

Full SAP Calculation Printout



Plot Reference	UNIT 14			Issued on Date	08/07/2026
Assessment Reference	001	Plot Type Ref	UNIT 14		
Plot Address	UNIT 14, Stoney Wood Quarter, 34 The Fairway, LONDON, NW7 3HS			SAP Version	10.2
SAP Rating	79 C	DER	4.84	TER	18.05
Environmental	97 A	% DER < TER			73.19
CO ₂ Emissions (t/year)	0.23	DFEE	42.72	TFEE	45.41
Compliance Check	See BREL	% DFEE < TFEE			5.92
% DPER < TPER	46.91	DPER	51.55	TPER	97.10
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	51.6000 (1b)	2.7500 (2b)	141.9000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	141.9000 (5)

2. Ventilation rate

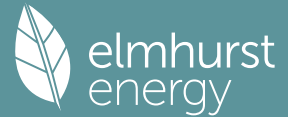
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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												
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	0.2432	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
Main dwelling							
dl			2.1000	1.0000	2.1000		(26)
l			22.6900	0.7940	18.0149		(27)
exposed wall	45.1000	22.6900	22.4100	0.1500	3.3615	60.0000	1344.5999 (29a)
corridor wall	19.2500	2.1000	17.1500	0.2500	4.2875	9.0000	154.3500 (29a)
flat roof	51.6000		51.6000	0.1000	5.1600	9.0000	464.4000 (30)
Total net area of external elements Aum(A, m ²)			115.9500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.9239		(33)
Main dwelling							
pw			21.7250	0.0000	0.0000	110.0000	2389.7500 (32)
pf			51.6000			40.0000	2063.9999 (32d)
iw			118.2500			9.0000	1064.2500 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	7481.3499 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							144.9874 (35)
List of Thermal Bridges							

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K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.4500	0.0500	0.5225
E3 Sill	9.4500	0.0500	0.4725
E4 Jamb	26.1000	0.0500	1.3050
E7 Party floor between dwellings (in blocks of flats)	16.3000	0.0700	1.1410
E9 Balcony between dwellings, wall insulation continuous	1.5000	0.0200	0.0300
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.5000	0.0200	0.1100
E24 Eaves (insulation at ceiling level - inverted)	5.4000	0.0800	0.4320
E14 Flat roof	7.1000	0.1600	1.1360
E15 Flat roof with parapet	16.3000	0.5600	9.1280
E16 Corner (normal)	11.0000	0.0900	0.9900
E17 Corner (inverted - internal area greater than external area)	8.2500	-0.0900	-0.7425
E18 Party wall between dwellings	2.7500	0.0600	0.1650
E25 Staggered party wall between dwellings	2.7500	0.0600	0.1650
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			14.8545 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	47.7784 (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	11.3892	11.2531	11.1170	10.4366	10.3005	9.6200	9.6200	9.4839	9.8922	10.3005	10.5727	10.8448 (38)
Average = Sum(39)m / 12 =	59.1676	59.0315	58.8954	58.2150	58.0789	57.3984	57.3984	57.2623	57.6706	58.0789	58.3511	58.6233 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1467	1.1440	1.1414	1.1282	1.1256	1.1124	1.1124	1.1097	1.1176	1.1256	1.1308	1.1361 (40)
HLP (average)												1.1275
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												1.7373 (42)
Hot water usage for mixer showers	53.3478	52.5461	51.3778	49.1426	47.4930	45.6535	44.6079	45.7673	47.0382	49.0133	51.2966	53.1434 (42a)
Hot water usage for baths	23.0645	22.7220	22.2396	21.3502	20.6842	19.9458	19.5469	20.0259	20.5474	21.3376	22.2453	22.9866 (42b)
Hot water usage for other uses	32.4214	31.2424	30.0635	28.8845	27.7055	26.5266	26.5266	27.7055	28.8845	30.0635	31.2424	32.4214 (42c)
Average daily hot water use (litres/day)												100.0433 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	108.8337	106.5105	103.6809	99.3773	95.8828	92.1258	90.6814	93.4987	96.4701	100.4144	104.7844	108.5513 (44)
Energy content (annual)	172.3660	151.6695	159.3537	136.0426	129.0767	113.2795	109.6712	115.7709	118.9573	136.2614	149.2845	169.9652 (45)
Distribution loss (46)m = 0.15 x (45)m	25.8549	22.7504	23.9031	20.4064	19.3615	16.9919	16.4507	17.3656	17.8436	20.4392	22.3927	25.4948 (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	227.6428	201.5970	214.6305	189.5363	184.3535	166.7732	164.9480	171.0477	172.4510	191.5382	202.7782	225.2420 (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	227.6428	201.5970	214.6305	189.5363	184.3535	166.7732	164.9480	171.0477	172.4510	191.5382	202.7782	225.2420 (64)
12Total per year (kWh/year)												2312.5384 (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	101.5331	90.3721	97.2066	88.0291	87.1394	80.4604	80.6871	82.7153	82.3483	89.5284	92.4320	100.7349 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.3580	84.5392	76.3580	78.9032	76.3580	78.9032	76.3580	76.3580	78.9032	76.3580	78.9032	76.3580 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.3882	152.9591	149.0004	140.5728	129.9344	119.9359	113.2562	111.6853	115.6440	124.0716	134.7100	144.7085 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863 (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)	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908 (71)
Water heating gains (Table 5)	136.4693	134.4822	130.6540	122.2626	117.1229	111.7505	108.4504	111.1765	114.3726	120.3338	128.3778	135.3963 (72)
Total internal gains	413.2745	421.0396	405.0714	390.7977	372.4744	359.6487	347.1237	348.2788	357.9789	369.8224	391.0501	405.5219 (73)

