

CGP | MEP

14 Blackburn Road

SAPS Calculation Sheet

DOCUMENT DETAILS

PROJECT NAME	DOCUMENT NUMBER	DOCUMENT TITLE	DATE CREATED
14 Blackburn Road	CG15060-CGP-XX-XX-RP-1004	SAPS Calculation Sheet	March 2025
			Author: Amaan Hussain

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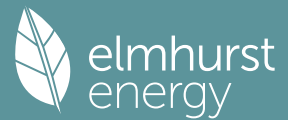
CHANGE HISTORY

REVISION No.	REVISION DATE	DOCUMENT UPDATE DETAILS	REVISED BY
01	10/04/2025	First Draft	Amaan Hussain
			Checked: Russell Entwistle
			Approved: Ben Green

DISTRIBUTION LIST

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Property Reference	Be Lean				Issued on Date	08/04/2025
Assessment Reference	0301_2B4P_BL		Prop Type Ref			
Property						
SAP Rating	86 B	DER	2.93	TER	12.79	
Environmental	98 A	% DER < TER				77.09
CO ₂ Emissions (t/year)	0.22	DFEE	26.10	TFEE	33.03	
Compliance Check	See BREL	% DFEE < TFEE				20.99
% DPER < TPER	54.42	DPER	31.27	TPER	68.61	
Assessor Details	Alfie Gamble-Thornton				Assessor ID	CM02-0001
Client	Fifth State, Fifth State					

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	82.0000 (1b)	3.1500 (2b)	258.3000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.0000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	258.3000 (5)

2. Ventilation rate

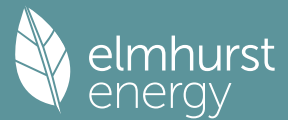
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (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	0.2862	0.2825	0.2787	0.2600	0.2562	0.2375	0.2375	0.2337	0.2450	0.2562	0.2637	0.2712 (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							
Glazing			14.9000	0.7752	11.4729		(27)
External Wall North	34.6500	7.4000	27.2500	0.1400	3.8150	70.0000	1907.5000 (29a)
External Wall West	27.7200		27.7200	0.1400	3.8808	70.0000	1940.4000 (29a)
External Wall South	37.8000	7.4000	30.4000	0.1400	4.2560	70.0000	2128.0000 (29a)
Total net area of external elements Aum(A, m ²)			100.1700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	23.4247		(33)
Main dwelling							
Party Wall 1 East			30.5600	0.0000	0.0000	45.0000	1375.2000 (32)
Party Floor 1			82.0000			30.0000	2460.0000 (32d)
Party Ceiling 1			82.0000			20.0000	1640.0000 (32b)
Internal Wall 1			104.6100			9.0000	941.4900 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12392.5900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							151.1291 (35)
List of Thermal Bridges							

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K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450
E18 Party wall between dwellings	12.6000	0.0300	0.3780
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			1.6230 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	25.0477 (37)

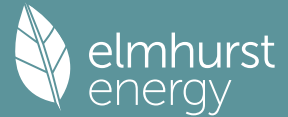
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	24.3997	24.0800	23.7604	22.1621	21.8425	20.2443	20.2443	19.9246	20.8836	21.8425	22.4818	23.1211
Average = Sum(39)m / 12 =	49.4473	49.1277	48.8080	47.2098	46.8902	45.2919	45.2919	44.9723	45.9312	46.8902	47.5295	48.1687
												47.1299
HLP	0.6030	0.5991	0.5952	0.5757	0.5718	0.5523	0.5523	0.5484	0.5601	0.5718	0.5796	0.5874
HLP (average)												0.5748
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.4997 (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)												129.3222 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	140.6734	137.6787	133.9799	129.1019	124.5744	118.8423	115.5015	120.9154	124.3880	130.0799	135.9449	140.5859
Energy content (annual)	207.0955	182.1768	191.4545	168.6393	160.5267	137.4371	127.6326	142.3196	144.2839	167.6210	183.7340	206.4606
Distribution loss (46)m = 0.15 x (45)m												2019.3818
Water storage loss:												
Store volume												110.0000 (47)
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												
If cylinder contains dedicated solar storage												
Primary loss												
Combi loss												
Total heat required for water heating calculated for each month												
WWHRS												
PV diverter												
Solar input												
FGHRS												
Output from w/h												
12Total per year (kWh/year)												
Electric shower(s)												
Heat gains from water heating, kWh/month												

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												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
Pumps, fans												
Losses e.g. evaporation (negative values) (Table 5)												
Water heating gains (Table 5)												
Total internal gains												

