)
Space and water heating			239.9240 (376)
Pumps, fans and electric keep-hot	170.8886	0.1387	23.7044 (378)
Energy for lighting	173.6645	0.1443	25.0652 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-131.1587	0.1304	-17.1069
PV Unit electricity exported	-43.7546	0.1205	-5.2745
Total			-22.3814 (380)
Total CO2, kg/year			266.3121 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.6200 (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			330.0000 (467a)
Space and Water heating from Heat pump	1599.2680	1.5848	646.3194 (467)
Electrical energy for heat distribution (space & water)	13.4583	0.0000	81.1254 (472)
Overall CO2 factor for heat network			0.4812 (486)
Total CO2 associated with community systems			2539.4712 (473)
Space and water heating			2539.4712 (476)
Pumps, fans and electric keep-hot	170.8886	1.5128	258.5203 (478)
Energy for lighting	173.6645	1.5338	266.3725 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-131.1587	1.4818	-194.3508
PV Unit electricity exported	-43.7546	0.4422	-19.3489
Total			-213.6997 (480)
Total Primary energy kWh/year			2850.6643 (483)
Dwelling Primary energy Rate (DPER)			38.7800 (484)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	73.5000 (1b)	2.7500 (2b)	202.1250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 202.1250 (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) = 0.1484 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3984 (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) = 0.2789 (21)

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Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Effective ac	0.3556	0.3486	0.3416	0.3068	0.2998	0.2650	0.2650	0.2580	0.2789	0.2998	0.3138	0.3277 (22b)
	0.5632	0.5608	0.5584	0.5471	0.5449	0.5351	0.5351	0.5333	0.5389	0.5449	0.5492	0.5537 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type			16.2800	1.1450	18.6412		(27)
exposed floor			55.0000	0.1300	7.1500		(28b)
exposed wall	36.3000	16.2800	20.0200	0.1800	3.6036		(29a)
stair wall	8.2500		8.2500	0.1800	1.4850		(29a)
corridor wall	5.5000	2.1000	3.4000	0.1800	0.6120		(29a)
terrace above 1F	6.3000		6.3000	0.1100	0.6930		(30)
Total net area of external elements Aum(A, m2)			111.3500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	34.2848	(33)
Main dwelling							
pw			67.9250	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							228.6714 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	7.9000	0.0500	0.3950
E3 Sill	6.9000	0.0500	0.3450
E4 Jamb	27.7000	0.0500	1.3850
E20 Exposed floor (normal)	11.3000	0.3200	3.6160
E21 Exposed floor (inverted)	7.6000	0.3200	2.4320
E7 Party floor between dwellings (in blocks of flats)	9.1000	0.0700	0.6370
E24 Eaves (insulation at ceiling level - inverted)	7.3000	0.2400	1.7520
E14 Flat roof	7.2000	0.0800	0.5760
E16 Corner (normal)	5.5000	0.0900	0.4950
E17 Corner (inverted - internal area greater than external area)	2.7500	-0.0900	-0.2475
E18 Party wall between dwellings	8.2500	0.0600	0.4950
E25 Staggered party wall between dwellings	2.7500	0.0600	0.1650
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			12.0455 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	46.3303 (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	37.5677	37.4039	37.2434	36.4895	36.3484	35.6918	35.6918	35.5702	35.9447	36.3484	36.6338	36.9321 (38)
Average = Sum(39)m / 12 =	83.8980	83.7342	83.5737	82.8198	82.6788	82.0221	82.0221	81.9005	82.2751	82.6788	82.9641	83.2624 (39)
												82.8191
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1415	1.1392	1.1371	1.1268	1.1249	1.1159	1.1159	1.1143	1.1194	1.1249	1.1288	1.1328 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

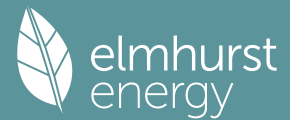
4. Water heating energy requirements (kWh/year)