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

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Northeast			5.2500		11.2829		0.5300		0.7000		0.7700		15.2296 (75)	
Southeast			17.4400		36.7938		0.5300		0.7000		0.7700		164.9790 (77)	
Solar gains	180.2086	312.0206	440.3568	568.1455	656.9273	661.2191	633.7227	566.1051	484.3941	348.4721	216.7696	153.6249	(83)	
Total gains	593.4830	733.0601	845.4282	958.9432	1029.4016	1020.8677	980.8464	914.3839	842.3729	718.2945	607.8197	559.1467	(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	35.1231	35.2041	35.2855	35.6979	35.7816	36.2057	36.2057	36.2918	36.0349	35.7816	35.6146	35.4493		
alpha	3.3415	3.3469	3.3524	3.3799	3.3854	3.4137	3.4137	3.4195	3.4023	3.3854	3.3743	3.3633		
util living area	0.9184	0.8583	0.7741	0.6418	0.4948	0.3527	0.2556	0.2851	0.4522	0.7011	0.8679	0.9297	(86)	
MIT	19.6207	19.9992	20.3779	20.7217	20.9037	20.9772	20.9942	20.9916	20.9467	20.6856	20.1135	19.5480	(87)	
Th 2	19.9629	19.9650	19.9672	19.9779	19.9800	19.9907	19.9907	19.9929	19.9864	19.9800	19.9757	19.9715	(88)	
util rest of house	0.9052	0.8381	0.7451	0.6026	0.4475	0.2995	0.1978	0.2239	0.3919	0.6562	0.8454	0.9180	(89)	
MIT 2	18.4069	18.8658	19.3141	19.7087	19.8989	19.9759	19.9882	19.9890	19.9487	19.6849	19.0231	18.3239	(90)	
Living area fraction	fLA = Living area / (4) =													
MIT	18.7739	19.2085	19.6357	20.0149	20.2027	20.2786	20.2924	20.2921	20.2504	19.9874	19.3527	18.6940	(92)	
Temperature adjustment	0.0000													
adjusted MIT	18.7739	19.2085	19.6357	20.0149	20.2027	20.2786	20.2924	20.2921	20.2504	19.9874	19.3527	18.6940	(93)	
8. Space heating requirement														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	0.8868	0.8212	0.7350	0.6041	0.4581	0.3148	0.2152	0.2423	0.4079	0.6565	0.8296	0.9002	(94)	
Useful gains	526.3136	601.9929	621.3501	579.2766	471.5662	321.4109	211.0460	221.5174	343.6278	471.5722	504.2345	503.3593	(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	856.3837	844.6509	773.6343	647.0563	493.8249	325.9432	211.9362	222.8700	354.6982	545.2103	714.9602	849.6838	(97)	
Space heating kWh	245.5721	163.0661	113.2995	48.8014	16.5605	0.0000	0.0000	0.0000	0.0000	54.7868	151.7225	257.6654	(98a)	
Space heating requirement - total per year (kWh/year)	1051.4743													
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	245.5721	163.0661	113.2995	48.8014	16.5605	0.0000	0.0000	0.0000	0.0000	54.7868	151.7225	257.6654	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)	1051.4743													
Space heating per m2	(98c) / (4) = 20.3774 (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	245.5721	163.0661	113.2995	48.8014	16.5605	0.0000	0.0000	0.0000	0.0000	54.7868	151.7225	257.6654	(98)	
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50														
307a	368.3582	244.5992	169.9492	73.2021	24.8407	0.0000	0.0000	0.0000	0.0000	82.1802	227.5837	386.4981		
Space heating requirement	368.3582	244.5992	169.9492	73.2021	24.8407	0.0000	0.0000	0.0000	0.0000	82.1802	227.5837	386.4981	(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														
227.6428	201.5970	214.6305	189.5363	184.3535	166.7732	164.9480	171.0477	172.4510	191.5382	202.7782	225.2420	(64)		
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50														
310a	341.4642	302.3955	321.9458	284.3044	276.5303	250.1597	247.4221	256.5716	258.6765	287.3073	304.1673	337.8630		
Water heating fuel	341.4642	302.3955	321.9458	284.3044	276.5303	250.1597	247.4221	256.5716	258.6765	287.3073	304.1673	337.8630	(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	10.1893	9.2032	10.1893	9.8606	10.1893	9.8606	10.1893	10.1893	9.8606	10.1893	9.8606	10.1893	(331)	
Lighting	15.8657	12.7280	11.4602	8.3962	6.4855	5.2987	5.9163	7.6902	9.9888	13.1059	14.8030	16.3066	(332)	
Electricity generated by PVs (Appendix M) (negative quantity)														
(333a)m	-2.2265	-3.9806	-7.4054	-10.5198	-13.2484	-13.1047	-12.8263	-10.9865	-8.1962	-5.2153	-2.6813	-1.8152	(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	-0.2495	-0.6642	-1.7369	-3.3042	-5.0361	-5.3273	-5.1725	-3.9649	-2.4022	-1.0701	-0.3599	-0.1847	(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	1577.2115 (307)													
Space heating fuel - secondary	0.0000 (309)													
Water heating fuel - community heating	3468.8076 (310)													
Efficiency of water heater	0.0000 (311)													
Electricity used for heat distribution	15.7721 (313)													
Space cooling fuel	0.0000 (321)													
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6930)														
mechanical ventilation fans (SFP = 0.6930)													119.9708 (330a)	
Total electricity for the above, kWh/year													119.9708 (331)	