6. Solar gains												
[Jan]												
North												
South												
Solar gains												
Total gains												

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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, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	69.6172	70.0702	70.5291	72.9168	73.4138	76.0044	76.0044	76.5446	74.9465	73.4138	72.4264	71.4651
alpha	5.6411	5.6713	5.7019	5.8611	5.8943	6.0670	6.0670	6.1030	5.9964	5.8943	5.8284	5.7643
util living area	0.9359	0.8926	0.8313	0.7003	0.5473	0.3769	0.2708	0.2906	0.4552	0.7071	0.8762	0.9419 (86)
MIT	20.4880	20.6473	20.7933	20.9356	20.9862	20.9989	20.9999	20.9998	20.9964	20.9430	20.7465	20.4837 (87)
Th 2	20.4273	20.4308	20.4343	20.4519	20.4554	20.4731	20.4731	20.4766	20.4660	20.4554	20.4484	20.4413 (88)
util rest of house	0.9271	0.8796	0.8128	0.6746	0.5171	0.3461	0.2384	0.2575	0.4207	0.6773	0.8600	0.9340 (89)
MIT 2	19.8353	20.0318	20.2088	20.3867	20.4430	20.4723	20.4730	20.4765	20.4632	20.3998	20.1693	19.8420 (90)
Living area fraction	19.9945	20.1819	20.3514	20.5206	20.5755	20.6007	20.6015	20.6042	fLA = Living area / (4) =	20.5323	20.3101	0.2439 (91)
MIT	19.9945	20.1819	20.3514	20.5206	20.5755	20.6007	20.6015	20.6042	20.5933	20.5323	20.3101	19.9985 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9945	20.1819	20.3514	20.5206	20.5755	20.6007	20.6015	20.6042	20.5933	20.5323	20.3101	19.9985 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9197	0.8735	0.8099	0.6779	0.5238	0.3536	0.2463	0.2656	0.4290	0.6816	0.8556	0.9269 (94)
Useful gains	585.3404	619.0277	599.1956	525.2423	411.4874	271.4615	181.2088	189.0280	297.1560	445.6462	534.6266	568.9834 (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	776.0525	750.7651	676.0594	548.6045	416.1714	271.7840	181.2366	189.0706	298.2441	465.7274	627.8665	760.9941 (97)
Space heating kWh	141.8898	88.5276	57.1867	16.8208	3.4849	0.0000	0.0000	0.0000	0.0000	14.9405	67.1328	142.8560 (98a)
Space heating requirement - total per year (kWh/year)												532.8389
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	141.8898	88.5276	57.1867	16.8208	3.4849	0.0000	0.0000	0.0000	0.0000	14.9405	67.1328	142.8560 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												532.8389
Space heating per m2										(98c) / (4) =		6.4980 (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												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	141.8898	88.5276	57.1867	16.8208	3.4849	0.0000	0.0000	0.0000	0.0000	14.9405	67.1328	142.8560 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	141.8898	88.5276	57.1867	16.8208	3.4849	0.0000	0.0000	0.0000	0.0000	14.9405	67.1328	142.8560
Space heating requirement	141.8898	88.5276	57.1867	16.8208	3.4849	0.0000	0.0000	0.0000	0.0000	14.9405	67.1328	142.8560 (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	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00												
310a	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374
Water heating fuel	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374 (310)
Cooling System Energy Efficiency Ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	18.7349	16.9218	18.7349	18.1305	18.7349	18.1305	18.7349	18.7349	18.1305	18.7349	18.1305	18.7349 (331)
Lighting	24.9564	20.0209	18.0266	13.2071	10.2015	8.3347	9.3062	12.0965	15.7122	20.6152	23.2849	25.6500 (332)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												532.8389 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2670.2216 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												5.3284 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)												
mechanical ventilation fans (SFP = 0.7000)												220.5882 (330a)
Total electricity for the above, kWh/year												220.5882 (331)
Electricity for lighting (calculated in Appendix L)												201.4122 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (333)
Wind generation												0.0000 (334)
Hydro-electric generation (Appendix N)												0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)
Appendix Q - special features												
Energy saved or generated												-0.0000 (336)
Energy used												0.0000 (337)
Total delivered energy for all uses												3625.0609 (338)

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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			262.0000 (367)
Space and Water heating from Heat pump	1222.5422	0.1583	32.1992 (367)
Electrical energy for heat distribution (space & water)	5.3284	0.0000	4.6054 (372)
Overall CO2 factor for heat network			0.0563 (386)
Total CO2 associated with community systems			180.3837 (373)
Space and water heating			180.3837 (376)
Pumps, fans and electric keep-hot	220.5882	0.1387	30.5983 (378)
Energy for lighting	201.4122	0.1443	29.0700 (379)
Total CO2, kg/year			240.0520 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.9300 (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			262.0000 (467a)
Space and Water heating from Heat pump	1222.5422	1.5861	322.5659 (467)
Electrical energy for heat distribution (space & water)	5.3284	0.0000	49.0631 (472)
Overall CO2 factor for heat network			0.6000 (486)
Total CO2 associated with community systems			1921.6990 (473)
Space and water heating			1921.6990 (476)
Pumps, fans and electric keep-hot	220.5882	1.5128	333.7058 (478)
Energy for lighting	201.4122	1.5338	308.9328 (479)
Total Primary energy kWh/year			2564.3376 (483)
Dwelling Primary energy Rate (DPER)			31.2700 (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	82.0000 (1b)	x 3.1500 (2b)	= 258.3000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 258.3000 (5)

2. Ventilation rate

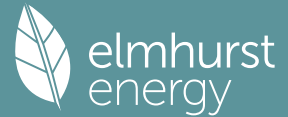
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.1161 (8)
Pressure Test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3661 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3661 (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	0.4668	0.4577	0.4485	0.4028	0.3936	0.3478	0.3478	0.3387	0.3661	0.3936	0.4119	0.4302 (22b)
Effective ac	0.6090	0.6047	0.6006	0.5811	0.5775	0.5605	0.5605	0.5574	0.5670	0.5775	0.5848	0.5925 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opening Type			14.8000	1.1450	16.9466		(27)
External Wall North	34.6500	7.4000	27.2500	0.1800	4.9050		(29a)
External Wall West	27.7200		27.7200	0.1800	4.9896		(29a)
External Wall South	37.8000	7.4000	30.4000	0.1800	5.4720		(29a)
Total net area of external elements Aum(A, m2)			100.1700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.3132		(33)
Main dwelling							

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Party Wall 1 East						30.5600	0.0000	0.0000					(32)		
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K													161.1291	(35)	
List of Thermal Bridges															
K1 Element							Length	Psi-value	Total						
E7 Party floor between dwellings (in blocks of flats)						41.5000	0.0700	2.9050							
E18 Party wall between dwellings						12.6000	0.0600	0.7560							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)													3.6610	(36)	
Point Thermal Bridges													(36a) =	0.0000	
Total fabric heat loss													(33) + (36) + (36a) =	35.9742	(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	51.9077	51.5470	51.1935	49.5330	49.2223	47.7761	47.7761	47.5082	48.3331	49.2223	49.8508	50.5079	(38)		
Average = Sum(39)m / 12 =	87.8819	87.5212	87.1677	85.5072	85.1965	83.7502	83.7502	83.4824	84.3073	85.1965	85.8250	86.4820	(39)		
												85.5057			
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
HLP (average)	1.0717	1.0673	1.0630	1.0428	1.0390	1.0213	1.0213	1.0181	1.0281	1.0390	1.0466	1.0547	(40)		
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31			
												1.0428			
												31			