												2.3280 (42)
Assumed occupancy												
Hot water usage for mixer showers												
	63.2528	62.3022	60.9171	58.2668	56.3110	54.1299	52.8901	54.2648	55.7717	58.1136	60.8207	63.0104 (42a)
Hot water usage for baths												
	27.3240	26.9182	26.3467	25.2931	24.5041	23.6293	23.1568	23.7242	24.3421	25.2782	26.3535	27.2316 (42b)
Hot water usage for other uses												
	38.4712	37.0722	35.6733	34.2743	32.8754	31.4764	31.4764	32.8754	34.2743	35.6733	37.0722	38.4712 (42c)
Average daily hot water use (litres/day)												
												118.6244 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
	129.0480	126.2927	122.9371	117.8342	113.6905	109.2356	107.5233	110.8644	114.3881	119.0650	124.2465	128.7132 (44)
Energy content (annual)												
	204.3804	179.8391	188.9497	161.3092	153.0492	134.3179	130.0401	137.2733	141.0519	161.5701	177.0119	201.5338 (45)
Distribution loss (46)m = 0.15 x (45)m												
	30.6571	26.9759	28.3425	24.1964	22.9574	20.1477	19.5060	20.5910	21.1578	24.2355	26.5518	30.2301 (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												
	255.3393	225.8664	239.9086	210.6242	204.0081	183.6330	180.9990	188.2322	190.3670	212.5290	226.3270	252.4927 (62)
WWHRS												
	-28.9165	-25.5740	-26.7796	-22.1746	-20.6659	-17.6840	-16.5759	-17.6268	-18.2965	-21.5696	-24.4357	-28.3810 (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												
	226.4228	200.2924	213.1290	188.4496	183.3422	165.9490	164.4231	170.6053	172.0705	190.9594	201.8912	224.1117 (64)
Total per year (kWh/year) = Sum(64)m = 2301.6463 (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												
	80.6962	71.3033	75.5655	65.9641	63.6286	56.9895	55.9781	58.3831	59.2285	66.4618	71.1852	79.7497 (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
	116.4006	116.4006	116.4006	116.4006	116.4006	116.4006	116.4006	116.4006	116.4006	116.4006	116.4006	116.4006 (66)

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Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	103.5780	114.6756	103.5780	107.0306	103.5780	107.0306	103.5780	103.5780	107.0306	103.5780	107.0306	103.5780 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.3242	207.4549	202.0858	190.6556	176.2270	162.6662	153.6068	151.4762	156.8453	168.2754	182.7040	196.2648 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6401	34.6401	34.6401	34.6401	34.6401	34.6401	34.6401	34.6401	34.6401	34.6401	34.6401	34.6401 (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)	-93.1205	-93.1205	-93.1205	-93.1205	-93.1205	-93.1205	-93.1205	-93.1205	-93.1205	-93.1205	-93.1205	-93.1205 (71)
Water heating gains (Table 5)	108.4627	106.1062	101.5665	91.6168	85.5223	79.1520	75.2393	78.4719	82.2619	89.3303	98.8684	107.1905 (72)
Total internal gains	478.2851	489.1568	468.1505	450.2231	426.2475	406.7690	390.3443	391.4462	404.0579	422.1039	449.5231	467.9534 (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				6.1500	10.6334	0.6300	0.7000	0.7700				19.9857 (74)
Northeast				10.1300	11.2829	0.6300	0.7000	0.7700				34.9304 (75)
Solar gains	54.9161	109.2955	193.0032	314.6284	423.2241	451.8229	422.3927	336.1975	234.1266	132.3566	68.6064	45.1870 (83)
Total gains	533.2011	598.4523	661.1537	764.8515	849.4716	858.5919	812.7369	727.6437	638.1845	554.4606	518.1295	513.1404 (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	55.6474	55.7563	55.8633	56.3719	56.4680	56.9201	56.9201	57.0046	56.7451	56.4680	56.2738	56.0722
alpha	4.7098	4.7171	4.7242	4.7581	4.7645	4.7947	4.7947	4.8003	4.7830	4.7645	4.7516	4.7381
util living area	0.9934	0.9878	0.9732	0.9170	0.7830	0.5876	0.4390	0.5069	0.7754	0.9523	0.9876	0.9945 (86)
MIT	19.6349	19.8137	20.1088	20.5275	20.8368	20.9678	20.9935	20.9876	20.8854	20.4784	19.9925	19.6058 (87)
Th 2	19.9671	19.9689	19.9707	19.9790	19.9806	19.9878	19.9878	19.9892	19.9850	19.9806	19.9774	19.9741 (88)
util rest of house	0.9915	0.9842	0.9649	0.8922	0.7273	0.5041	0.3406	0.4009	0.6974	0.9327	0.9832	0.9929 (89)
MIT 2	18.3875	18.6159	18.9892	19.5050	19.8459	19.9695	19.9857	19.9846	19.9061	19.4593	18.8510	18.3554 (90)
Living area fraction									fLA = Living area / (4) =			0.4857 (91)
MIT	18.9934	19.1977	19.5330	20.0016	20.3272	20.4544	20.4752	20.4718	20.3817	19.9543	19.4055	18.9627 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9934	19.1977	19.5330	20.0016	20.3272	20.4544	20.4752	20.4718	20.3817	19.9543	19.4055	18.9627 (93)

