

Full SAP Calculation Printout



Property Reference	UNIT 40				Issued on Date	28/06/2023
Assessment Reference	UNIT 40	Prop Type Ref				
Property	Alexander House, UNIT 40, 205-207 King's Road, RG1 4LS					
SAP Rating	81 B	DER	6.07	TER	16.35	
Environmental	96 A	% DER < TER				62.87
CO ₂ Emissions (t/year)	0.25	DFEE	44.65	TFEE	43.61	
Compliance Check	See BREL	% DFEE < TFEE				-2.39
% DPER < TPER	25.84	DPER	64.02	TPER	86.32	
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)
Ground floor	43.2000 (1b)	x 2.5000 (2b)	= 108.0000 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.2000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 108.0000 (5)

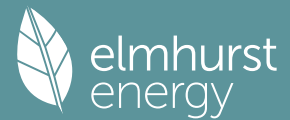
2. Ventilation rate

											m3 per hour	
Number of open chimneys											0 * 80 =	0.0000 (6a)
Number of open flues											0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire											0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler											0 * 20 =	0.0000 (6d)
Number of flues attached to other heater											0 * 35 =	0.0000 (6e)
Number of blocked chimneys											0 * 20 =	0.0000 (6f)
Number of intermittent extract fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
											Air changes per hour	
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											4.0000 (17)	
Infiltration rate											0.2000 (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) =	0.1550 (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	0.1976	0.1938	0.1899	0.1705	0.1666	0.1473	0.1473	0.1434	0.1550	0.1666	0.1744	0.1821 (22b)
Mechanical extract ventilation - centralised												
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)	
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
1 (Uw = 1.30)			6.5000	1.2357	8.0323		(27)
2 (Uw = 1.30)			6.5000	1.2357	8.0323		(27)
1			2.1000	1.0000	2.1000		(26)
top floor exposed new	25.2500	13.0000	12.2500	0.1800	2.2050	18.0000	220.5000 (29a)

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corridor new	25.2500	2.1000	23.1500	0.2400	5.5560	60.0000	1389.0000 (29a)
flat roof new	20.8000		20.8000	0.1300	2.7040	9.0000	187.2000 (30)
roof terrace new	22.4000		22.4000	0.1300	2.9120	9.0000	201.6000 (30)
Total net area of external elements Aum(A, m2)			93.7000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	31.5416			(33)
pw			21.5000	0.0000	0.0000	20.0000	430.0000 (32)
pf			43.2000			30.0000	1296.0000 (32d)
iw			56.0000			9.0000	504.0000 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 4228.3000 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 97.8773 (35)

List of Thermal Bridges							
K1 Element	Length	Psi-value	Total				
E2 Other lintels (including other steel lintels)	6.2000	0.0500	0.3100				
E3 Sill	5.2000	0.0500	0.2600				
E4 Jamb	14.2000	0.0500	0.7100				
E7 Party floor between dwellings (in blocks of flats)	10.0000	0.0700	0.7000				
E14 Flat roof	18.6000	0.0800	1.4880				
E15 Flat roof with parapet	10.0000	0.1500	1.5000				
E18 Party wall between dwellings	10.0000	0.0600	0.6000				
E24 Eaves (insulation at ceiling level - inverted)	3.4000	0.2400	0.8160				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.3840 (36)
Point Thermal bridges							(36a) = 0.0000
Total fabric heat loss							(33) + (36) + (36a) = 37.9256 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(38)
Heat transfer coeff	17.8200	17.8200	17.8200	17.8200	17.8200	17.8200	17.8200	17.8200	17.8200	17.8200	17.8200	17.8200	
Average = Sum(39)m / 12 =	55.7456	55.7456	55.7456	55.7456	55.7456	55.7456	55.7456	55.7456	55.7456	55.7456	55.7456	55.7456	(39)
	55.7456	55.7456	55.7456	55.7456	55.7456	55.7456	55.7456	55.7456	55.7456	55.7456	55.7456	55.7456	(39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(40)
HLP (average)	1.2904	1.2904	1.2904	1.2904	1.2904	1.2904	1.2904	1.2904	1.2904	1.2904	1.2904	1.2904	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