4. Water heating energy requirements (kWh/year)															

Assumed occupancy													2.4997	(42)	
Hot water usage for mixer showers															
	66.1317	65.1379	63.6897	60.9188	58.8739	56.5936	55.2974	56.7346	58.3101	60.7586	63.5890	65.8783	(42a)		
Hot water usage for baths															
	28.5620	28.1378	27.5405	26.4391	25.6144	24.6999	24.2060	24.7991	25.4450	26.4235	27.5476	28.4655	(42b)		
Hot water usage for other uses															
	40.2296	38.7667	37.3038	35.8409	34.3780	32.9151	32.9151	34.3780	35.8409	37.3038	38.7667	40.2296	(42c)		
Average daily hot water use (litres/day)													124.0251	(43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Energy conte	134.9233	132.0424	128.5340	123.1988	118.8663	114.2086	112.4185	115.9118	119.5960	124.4859	129.9032	134.5734	(44)		
Energy content (annual)	213.6855	188.0266	197.5519	168.6530	160.0169	140.4328	135.9604	143.5230	147.4738	168.9261	185.0710	210.7094	(45)		
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2060.0305			
	32.0528	28.2040	29.6328	25.2979	24.0025	21.0649	20.3941	21.5284	22.1211	25.3389	27.7606	31.6064	(46)		
Water storage loss:															
Store volume													150.0000	(47)	
a) If manufacturer declared loss factor is known (kWh/day):													1.3938	(48)	
Temperature factor from Table 2b													0.5400	(49)	
Enter (49) or (54) in (55)													0.7527	(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															
	260.2804	230.1123	244.1468	213.7448	206.6118	185.5246	182.5553	190.1179	192.5657	215.5210	230.1628	257.3043	(62)		
WWHRS	-30.2327	-26.7380	-27.9985	-23.1839	-21.6065	-18.4889	-17.3304	-18.4291	-19.1293	-22.5513	-25.5479	-29.6728	(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															
	230.0478	203.3743	216.1483	190.5610	185.0053	167.0358	165.2249	171.6888	173.4364	192.9697	204.6149	227.6315	(64)		
								Total per year (kWh/year) = Sum(64)m =						2327.7386	(64)
12Total per year (kWh/year)													2328	(64)	
Electric shower(s)															
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)		
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000	(64a)	
Heat gains from water heating, kWh/month															
	108.3264	96.1874	102.9619	92.1506	90.4816	82.7674	82.4828	84.9973	85.1085	93.4439	97.6096	107.3368	(65)		

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

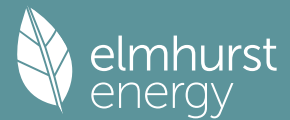
Metabolic gains (Table 5), Watts															
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	(66)		
	115.1238	127.4585	115.1238	118.9613	115.1238	118.9613	115.1238	115.1238	118.9613	115.1238	118.9613	115.1238	(67)		
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	223.5697	225.8896	220.0434	207.5975	191.8868	177.1210	167.2565	164.9365	170.7828	183.2286	198.9393	213.7052	(68)		
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	(69)		
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)		
Losses e.g. evaporation (negative values) (Table 5)															
	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	(71)		
Water heating gains (Table 5)															
	145.6000	143.1361	138.3897	127.9869	121.6150	114.9547	110.8639	114.2437	118.2063	125.5966	135.5688	144.2699	(72)		
Total internal gains															
	547.7892	559.9799	537.0527	518.0415	492.1214	471.5327	453.7400	454.7998	468.4461	487.4448	516.9652	536.5946	(73)		

6. Solar gains															

[Jan]				Area	Solar flux	g	FF		Access			Gains			
				m2	Table 6a	Specific data	Specific data		factor			W			
					W/m2	or Table 6b	or Table 6c		Table 6d						
North				7.4000	10.6334	0.6300	0.7000		0.7700			24.0478	(74)		
South				7.4000	46.7521	0.6300	0.7000		0.7700			105.7315	(78)		

Solar gains	129.7793	219.1175	298.6678	374.7340	428.7574	430.8977	413.1566	371.2105	324.3092	241.4756	154.9939	111.4092	(83)		
Total gains	677.5685	779.0974	835.7204	892.7755	920.8788	902.4304	866.8966	826.0103	792.7553	728.9204	671.9591	648.0038	(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, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	41.7625	41.9346	42.1046	42.9223	43.0788	43.8227	43.8227	43.9633	43.5332	43.0788	42.7634	42.4384
alpha	3.7842	3.7956	3.8070	3.8615	3.8719	3.9215	3.9215	3.9309	3.9022	3.8719	3.8509	3.8292
util living area	0.9704	0.9499	0.9187	0.8484	0.7312	0.5601	0.4164	0.4524	0.6590	0.8643	0.9490	0.9743 (86)
MIT	19.4972	19.7575	20.0776	20.4819	20.7774	20.9425	20.9859	20.9805	20.8888	20.5210	19.9632	19.4693 (87)
Th 2	20.0240	20.0276	20.0311	20.0478	20.0510	20.0656	20.0656	20.0683	20.0600	20.0510	20.0446	20.0380 (88)
util rest of house	0.9645	0.9403	0.9030	0.8195	0.6822	0.4891	0.3317	0.3660	0.5900	0.8323	0.9375	0.9692 (89)
MIT 2	18.2902	18.6183	19.0176	19.5163	19.8511	20.0262	20.0592	20.0588	19.9763	19.5744	18.8923	18.2648 (90)
Living area fraction	18.5846	18.8961	19.2761	19.7518	20.0770	20.2497	20.2852	20.2836	20.1988	19.8053	19.1535	18.5585 (92)
MIT	18.5846	18.8961	19.2761	19.7518	20.0770	20.2497	20.2852	20.2836	20.1988	19.8053	19.1535	18.5585 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5846	18.8961	19.2761	19.7518	20.0770	20.2497	20.2852	20.2836	20.1988	19.8053	19.1535	18.5585 (93)