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Electricity for lighting (calculated in Appendix L)	128.0451 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-121.6788 (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	5172.3561 (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	1529.0967	0.1569	74.9904 (367)
Electrical energy for heat distribution (space & water)	15.7721	0.0000	7.3578 (372)
Overall CO2 factor for heat network			0.0456 (386)
Total CO2 associated with community systems			230.3207 (373)
Space and water heating			230.3207 (376)
Pumps, fans and electric keep-hot	119.9708	0.1387	16.6414 (378)
Energy for lighting	128.0451	0.1443	18.4809 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-92.2063	0.1304	-12.0227
PV Unit electricity exported	-29.4725	0.1205	-3.5527
Total			-15.5754 (380)
Total CO2, kg/year			249.8676 (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			330.0000 (467a)
Space and Water heating from Heat pump	1529.0967	1.5808	755.5429 (467)
Electrical energy for heat distribution (space & water)	15.7721	0.0000	77.6767 (472)
Overall CO2 factor for heat network			0.4819 (486)
Total CO2 associated with community systems			2431.5157 (473)
Space and water heating			2431.5157 (476)
Pumps, fans and electric keep-hot	119.9708	1.5128	181.4918 (478)
Energy for lighting	128.0451	1.5338	196.3998 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-92.2063	1.4817	-136.6175
PV Unit electricity exported	-29.4725	0.4422	-13.0325
Total			-149.6500 (480)
Total Primary energy kWh/year			2659.7573 (483)
Dwelling Primary energy Rate (DPER)			51.5500 (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	51.6000 (1b)	2.7500 (2b)	141.9000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6000		141.9000 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	141.9000 (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) = 0.1409 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3909 (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) = 0.3030 (21)

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Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.3863	0.3787	0.3712	0.3333	0.3257	0.2878	0.2878	0.2803	0.3030	0.3257	0.3409	0.3560 (22b)
	0.5746	0.5717	0.5689	0.5555	0.5530	0.5414	0.5414	0.5393	0.5459	0.5530	0.5581	0.5634 (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			10.8000	1.1450	12.3664		(27)
exposed wall	45.1000	10.8000	34.3000	0.1800	6.1740		(29a)
corridor wall	19.2500	2.1000	17.1500	0.1800	3.0870		(29a)
flat roof	51.6000		51.6000	0.1100	5.6760		(30)
Total net area of external elements Aum(A, m2)			115.9500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	29.4034	(33)
Main dwelling							
pw			21.7250	0.0000	0.0000		(32)

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

List of Thermal Bridges 144.9874 (35)

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.4500	0.0500	0.5225
E3 Sill	9.4500	0.0500	0.4725
E4 Jamb	26.1000	0.0500	1.3050
E7 Party floor between dwellings (in blocks of flats)	16.3000	0.0700	1.1410
E9 Balcony between dwellings, wall insulation continuous	1.5000	0.0200	0.0300
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.5000	0.0200	0.1100
E24 Eaves (insulation at ceiling level - inverted)	5.4000	0.2400	1.2960
E14 Flat roof	7.1000	0.0800	0.5680
E15 Flat roof with parapet	16.3000	0.5600	9.1280
E16 Corner (normal)	11.0000	0.0900	0.9900
E17 Corner (inverted - internal area greater than external area)	8.2500	-0.0900	-0.7425
E18 Party wall between dwellings	2.7500	0.0600	0.1650
E25 Staggered party wall between dwellings	2.7500	0.0600	0.1650

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.1505 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 44.5539 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	26.9075	26.7718	26.6388	26.0142	25.8973	25.3533	25.3533	25.2525	25.5628	25.8973	26.1337	26.3809 (38)
Average = Sum(39)m / 12 =	71.4614	71.3257	71.1927	70.5681	70.4512	69.9072	69.9072	69.8064	70.1167	70.4512	70.6876	70.9348 (39)
												70.5675

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.3849	1.3823	1.3797	1.3676	1.3653	1.3548	1.3548	1.3528	1.3589	1.3653	1.3699	1.3747 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