8. Space heating requirement

Utilisation	0.9890	0.9806	0.9606	0.8928	0.7474	0.5435	0.3884	0.4524	0.7302	0.9320	0.9800	0.9907 (94)
Useful gains	527.3103	586.8663	635.0863	682.8969	634.9312	466.6755	315.6947	329.1643	465.9743	516.7803	507.7513	508.3442 (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	1232.7472	1197.2048	1089.2196	919.4360	713.2864	480.1889	317.8513	333.4792	516.8311	773.4046	1020.9138	1229.1801 (97)
Space heating kWh	524.8450	410.1475	337.8752	170.3082	58.2962	0.0000	0.0000	0.0000	0.0000	190.9285	369.4769	536.3020 (98a)
Space heating requirement - total per year (kWh/year)												2598.1795
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	524.8450	410.1475	337.8752	170.3082	58.2962	0.0000	0.0000	0.0000	0.0000	190.9285	369.4769	536.3020 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2598.1795
Space heating per m2										(98c) / (4) =		35.3494 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	524.8450	410.1475	337.8752	170.3082	58.2962	0.0000	0.0000	0.0000	0.0000	190.9285	369.4769	536.3020 (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)	568.0141	443.8826	365.6658	184.3162	63.0912	0.0000	0.0000	0.0000	0.0000	206.6325	399.8668	580.4134 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	226.4228	200.2924	213.1290	188.4496	183.3422	165.9490	164.4231	170.6053	172.0705	190.9594	201.8912	224.1117 (64)
Efficiency of water heater (217)m	86.1202	85.8821	85.3637	84.1651	82.2189	80.3000	80.3000	80.3000	80.3000	84.3811	85.6584	86.1798 (217)
Fuel for water heating, kWh/month	262.9149	233.2179	249.6716	223.9047	222.9929	206.6612	204.7610	212.4599	214.2845	226.3059	235.6933	260.0514 (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)

Full SAP Calculation Printout



Lighting	21.5215	17.2653	15.5455	11.3893	8.7974	7.1876	8.0253	10.4316	13.5496	17.7778	20.0800	22.1196 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-13.8992	-21.0260	-32.4023	-39.1448	-44.6369	-42.5602	-42.0415	-38.4703	-32.6278	-25.1955	-15.7794	-11.8557 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-4.0373	-8.7543	-17.9009	-27.6425	-37.3076	-37.7672	-37.3249	-31.2540	-22.4553	-12.7632	-5.4665	-3.1736 (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												2811.8826 (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												2752.9192 (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)												173.6905 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-605.4869 (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												5219.0054 (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	2811.8826	0.2100	590.4953 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2752.9192	0.2100	578.1130 (264)
Space and water heating			1168.6084 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	173.6905	0.1443	25.0689 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-359.6396	0.1331	-47.8819
PV Unit electricity exported	-245.8473	0.1251	-30.7535
Total			-78.6355 (269)
Total CO2, kg/year			1126.9711 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.3300 (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	2811.8826	1.1300	3177.4273 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2752.9192	1.1300	3110.7988 (278)
Space and water heating			6288.2261 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	173.6905	1.5338	266.4122 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-359.6396	1.4920	-536.5733
PV Unit electricity exported	-245.8473	0.4591	-112.8770
Total			-649.4503 (283)
Total Primary energy kWh/year			6035.2888 (286)
Target Primary Energy Rate (TPER)			82.1100 (287)