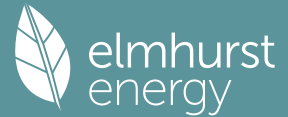
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9529	0.9262	0.8882	0.8093	0.6836	0.5036	0.3520	0.3864	0.6008	0.8228	0.9241	0.9586 (94)
Useful gains	645.6646	721.6384	742.3113	722.5609	629.5241	454.4909	305.1523	319.1768	476.2796	599.7216	620.9641	621.1660 (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	1255.3578	1224.9598	1113.6644	927.9102	713.6896	473.1640	308.6368	324.2137	514.1751	784.2565	1034.4884	1241.7559 (97)
Space heating kWh	453.6118	338.2320	276.2867	147.8515	62.6191	0.0000	0.0000	0.0000	0.0000	137.2940	297.7375	461.7189 (98a)
Space heating requirement - total per year (kWh/year)												2175.3513
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	453.6118	338.2320	276.2867	147.8515	62.6191	0.0000	0.0000	0.0000	0.0000	137.2940	297.7375	461.7189 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2175.3513
Space heating per m2										(98c) / (4) =		26.5287 (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	453.6118	338.2320	276.2867	147.8515	62.6191	0.0000	0.0000	0.0000	0.0000	137.2940	297.7375	461.7189 (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)	491.4537	366.4485	299.3355	160.1858	67.8430	0.0000	0.0000	0.0000	0.0000	148.7475	322.5758	500.2371 (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	230.0478	203.3743	216.1483	190.5610	185.0053	167.0358	165.2249	171.6888	173.4364	192.9697	204.6149	227.6315 (64)
Efficiency of water heater	85.5532	85.1921	84.6114	83.4973	81.8990	79.8000	79.8000	79.8000	79.8000	83.3101	84.8999	79.8000 (216)
Fuel for water heating, kWh/month	268.8944	238.7243	255.4601	228.2242	225.8944	209.3180	207.0488	215.1488	217.3388	231.6283	241.0072	265.8884 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	23.9205	19.1899	17.2784	12.6589	9.7781	7.9888	8.9199	11.5944	15.0600	19.7595	22.3183	24.5853 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-13.5036	-20.5454	-31.8395	-38.6837	-44.3007	-42.3032	-41.7849	-38.1437	-32.2167	-24.7093	-15.3697	-11.5054 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-3.6484	-7.9325	-16.2639	-25.1830	-34.0602	-34.5113	-34.1107	-28.5315	-20.4576	-11.5895	-4.9471	-2.8666 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												2356.8270 (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												2804.5757 (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)												193.0518 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-579.0079 (233)
Wind generation												0.0000 (234)

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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	4861.4466 (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	2356.8270	0.2100	494.9337 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2804.5757	0.2100	588.9609 (264)
Space and water heating			1083.8946 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	193.0518	0.1443	27.8633 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-354.9056	0.1330	-47.2129
PV Unit electricity exported	-224.1023	0.1250	-28.0155
Total			-75.2284 (269)
Total CO2, kg/year			1048.4587 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.7900 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2356.8270	1.1300	2663.2145 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2804.5757	1.1300	3169.1706 (278)
Space and water heating			5832.3851 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	193.0518	1.5338	296.1093 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-354.9056	1.4916	-529.3650
PV Unit electricity exported	-224.1023	0.4588	-102.8264
Total			-632.1913 (283)
Total Primary energy kWh/year			5626.4039 (286)
Target Primary Energy Rate (TPER)			68.6100 (287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	82.0000 (1b)	x 3.1500 (2b)	= 258.3000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 258.3000 (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) = 0.1161 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2661 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2661 (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	0.3393	0.3327	0.3260	0.2928	0.2861	0.2528	0.2528	0.2462	0.2661	0.2861	0.2994	0.3127 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5576	0.5553	0.5531	0.5429	0.5409	0.5320	0.5320	0.5303	0.5354	0.5409	0.5448	0.5489 (25)

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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								
Glazing			14.8000	0.7752	11.4729			(27)
External Wall North	34.6500	7.4000	27.2500	0.1400	3.8150	70.0000	1907.5000	(29a)
External Wall West	27.7200		27.7200	0.1400	3.8808	70.0000	1940.4000	(29a)
External Wall South	37.8000	7.4000	30.4000	0.1400	4.2560	70.0000	2128.0000	(29a)
Total net area of external elements Aum(A, m2)			100.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...	(30) + (32) =	23.4247			(33)
Main dwelling								
Party Wall 1 East			30.5600	0.0000	0.0000	45.0000	1375.2000	(32)
Party Floor 1			82.0000			30.0000	2460.0000	(32d)
Party Ceiling 1			82.0000			30.0000	2460.0000	(32b)
Internal Wall 1			104.6100			9.0000	941.4900	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13212.5900 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 161.1291 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450	
E18 Party wall between dwellings	12.6000	0.0300	0.3780	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				1.6230 (36)
Point Thermal Bridges				(36a) = 0.0000
Total fabric heat loss				(33) + (36) + (36a) = 25.0477 (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	47.5270	47.3365	47.1497	46.2723	46.1082	45.3440	45.3440	45.2025	45.6384	46.1082	46.4402	46.7874	(38)
Average = Sum(39)m / 12 =	72.5747	72.3841	72.1973	71.3200	71.1558	70.3917	70.3917	70.2502	70.6860	71.1558	71.4879	71.8351	(39)
												71.3192	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8851	0.8827	0.8805	0.8698	0.8678	0.8584	0.8584	0.8567	0.8620	0.8678	0.8718	0.8760	(40)
HLP (average)												0.8697	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