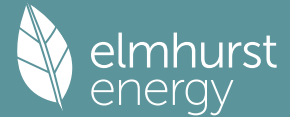
4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.4937 (42)
Hot water usage for mixer showers													
Hot water usage for baths													
Hot water usage for other uses													
Average daily hot water use (litres/day)													92.3836 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	100.5007	98.3556	95.7429	91.7687	88.5419	85.0726	83.7385	86.3400	89.0838	92.7260	96.7614	100.2399	(44)
Energy content (annual)	159.1685	140.0571	147.1532	125.6268	119.1944	104.6067	101.2745	106.9070	109.8492	125.8283	137.8543	156.9515	(45)
Distribution loss (46)m = 0.15 x (45)m													
Water storage loss:	23.8753	21.0086	22.0730	18.8440	17.8792	15.6910	15.1912	16.0360	16.4774	18.8742	20.6782	23.5427	(46)
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.1500 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.6210 (55)
Total storage loss													
If cylinder contains dedicated solar storage	19.2510	17.3880	19.2510	18.6300	19.2510	18.6300	19.2510	19.2510	18.6300	19.2510	18.6300	19.2510	(56)
Primary loss	19.2510	17.3880	19.2510	18.6300	19.2510	18.6300	19.2510	19.2510	18.6300	19.2510	18.6300	19.2510	(57)
Combi loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
WWHRS	201.6819	178.4563	189.6666	166.7688	161.7078	145.7487	143.7879	149.4204	150.9912	168.3417	178.9963	199.4649	(62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Total per year (kWh/year)	201.6819	178.4563	189.6666	166.7688	161.7078	145.7487	143.7879	149.4204	150.9912	168.3417	178.9963	199.4649	(64)
Electric shower(s)													2035.0326 (64)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													2035 (64)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
	86.9343	77.2883	82.9392	74.6845	73.6429	67.6953	67.6845	69.5573	69.4385	75.8486	78.7502	86.1971	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	74.6873	74.6873	74.6873	74.6873	74.6873	74.6873	74.6873	74.6873	74.6873	74.6873	74.6873	74.6873	

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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	65.3971	72.4040	65.3971	67.5770	65.3971	67.5770	65.3971	65.3971	67.5770	65.3971	67.5770	65.3971 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	129.6571	131.0026	127.6121	120.3943	111.2830	102.7197	96.9989	95.6534	99.0439	106.2618	115.3730	123.9363 (68)
Pumps, fans	30.4687	30.4687	30.4687	30.4687	30.4687	30.4687	30.4687	30.4687	30.4687	30.4687	30.4687	30.4687 (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)	-59.7498	-59.7498	-59.7498	-59.7498	-59.7498	-59.7498	-59.7498	-59.7498	-59.7498	-59.7498	-59.7498	-59.7498 (71)
Total internal gains	116.8471	115.0124	111.4774	103.7285	98.9823	94.0213	90.9738	93.4910	96.4423	101.9471	109.3752	115.8563 (72)
	357.3076	363.8252	349.8928	337.1060	321.0686	309.7242	298.7760	299.9477	308.4694	319.0122	337.7315	350.5960 (73)