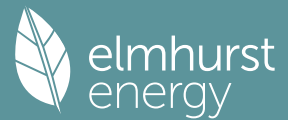
4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7373 (42)
Hot water usage for mixer showers												
53.3478	52.5461	51.3778	49.1426	47.4930	45.6535	44.6079	45.7673	47.0382	49.0133	51.2966	53.1434 (42a)	
Hot water usage for baths												
23.0645	22.7220	22.2396	21.3502	20.6842	19.9458	19.5469	20.0259	20.5474	21.3376	22.2453	22.9866 (42b)	
Hot water usage for other uses												
32.4214	31.2424	30.0635	28.8845	27.7055	26.5266	26.5266	27.7055	28.8845	30.0635	31.2424	32.4214 (42c)	
Average daily hot water use (litres/day)												100.0433 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
108.8337	106.5105	103.6809	99.3773	95.8828	92.1258	90.6814	93.4987	96.4701	100.4144	104.7844	108.5513 (44)	
Energy content (annual)	172.3660	151.6695	159.3537	136.0426	129.0767	113.2795	109.6712	115.7709	118.9573	136.2614	149.2845	169.9652 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1661.6986
25.8549	22.7504	23.9031	20.4064	19.3615	16.9919	16.4507	17.3656	17.8436	20.4392	22.3927	25.4948 (46)	
Water storage loss (or HIU loss):												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)	
Combi loss	50.9589	46.0274	50.9589	49.0080	48.8608	45.4319	46.2102	47.6459	47.5743	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
223.3249	197.6969	210.3126	185.0506	177.9376	158.7114	155.8815	163.4169	166.5317	187.2203	198.5996	220.9241 (62)	
WWHRS	-24.3884	-21.5693	-22.5861	-18.7022	-17.4298	-14.9148	-13.9802	-14.8666	-15.4314	-18.1919	-20.6092	-23.9368 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	198.9365	176.1276	187.7265	166.3484	160.5078	143.7966	141.9012	148.5503	151.1002	169.0284	177.9903	196.9873 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2019.0012 (64)
Electric shower(s)												2019 (64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)
Heat gains from water heating, kWh/month												
70.0514	61.9370	65.7248	57.4862	55.1332	49.0234	48.0182	50.4053	51.4469	58.0466	61.9659	69.2531 (65)	

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	76.5856	84.7912	76.5856	79.1384	76.5856	79.1384	76.5856	76.5856	79.1384	76.5856	79.1384	76.5856 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												