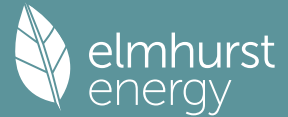
Assumed occupancy													2.4997 (42)
Hot water usage for mixer showers													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
27.9253	27.5038	26.9041	26.0060	25.1966	24.0824	23.2371	24.2707	24.8132	25.9172	27.0651	27.9032	27.9032	(42b)
Hot water usage for other uses													
40.2296	38.7667	37.3038	35.8409	34.3780	32.9151	32.9151	34.3780	35.8409	37.3038	38.7667	40.2296	40.2296	(42c)
Average daily hot water use (litres/day)												62.4657	(43)
Daily hot water use													
68.1549	66.2704	64.2078	61.8469	59.5746	56.9975	56.1522	58.6488	60.6541	63.2210	65.8317	68.1327	68.1327	(44)
Energy conte	100.3358	87.6892	91.7517	80.7875	76.7679	65.9157	62.0498	69.0307	70.3558	81.4667	88.9738	100.0579	(45)
Energy content (annual)												975.1823	
Distribution loss (46)m = 0.15 x (45)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	0.0000	(46)
Water storage 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	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	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	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													
85.2854	74.5358	77.9889	68.6693	65.2527	56.0284	52.7424	58.6761	59.8024	69.2467	75.6277	85.0492	85.0492	(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													
85.2854	74.5358	77.9889	68.6693	65.2527	56.0284	52.7424	58.6761	59.8024	69.2467	75.6277	85.0492	85.0492	(64)
12Total per year (kWh/year)												829	(64)
Electric shower(s)													
52.9605	47.1882	51.5277	49.1723	50.0950	47.7858	49.3786	50.0950	49.1723	51.5277	50.5588	52.9605	52.9605	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												602.4224	(64a)
Heat gains from water heating, kWh/month													
34.5615	30.4310	32.3792	29.4604	28.8369	25.9535	25.5302	27.1928	27.2437	30.1936	31.5466	34.5024	34.5024	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
112.8185	124.9061	112.8185	116.5791	112.8185	116.5791	112.8185	112.8185	116.5791	112.8185	116.5791	112.8185	112.8185	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
223.5697	225.8896	220.0434	207.5975	191.8868	177.1210	167.2565	164.9365	170.7828	183.2286	198.9393	213.7052	213.7052	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	(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)													
-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	(71)
Water heating gains (Table 5)													
46.4536	45.2842	43.5204	40.9172	38.7593	36.0466	34.3148	36.5494	37.8384	40.5828	43.8148	46.3742	46.3742	(72)
Total internal gains													
443.3374	456.5757	436.8780	425.5895	403.9603	390.2423	374.8855	374.8001	385.6960	397.1256	419.8289	433.3936	433.3936	(73)

6. Solar gains

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[Jan]	Area m2		Solar flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		FF Access factor Table 6d		Gains W	
North	7.4000		10.6334		0.3500		0.8500		0.7700		16.2227	(74)
South	7.4000		46.7521		0.3500		0.8500		0.7700		71.3268	(78)

Solar gains	87.5495	147.8174	201.4822	252.7968	289.2411	290.6849	278.7168	250.4198	218.7800	162.9002	104.5594	75.1570	(83)
Total gains	530.8869	604.3931	638.3602	678.3863	693.2014	680.9273	653.6023	625.2199	604.4760	560.0258	524.3883	508.5505	(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	50.5709	50.7040	50.8352	51.4605	51.5792	52.1392	52.1392	52.2442	51.9221	51.5792	51.3397	51.0915	
alpha	4.3714	4.3803	4.3890	4.4307	4.4386	4.4759	4.4759	4.4829	4.4615	4.4386	4.4226	4.4061	
util living area	0.9846	0.9721	0.9522	0.8990	0.7967	0.6223	0.4649	0.5035	0.7202	0.9095	0.9711	0.9870 (86)	
MIT	19.6565	19.8730	20.1432	20.5047	20.7856	20.9474	20.9885	20.9836	20.8972	20.5483	20.0524	19.6228 (87)	
Th 2	20.1802	20.1822	20.1841	20.1933	20.1950	20.2030	20.2030	20.2045	20.1999	20.1950	20.1915	20.1879 (88)	
util rest of house	0.9815	0.9666	0.9425	0.8784	0.7563	0.5569	0.3846	0.4220	0.6595	0.8869	0.9645	0.9844 (89)	
MIT 2	18.9495	19.1642	19.4303	19.7832	20.0379	20.1732	20.1985	20.1977	20.1361	19.8307	19.3502	18.9221 (90)	
Living area fraction									fLA = Living area / (4) =				0.2439 (91)
MIT	19.1220	19.3370	19.6042	19.9592	20.2203	20.3620	20.3912	20.3894	20.3218	20.0057	19.5215	19.0930 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.1220	19.3370	19.6042	19.9592	20.2203	20.3620	20.3912	20.3894	20.3218	20.0057	19.5215	19.0930 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9764	0.9596	0.9343	0.8716	0.7577	0.5705	0.4039	0.4414	0.6694	0.8807	0.9577	0.9798	(94)
Useful gains	518.3325	579.9549	596.3945	591.2964	525.2130	388.4608	263.9834	275.9673	404.6079	493.2425	502.2121	498.2949	(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	1075.6984	1045.0121	946.0847	788.7387	606.2683	405.5991	266.8703	280.2574	439.7913	669.2700	887.9861	1069.8385	(97)
Space heating kWh	414.6803	312.5185	260.1695	142.1584	60.3051	0.0000	0.0000	0.0000	0.0000	130.9644	277.7573	425.2284	(98a)
Space heating requirement - total per year (kWh/year)												2023.7819	
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	414.6803	312.5185	260.1695	142.1584	60.3051	0.0000	0.0000	0.0000	0.0000	130.9644	277.7573	425.2284	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2023.7819	
Space heating per m2											(98c) / (4) =	24.6803	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Heat loss rate W												
	0.0000	0.0000	0.0000	0.0000	0.0000	661.6818	520.8984	533.9013	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8658	0.9227	0.9058	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	572.8646	480.6305	483.6012	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	752.5313	722.8827	691.7784	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	129.3600	180.2357	154.8838	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	32.3400	45.0589	38.7210	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												116.1199 (107)
Energy for space heating												24.6803 (99)
Energy for space cooling												1.4161 (108)
Total												26.0964 (109)
Fabric Energy Efficiency (DFEE)												26.1 (109)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling	82.0000	3.1500	258.3000	(1b) - (3b)
Ground floor				(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.0000			
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	258.3000	(5)