6. Solar gains

[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
West			6.5000		19.6403		0.6300		0.8000		0.7700		44.5887 (80)
West			6.5000		19.6403		0.6300		0.8000		0.7700		44.5887 (80)
Solar gains	89.1773	174.4498	287.2939	419.0010	513.5015	525.6602	500.4499	429.8791	334.1347	206.9993	111.1936	73.3351	(83)
Total gains	446.4849	538.2749	637.1867	756.1070	834.5702	835.3844	799.2259	729.8268	642.6041	526.0115	448.9251	423.9310	(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	21.0694	21.0694	21.0694	21.0694	21.0694	21.0694	21.0694	21.0694	21.0694	21.0694	21.0694	21.0694
alpha	2.4046	2.4046	2.4046	2.4046	2.4046	2.4046	2.4046	2.4046	2.4046	2.4046	2.4046	2.4046
util living area	0.9031	0.8580	0.7848	0.6650	0.5279	0.3936	0.2942	0.3324	0.5139	0.7398	0.8659	0.9127 (86)
Living	18.5953	19.0148	19.5952	20.2175	20.6450	20.8726	20.9539	20.9369	20.7520	20.1314	19.2403	18.4956
Non living	17.1041	17.6199	18.3245	19.0543	19.5276	19.7566	19.8252	19.8145	19.6539	18.9842	17.9127	16.9806
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	19.7698	19.0148	19.5952	20.2175	20.6450	20.8726	20.9539	20.9369	20.7520	20.1314	19.2403	18.8459 (87)
Th 2	19.8484	19.8484	19.8484	19.8484	19.8484	19.8484	19.8484	19.8484	19.8484	19.8484	19.8484	19.8484 (88)
util rest of house	0.8901	0.8401	0.7588	0.6276	0.4785	0.3314	0.2216	0.2555	0.4469	0.6992	0.8457	0.9008 (89)
MIT 2	18.7543	17.6199	18.3245	19.0543	19.5276	19.7566	19.8252	19.8145	19.6539	18.9842	17.9127	17.4974 (90)
Living area fraction									fLA = Living area / (4) =			0.5463 (91)
MIT	19.3091	18.3819	19.0187	19.6897	20.1380	20.3662	20.4418	20.4277	20.2538	19.6109	18.6380	18.2341 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3091	18.3819	19.0187	19.6897	20.1380	20.3662	20.4418	20.4277	20.2538	19.6109	18.6380	18.2341 (93)

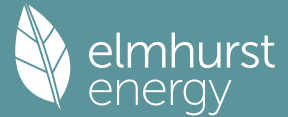
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.8832	0.8127	0.7377	0.6221	0.4914	0.3600	0.2596	0.2949	0.4715	0.6898	0.8198	0.8801 (94)
Useful gains	394.3516	437.4564	470.0326	470.3485	410.1221	300.7470	207.4810	215.2263	302.9634	362.8623	368.0362	373.1163 (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	836.6912	751.5593	697.8632	601.4814	470.3826	321.4427	214.1636	224.5258	343.0449	502.3177	643.1923	782.3386 (97)
Space heating kWh	329.1006	211.0771	169.5059	94.4157	44.8338	0.0000	0.0000	0.0000	0.0000	103.7548	198.1124	304.4613 (98a)
Space heating requirement - total per year (kWh/year)												1455.2618
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	329.1006	211.0771	169.5059	94.4157	44.8338	0.0000	0.0000	0.0000	0.0000	103.7548	198.1124	304.4613 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1455.2618
Space heating per m2										(98c) / (4) =		33.6866 (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 %)	233.6929 (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
	329.1006	211.0771	169.5059	94.4157	44.8338	0.0000	0.0000	0.0000	0.0000	103.7548	198.1124	304.4613 (98)