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Cooking gains	151.3882	152.9591	149.0004	140.5728	129.9344	119.9359	113.2562	111.6853	115.6440	124.0716	134.7100	144.7085 (68)
Pumps, fans	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863 (69)
Losses e.g. evaporation	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)
(negative values) (Table 5)												
Water heating gains (Table 5)	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908 (71)
Total internal gains	94.1551	92.1681	88.3398	79.8419	74.1038	68.0881	64.5406	67.7491	71.4540	78.0197	86.0637	93.0822 (72)
	374.1879	381.9775	365.9849	351.6122	332.6829	316.2214	303.4415	305.0790	315.2955	330.7359	351.9712	366.4353 (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
Northeast					2.5000	11.2829	0.6300	0.7000			0.7700			8.6205 (75)
Southeast					8.3000	36.7938	0.6300	0.7000			0.7700			93.3308 (77)
Solar gains	101.9513	176.5242	249.1338	321.4372	371.6725	374.1030	358.5452	320.2850	274.0502	197.1476	122.6356			86.9117 (83)
Total gains	476.1393	558.5017	615.1187	673.0493	704.3553	690.3245	661.9867	625.3640	589.3457	527.8835	474.6068			453.3470 (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	29.0808	29.1361	29.1905	29.4489	29.4978	29.7273	29.7273	29.7702	29.6385	29.4978	29.3991	29.2967
alpha	2.9387	2.9424	2.9460	2.9633	2.9665	2.9818	2.9818	2.9759	2.9665	2.9665	2.9599	2.9531
util living area	0.9585	0.9346	0.8990	0.8287	0.7202	0.5720	0.4381	0.4767	0.6706	0.8547	0.9365	0.9635 (86)
MIT	18.8457	19.1679	19.5971	20.1305	20.5655	20.8452	20.9482	20.9323	20.7393	20.1730	19.4210	18.7876 (87)
Th 2	19.7749	19.7769	19.7789	19.7883	19.7900	19.7982	19.7982	19.7997	19.7950	19.7900	19.7865	19.7828 (88)
util rest of house	0.9503	0.9221	0.8794	0.7949	0.6642	0.4865	0.3288	0.3661	0.5904	0.8184	0.9221	0.9563 (89)
MIT 2	17.3243	17.7273	18.2599	18.9090	19.4050	19.6941	19.7759	19.7681	19.6011	18.9780	18.0578	17.2563 (90)
Living area fraction	17.7842	18.1628	18.6642	19.2783	19.7559	20.0421	20.1303	20.1201	19.9452	19.3393	18.4699	17.7192 (92)
MIT	17.7842	18.1628	18.6642	19.2783	19.7559	20.0421	20.1303	20.1201	19.9452	19.3393	18.4699	17.7192 (92)
Temperature adjustment												0.0000
adjusted MIT	17.7842	18.1628	18.6642	19.2783	19.7559	20.0421	20.1303	20.1201	19.9452	19.3393	18.4699	17.7192 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9320	0.9007	0.8572	0.7783	0.6624	0.5049	0.3602	0.3971	0.6014	0.8022	0.9017	0.9392 (94)
Useful gains	443.7829	503.0248	527.2977	523.8586	466.5919	348.5736	238.4643	248.3219	354.4176	423.4796	427.9382	425.7640 (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	963.6020	945.9780	866.0015	732.3741	567.5448	380.4414	246.7935	259.6849	409.8480	615.6929	803.7122	958.9833 (97)
Space heating kWh	386.7454	297.6646	251.9956	150.1312	75.1090	0.0000	0.0000	0.0000	0.0000	143.0067	270.5573	396.7152 (98a)
Space heating requirement - total per year (kWh/year)												1971.9249