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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)
		Air changes per hour	
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1161 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50			5.0000 (17)
Infiltration rate			0.3661 (18)
Number of sides sheltered			0 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.3661 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
	0.4668	0.4577	0.4485	0.4028	0.3936	0.3478	0.3478	0.3387	0.3661	0.3936	0.4119	0.4302	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													(23c)
Effective ac	0.6090	0.6047	0.6006	0.5811	0.5775	0.5605	0.5605	0.5574	0.5670	0.5775	0.5848	0.5925	(25)

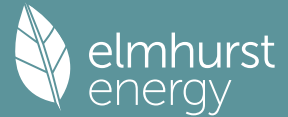
3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K						
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K						
TER Opening Type			14.8000	1.1450	16.9466			(27)					
External Wall North	34.6500	7.4000	27.2500	0.1800	4.9050			(29a)					
External Wall West	27.7200		27.7200	0.1800	4.9896			(29a)					
External Wall South	37.8000	7.4000	30.4000	0.1800	5.4720			(29a)					
Total net area of external elements Aum(A, m2)			100.1700					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.3132			(33)					
Main dwelling													
Party Wall 1 East			30.5600	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								161.1291 (35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
E7 Party floor between dwellings (in blocks of flats)				41.5000	0.0700	2.9050							
E18 Party wall between dwellings				12.6000	0.0600	0.7560							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								3.6610 (36)					
Point Thermal bridges								(36a) = 0.0000					
Total fabric heat loss								(33) + (36) + (36a) = 35.9742 (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	51.9077	51.5470	51.1935	49.5330	49.2223	47.7761	47.7761	47.5082	48.3331	49.2223	49.8508	50.5079	(38)
Average = Sum(39)m / 12 =	87.8819	87.5212	87.1677	85.5072	85.1965	83.7502	83.7502	83.4824	84.3073	85.1965	85.8250	86.4820	(39)
												85.5057	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0717	1.0673	1.0630	1.0428	1.0390	1.0213	1.0213	1.0181	1.0281	1.0390	1.0466	1.0547	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4997 (42)	
Hot water usage for mixer showers													
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000												0.0000 (42a)	
Hot water usage for baths													
28.5620 28.1378 27.5405 26.4391 25.6144 24.6999 24.2060 24.7991 25.4450 26.4235 27.5476												28.4655 (42b)	
Hot water usage for other uses													
40.2296 38.7667 37.3038 35.8409 34.3780 32.9151 32.9151 34.3780 35.8409 37.3038 38.7667												40.2296 (42c)	
Average daily hot water use (litres/day)												63.0538 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.7916	66.9045	64.8443	62.2800	59.9924	57.6150	57.1211	59.1771	61.2859	63.7273	66.3143	68.6950	(44)
Energy content (annual)	108.9491	95.2711	99.6633	85.2582	80.7613	70.8444	69.0830	73.2737	75.5716	86.4773	94.4768	107.5598	(45)
Distribution loss (46)m = 0.15 x (45)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	(46)
Water storage 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	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	92.6067	80.9805	84.7138	72.4695	68.6471	60.2177	58.7205	62.2826	64.2359	73.5057	80.3053	91.4259	(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	92.6067	80.9805	84.7138	72.4695	68.6471	60.2177	58.7205	62.2826	64.2359	73.5057	80.3053	91.4259	(64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =								890.1111 (64)				
									890 (64)				

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Electric shower(s)	52.9605	47.1882	51.5277	49.1723	50.0950	47.7858	49.3786	50.0950	49.1723	51.5277	50.5588	52.9605 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												602.4224 (64a)
Heat gains from water heating, kWh/month	36.3918	32.0422	34.0604	30.4104	29.6855	27.0009	27.0248	28.0944	28.3520	31.2584	32.7160	36.0966 (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	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	115.1238	127.4585	115.1238	118.9613	115.1238	118.9613	115.1238	115.1238	118.9613	115.1238	118.9613	115.1238	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	223.5697	225.8896	220.0434	207.5975	191.8868	177.1210	167.2565	164.9365	170.7828	183.2286	198.9393	213.7052	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	(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)	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	(71)
Water heating gains (Table 5)	48.9137	47.6818	45.7801	42.2367	39.8999	37.5012	36.3236	37.7613	39.3778	42.0139	45.4389	48.5169	(72)
Total internal gains	448.1029	461.5257	441.4430	429.2913	407.4063	394.0792	379.1997	378.3174	389.6176	400.8621	423.8353	437.8416	(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					7.4000	10.6334	0.6300	0.7000			0.7700	24.0478 (74)
South					7.4000	46.7521	0.6300	0.7000			0.7700	105.7315 (78)
Solar gains	129.7793	219.1175	298.6678	374.7340	428.7574	430.8977	413.1566	371.2105	324.3092	241.4756	154.9939	111.4092 (83)
Total gains	577.8822	680.6432	740.1108	804.0253	836.1637	824.9769	792.3564	749.5279	713.9269	642.3378	578.8292	549.2508 (84)