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Space heating efficiency (main heating system 1)	233.6929	233.6929	233.6929	233.6929	233.6929	0.0000	0.0000	0.0000	0.0000	233.6929	233.6929	233.6929	(210)
Space heating fuel (main heating system)	140.8261	90.3224	72.5336	40.4016	19.1849	0.0000	0.0000	0.0000	0.0000	44.3979	84.7747	130.2827	(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	201.6819	178.4563	189.6666	166.7688	161.7078	145.7487	143.7879	149.4204	150.9912	168.3417	178.9963	199.4649	(64)
Efficiency of water heater	191.5279	191.5279	191.5279	191.5279	191.5279	191.5279	191.5279	191.5279	191.5279	191.5279	191.5279	191.5279	(216)
Fuel for water heating, kWh/month	105.3016	93.1751	99.0282	87.0729	84.4304	76.0979	75.0741	78.0149	78.8351	87.8941	93.4571	104.1440	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	13.5882	10.9010	9.8151	7.1910	5.5545	4.5381	5.0670	6.5863	8.5550	11.2246	12.6781	13.9659	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												622.7239	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												191.5279	
Water heating fuel used												1062.5255	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												109.6648	(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												1794.9142	(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	622.7239	0.1556	96.8889	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1062.5255	0.1409	149.6814	(264)
Space and water heating			246.5702	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	109.6648	0.1443	15.8280	(268)
Total CO2, kg/year			262.3983	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.0700	(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	622.7239	1.5760	981.3890	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1062.5255	1.5209	1615.9915	(278)
Space and water heating			2597.3805	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	109.6648	1.5338	168.2076	(282)
Total Primary energy kWh/year			2765.5881	(286)
Dwelling Primary energy Rate (DPER)			64.0200	(287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	43.2000 (1b)	x 2.5000 (2b)	= 108.0000 (1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 108.0000 (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	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) = 0.1852 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4352 (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) = 0.3373 (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	0.4300	0.4216	0.4132	0.3710	0.3626	0.3204	0.3204	0.3120	0.3373	0.3626	0.3794	0.3963 (22b)
Effective ac	0.5925	0.5889	0.5853	0.5688	0.5657	0.5513	0.5513	0.5487	0.5569	0.5657	0.5720	0.5785 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type (Uw = 1.20)			8.7000	1.1450	9.9618		(27)
top floor exposed new	25.2500	8.7000	16.5500	0.1800	2.9790		(29a)
corridor new	25.2500	2.1000	23.1500	0.1800	4.1670		(29a)
flat roof new	20.8000		20.8000	0.1100	2.2880		(30)
roof terrace new	22.4000		22.4000	0.1100	2.4640		(30)
Total net area of external elements Aum(A, m ²)			93.7000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.9598		(33)
pw			21.5000	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 97.8773 (35)

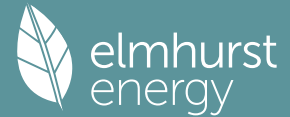
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2000	0.0500	0.3100
E3 Sill	5.2000	0.0500	0.2600
E4 Jamb	14.2000	0.0500	0.7100
E7 Party floor between dwellings (in blocks of flats)	10.0000	0.0700	0.7000
E14 Flat roof	18.6000	0.0800	1.4880
E15 Flat roof with parapet	10.0000	0.5600	5.6000
E18 Party wall between dwellings	10.0000	0.0600	0.6000
E24 Eaves (insulation at ceiling level - inverted)	3.4000	0.2400	0.8160
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			10.4840 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 34.4438 (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	21.1152	20.9872	20.8618	20.2727	20.1625	19.6494	19.6494	19.5544	19.8470	20.1625	20.3855	20.6186 (38)
Heat transfer coeff	55.5590	55.4311	55.3056	54.7165	54.6063	54.0932	54.0932	53.9982	54.2909	54.6063	54.8293	55.0624 (39)