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	386.7454	297.6646	251.9956	150.1312	75.1090	0.0000	0.0000	0.0000	0.0000	143.0067	270.5573	396.7152 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1971.9249
Space heating per m ²										(98c) / (4) =		38.2156 (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	386.7454	297.6646	251.9956	150.1312	75.1090	0.0000	0.0000	0.0000	0.0000	143.0067	270.5573	396.7152 (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)	418.5556	322.1478	272.7225	162.4796	81.2868	0.0000	0.0000	0.0000	0.0000	154.7692	292.8109	429.3454 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	198.9365	176.1276	187.7265	166.3484	160.5078	143.7966	141.9012	148.5503	151.1002	169.0284	177.9903	196.9873 (64)
Efficiency of water heater (217)m	85.7795	85.4962	85.0130	84.1622	82.8551	80.3000	80.3000	80.3000	80.3000	84.0253	85.2759	80.3000 (216)
Fuel for water heating, kWh/month	231.9161	206.0065	220.8210	197.6520	193.7211	179.0742	176.7139	184.9941	188.1697	201.1637	208.7228	229.4569 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	15.9130	12.7660	11.4943	8.4213	6.5048	5.3145	5.9339	7.7131	10.0186	13.1449	14.8472	16.3552 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-9.8504	-14.9527	-23.1257	-28.0490	-32.0951	-30.6566	-30.2971	-27.6773	-23.3969	-17.9762	-11.2048	-8.3975 (233a)

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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	-2.7417	-5.9543	-12.1892	-18.8385	-25.4332	-25.7364	-25.4213	-21.2720	-15.2738	-8.6724	-3.7107	-2.1536	(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												2134.1178	(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												2418.4121	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												128.4268	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-425.0765	(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												4341.8802	(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	2134.1178	0.2100	448.1647	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2418.4121	0.2100	507.8665	(264)
Space and water heating			956.0313	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	128.4268	0.1443	18.5360	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-257.6794	0.1331	-34.2854	
PV Unit electricity exported	-167.3972	0.1251	-20.9384	
Total			-55.2237	(269)
Total CO2, kg/year			931.2727	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			18.0500	(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	2134.1178	1.1300	2411.5531	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2418.4121	1.1300	2732.8056	(278)
Space and water heating			5144.3588	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	128.4268	1.5338	196.9853	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-257.6794	1.4917	-384.3697	
PV Unit electricity exported	-167.3972	0.4591	-76.8518	
Total			-461.2214	(283)
Total Primary energy kWh/year			5010.2234	(286)
Target Primary Energy Rate (TPER)			97.1000	(287)