7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, nil,m (see Table 9a)													21.0000 (85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	41.7625	41.9346	42.1046	42.9223	43.0788	43.8227	43.8227	43.9633	43.5332	43.0788	42.7634	42.4384	
alpha	3.7842	3.7956	3.8070	3.8615	3.8719	3.9215	3.9215	3.9309	3.9022	3.8719	3.8509	3.8292	
util living area	0.9820	0.9663	0.9415	0.8809	0.7728	0.6021	0.4524	0.4936	0.7077	0.9000	0.9672	0.9849	(86)
MIT	19.3302	19.6046	19.9456	20.3899	20.7266	20.9261	20.9812	20.9736	20.8565	20.4238	19.8179	19.3008	(87)
Th 2	20.0240	20.0276	20.0311	20.0478	20.0510	20.0656	20.0656	20.0683	20.0600	20.0510	20.0446	20.0380	(88)
util rest of house	0.9782	0.9594	0.9293	0.8559	0.7262	0.5289	0.3617	0.4013	0.6394	0.8737	0.9594	0.9817	(89)
MIT 2	18.5092	18.7816	19.1170	19.5524	19.8560	20.0254	20.0588	20.0581	19.9736	19.5945	19.0072	18.4906	(90)
Living area fraction									fLA = Living area / (4) =			0.2439	(91)
MIT	18.7094	18.9823	19.3191	19.7567	20.0683	20.2450	20.2838	20.2814	20.1890	19.7968	19.2049	18.6882	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7094	18.9823	19.3191	19.7567	20.0683	20.2450	20.2838	20.2814	20.1890	19.7968	19.2049	18.6882	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9714	0.9501	0.9184	0.8472	0.7271	0.5436	0.3834	0.4231	0.6495	0.8654	0.9505	0.9757	(94)
Useful gains	561.3560	646.6703	679.6953	681.1300	608.0140	448.4622	303.8082	317.1073	463.6644	555.8628	550.2007	535.8884	(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	1266.3287	1232.4999	1117.4087	928.3255	712.9512	472.7740	308.5163	324.0262	513.3438	783.5317	1038.9030	1252.9671	(97)
Space heating kWh	524.4997	393.6775	325.6588	177.9808	78.0733	0.0000	0.0000	0.0000	0.0000	169.3857	351.8657	533.5066	(98a)
Space heating requirement - total per year (kWh/year)												2554.6480	
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	524.4997	393.6775	325.6588	177.9808	78.0733	0.0000	0.0000	0.0000	0.0000	169.3857	351.8657	533.5066	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2554.6480	
Space heating per m ²										(98c) / (4) =		31.1542	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	787.2520	619.7516	634.4662	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8531	0.9096	0.8898	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	671.5804	563.7376	564.5755	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	918.0727	882.2470	834.4575	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	177.4744	236.9710	200.7922	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	44.3686	59.2428	50.1981	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												153.8094	(107)

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Energy for space heating	31.1542 (99)
Energy for space cooling	1.8757 (108)
Total	33.0300 (109)
Fabric Energy Efficiency (TFEE)	33.0 (109)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	82.0000 (1b)	3.1500 (2b)	258.3000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.0000		(3a) + (3b) + (3c) + (3d) + (3e) ... (3n) = 258.3000 (5)
Dwelling volume			

2. Ventilation rate

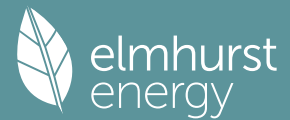
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (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	0.2862	0.2825	0.2787	0.2600	0.2562	0.2375	0.2375	0.2337	0.2450	0.2562	0.2637	0.2712 (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												
Glazing			14.8000	0.7752	11.4729			(27)				
External Wall North	34.6500	7.4000	27.2500	0.1400	3.8150	70.0000	1907.5000	(29a)				
External Wall West	27.7200		27.7200	0.1400	3.8808	70.0000	1940.4000	(29a)				
External Wall South	37.8000	7.4000	30.4000	0.1400	4.2560	70.0000	2128.0000	(29a)				
Total net area of external elements Aum(A, m2)			100.1700					(31)				
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		23.4247			(33)				
Main dwelling												
Party Wall 1 East			30.5600	0.0000	0.0000	45.0000	1375.2000	(32)				
Party Floor 1			82.0000			30.0000	2460.0000	(32d)				
Party Ceiling 1			82.0000			30.0000	2460.0000	(32b)				
Internal Wall 1			104.6100			9.0000	941.4900	(32c)				
Heat capacity Cm = Sum(A x k)						(28) ... (30) + (32) + (32a) ... (32e) =	13212.5900	(34)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							161.1291	(35)				
List of Thermal Bridges												
K1 Element					Length	Psi-value	Total					
E7 Party floor between dwellings (in blocks of flats)					41.5000	0.0300	1.2450					
E18 Party wall between dwellings					12.6000	0.0300	0.3780					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								1.6230 (36)				
Point Thermal bridges							(36a) =	0.0000				
Total fabric heat loss							(33) + (36) + (36a) =	25.0477 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 24.3997	Feb 24.0800	Mar 23.7604	Apr 22.1621	May 21.8425	Jun 20.2443	Jul 20.2443	Aug 19.9246	Sep 20.8836	Oct 21.8425	Nov 22.4818	Dec 23.1211 (38)
Heat transfer coeff	49.4473	49.1277	48.8080	47.2098	46.8902	45.2919	45.2919	44.9723	45.9312	46.8902	47.5295	48.1687 (39)
Average = Sum(39)m / 12 =												47.1299
HLP	Jan 0.6030	Feb 0.5991	Mar 0.5952	Apr 0.5757	May 0.5718	Jun 0.5523	Jul 0.5523	Aug 0.5484	Sep 0.5601	Oct 0.5718	Nov 0.5796	Dec 0.5874 (40)
HLP (average)												0.5748
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