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Average = Sum(39)m / 12 =	54.7160											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2861	1.2831	1.2802	1.2666	1.2640	1.2522	1.2522	1.2500	1.2567	1.2640	1.2692	1.2746 (40)
HLP (average)												1.2666
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.4937 (42)											
Hot water usage for mixer showers	49.2646	48.5243	47.4454	45.3813	43.8580	42.1592	41.1936	42.2643	43.4380	45.2619	47.3704	49.0759 (42a)
Hot water usage for baths	21.3086	20.9922	20.5465	19.7248	19.1096	18.4273	18.0588	18.5013	18.9832	19.7132	20.5518	21.2366 (42b)
Hot water usage for other uses	29.9274	28.8392	27.7509	26.6626	25.5744	24.4861	24.4861	25.5744	26.6626	27.7509	28.8392	29.9274 (42c)
Average daily hot water use (litres/day)												92.3836 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	100.5007	98.3556	95.7429	91.7687	88.5419	85.0726	83.7385	86.3400	89.0838	92.7260	96.7614	100.2399 (44)
Energy content (annual)	159.1685	140.0571	147.1532	125.6268	119.1944	104.6067	101.2745	106.9070	109.8492	125.8283	137.8543	156.9515 (45)
Distribution loss (46)m = 0.15 x (45)m	23.8753	21.0086	22.0730	18.8440	17.8792	15.6910	15.1912	16.0360	16.4774	18.8742	20.6782	23.5427 (46)
Water storage loss:												150.0000 (47)
Store volume												1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7527 (55)
Enter (49) or (54) in (55)												
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (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	205.7635	182.1428	193.7481	170.7187	165.7893	149.6986	147.8694	153.5019	154.9410	172.4232	182.9462	203.5464 (62)
WWHRS	-22.5217	-19.9184	-20.8574	-17.2708	-16.0957	-13.7732	-12.9102	-13.7287	-14.2503	-16.7995	-19.0318	-22.1047 (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	183.2417	162.2244	172.8907	153.4479	149.6936	135.9253	134.9592	139.7732	140.6907	155.6237	163.9143	181.4417 (64)
12Total per year (kWh/year)												1873.8265 (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	90.1995	80.2376	86.2044	77.8444	76.9081	70.8552	70.9497	72.8225	72.5983	79.1138	81.9100	89.4623 (65)

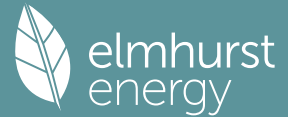
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	74.6873	74.6873	74.6873	74.6873	74.6873	74.6873	74.6873	74.6873	74.6873	74.6873	74.6873	74.6873 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	65.8113	72.8625	65.8113	68.0050	65.8113	68.0050	65.8113	65.8113	68.0050	65.8113	68.0050	65.8113 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	129.6571	131.0026	127.6121	120.3943	111.2830	102.7197	96.9989	95.6534	99.0439	106.2618	115.3730	123.9363 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.4687	30.4687	30.4687	30.4687	30.4687	30.4687	30.4687	30.4687	30.4687	30.4687	30.4687	30.4687 (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)	-59.7498	-59.7498	-59.7498	-59.7498	-59.7498	-59.7498	-59.7498	-59.7498	-59.7498	-59.7498	-59.7498	-59.7498 (71)
Water heating gains (Table 5)	121.2358	119.4011	115.8661	108.1172	103.3711	98.4100	95.3625	97.8797	100.8310	106.3358	113.7639	120.2450 (72)
Total internal gains	365.1105	371.6724	357.6957	344.9227	328.8715	314.5409	303.5788	304.7506	313.2861	326.8150	345.5482	358.3988 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
West				8.7000	19.6403	0.6300	0.7000	0.7700	52.2202 (80)			
Solar gains	52.2202	102.1538	168.2327	245.3573	300.6946	307.8145	293.0519	251.7273	195.6616	121.2140	65.1124	42.9433 (83)
Total gains	417.3306	473.8262	525.9284	590.2800	629.5662	622.3553	596.6307	556.4778	508.9476	448.0291	410.6606	401.3422 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n _{l,m} (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	21.1402	21.1890	21.2370	21.4657	21.5090	21.7130	21.7130	21.7512	21.6340	21.5090	21.4215	21.3309
alpha	2.4093	2.4126	2.4158	2.4310	2.4339	2.4475	2.4475	2.4501	2.4423	2.4339	2.4281	2.4221
util living area	0.9141	0.8849	0.8373	0.7480	0.6295	0.4886	0.3725	0.4099	0.5950	0.7872	0.8832	0.9205 (86)
MIT	18.5067	18.8386	19.3466	19.9869	20.4872	20.8055	20.9273	20.9062	20.6692	20.0105	19.1669	18.4547 (87)
Th 2	19.8517	19.8541	19.8564	19.8671	19.8691	19.8785	19.8785	19.8802	19.8749	19.8691	19.8650	19.8608 (88)
util rest of house	0.9023	0.8695	0.8154	0.7144	0.5799	0.4192	0.2864	0.3217	0.5267	0.7506	0.8651	0.9095 (89)
MIT 2	16.9971	17.4103	18.0383	18.8155	19.3911	19.7326	19.8400	19.8274	19.6061	18.8671	17.8354	16.9375 (90)
Living area fraction	f _{LA} = Living area / (4) =											
MIT	17.8218	18.1906	18.7531	19.4554	19.9899	20.3187	20.4340	20.4167	20.1869	19.4918	18.5628	17.7664 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.8218	18.1906	18.7531	19.4554	19.9899	20.3187	20.4340	20.4167	20.1869	19.4918	18.5628	17.7664 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8754	0.8419	0.7905	0.7008	0.5855	0.4474	0.3301	0.3652	0.5468	0.7367	0.8393	0.8833 (94)
Useful gains	365.3215	398.9177	415.7392	413.6590	368.6063	278.4574	196.9306	203.2071	278.3011	330.0649	344.6718	354.5104 (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	751.2579	736.7108	677.6630	577.5565	452.6813	309.3439	207.3927	216.8952	330.4619	485.5464	628.4947	746.9960 (97)
Space heating kWh	287.1367	226.9969	194.8713	118.0062	62.5518	0.0000	0.0000	0.0000	0.0000	115.6782	204.3525	292.0093 (98a)
Space heating requirement - total per year (kWh/year)												1501.6030
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	287.1367	226.9969	194.8713	118.0062	62.5518	0.0000	0.0000	0.0000	0.0000	115.6782	204.3525	292.0093 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1501.6030
Space heating per m ²												(98c) / (4) = 34.7593 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	287.1367	226.9969	194.8713	118.0062	62.5518	0.0000	0.0000	0.0000	0.0000	115.6782	204.3525	292.0093 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	311.0907	245.9338	211.1282	127.8507	67.7700	0.0000	0.0000	0.0000	0.0000	125.3285	221.4003	316.3698 (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	183.2417	162.2244	172.8907	153.4479	149.6936	135.9253	134.9592	139.7732	140.6907	155.6237	163.9143	181.4417 (64)
Efficiency of water heater	85.0627	84.8132	84.3288	83.4780	82.2570	79.8000	79.8000	79.8000	79.8000	83.4043	84.5554	79.8000 (216)
Fuel for water heating, kWh/month	215.4195	191.2726	205.0197	183.8184	181.9828	170.3325	169.1218	175.1543	176.3042	186.5896	193.8543	213.1576 (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	13.6743	10.9700	9.8773	7.2365	5.5897	4.5668	5.0991	6.6280	8.6091	11.2957	12.7584	14.0543 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-20.7359	-29.5115	-42.8461	-48.7189	-53.0591	-49.7838	-49.2317	-46.2494	-41.0197	-34.0516	-22.9187	-17.9001 (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	-10.8907	-22.9991	-45.8520	-69.0449	-91.4308	-91.8546	-90.7123	-76.6930	-56.1065	-32.8798	-14.5434	-8.6005 (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)

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Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Annual totals kWh/year												
Space heating fuel - main system 1												1626.8721 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.8000
Water heating fuel used												2262.0273 (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)												110.3593 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1067.6341 (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												3017.6247 (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	1626.8721	0.2100	341.6431 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2262.0273	0.2100	475.0257 (264)
Space and water heating			816.6689 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	110.3593	0.1443	15.9283 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-456.0265	0.1343	-61.2604
PV Unit electricity exported	-611.6076	0.1258	-76.9628
Total			-138.2232 (269)
Total CO2, kg/year			706.3032 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.3500 (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	1626.8721	1.1300	1838.3655 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2262.0273	1.1300	2556.0909 (278)
Space and water heating			4394.4564 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	110.3593	1.5338	169.2728 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-456.0265	1.4965	-682.4281
PV Unit electricity exported	-611.6076	0.4619	-282.5056
Total			-964.9337 (283)
Total Primary energy kWh/year			3728.8963 (286)
Target Primary Energy Rate (TPER)			86.3200 (287)