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4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.4997 (42)
Hot water usage for mixer showers												
72.5185	71.4083	69.7721	67.2550	64.9998	61.8448	59.3493	62.2666	63.7339	66.8588	70.1132	72.4531	(42a)
Hot water usage for baths												
27.9253	27.5038	26.9041	26.0060	25.1966	24.0824	23.2371	24.2707	24.8132	25.9172	27.0651	27.9032	(42b)
Hot water usage for other uses												
40.2296	38.7667	37.3038	35.8409	34.3780	32.9151	32.9151	34.3780	35.8409	37.3038	38.7667	40.2296	(42c)
Average daily hot water use (litres/day)												129.3222 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	140.6734	137.6787	133.9799	129.1019	124.5744	118.8423	115.5015	120.9154	124.3880	130.0799	135.9449	140.5859 (44)
Energy content	207.0955	182.1768	191.4545	168.6393	160.5267	137.4371	127.6326	142.3196	144.2839	167.6210	183.7340	206.4606 (45)
Energy content (annual)												Total = Sum(45)m = 2019.3818
Distribution loss (46)m = 0.15 x (45)m												
31.0643	27.3265	28.7182	25.2959	24.0790	20.6156	19.1449	21.3479	21.6426	25.1432	27.5601	30.9691	(46)
Water storage loss:												
Store volume												110.0000 (47)
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	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	(61)
Total heat required for water heating calculated for each month												
262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(62)
WWHRS	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	(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	(63c)
FGHRS	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	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374 (64)
Total per year (kWh/year) = Sum(64)m =												2670.2216 (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	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	113.0807	100.5157	107.8801	98.8675	97.5966	88.4928	86.6593	91.5427	90.7693	99.9554	103.8865	112.8696 (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	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.5120	25.3241	20.5949	15.5917	11.6550	9.8396	10.6321	13.8199	18.5491	23.5523	27.4891	29.3044 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	333.6861	337.1487	328.4230	309.8470	286.3982	264.3597	249.6366	246.1740	254.8996	273.4756	296.9244	318.9629 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980 (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)	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886 (71)
Water heating gains (Table 5)	151.9902	149.5770	145.0001	137.3160	131.1782	122.9066	116.4775	123.0413	126.0685	134.3487	144.2868	151.7065 (72)
Total internal gains	616.6805	614.5420	596.5103	565.2470	531.7237	499.5982	479.2384	485.5275	502.0096	533.8689	571.1926	602.4661 (73)

6. Solar gains												
[Jan]												
	Area	Solar flux		g		FF		Access		Gains		
	m2	Table 6a		Specific data		Specific data		factor		W		
		W/m2		or Table 6b		or Table 6c		Table 6d				
North	7.4000	10.6334		0.3500		0.8500		0.7700		16.2227		(74)
South	7.4000	46.7521		0.3500		0.8500		0.7700		71.3268		(78)
Solar gains	87.5495	147.8174	201.4822	252.7968	289.2411	290.6849	278.7168	250.4198	218.7800	162.9002	104.5594	75.1570 (83)
Total gains	704.2300	762.3594	797.9925	818.0438	820.9648	790.2832	757.9552	735.9473	720.7896	696.7691	675.7520	677.6231 (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	74.2237	74.7066	75.1959	77.7416	78.2715	81.0335	81.0335	81.6095	79.9056	78.2715	77.2187	76.1939
alpha	5.9482	5.9804	6.0131	6.1828	6.2181	6.4022	6.4022	6.4406	6.3270	6.2181	6.1479	6.0796
util living area	0.9147	0.8720	0.8012	0.6735	0.5263	0.3664	0.2629	0.2810	0.4383	0.6752	0.8502	0.9227 (86)
MIT	20.6166	20.7334	20.8554	20.9569	20.9914	20.9994	20.9999	20.9999	20.9979	20.9633	20.8169	20.6099 (87)
Th 2	20.4273	20.4308	20.4343	20.4519	20.4554	20.4731	20.4731	20.4766	20.4660	20.4554	20.4484	20.4413 (88)
util rest of house	0.9035	0.8571	0.7808	0.6475	0.4967	0.3364	0.2314	0.2491	0.4049	0.6449	0.8316	0.9125 (89)
MIT 2	19.9908	20.1337	20.2796	20.4091	20.4478	20.4726	20.4731	20.4766	20.4644	20.4205	20.2506	19.9951 (90)
Living area fraction												fLA = Living area / (4) = 0.2439 (91)
MIT	20.1434	20.2799	20.4200	20.5427	20.5804	20.6011	20.6016	20.6042	20.5945	20.5529	20.3887	20.1450 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1434	20.2799	20.4200	20.5427	20.5804	20.6011	20.6016	20.6042	20.5945	20.5529	20.3887	20.1450 (93)

Full SAP Calculation Printout



8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8975	0.8529	0.7803	0.6519	0.5035	0.3437	0.2391	0.2569	0.4129	0.6504	0.8294	0.9065	(94)
Useful gains	632.0305	650.2077	622.6752	533.2787	413.3677	271.6092	181.2239	189.0510	297.6428	453.1952	560.4942	614.2723	(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	783.4156	755.5813	679.4083	549.6504	416.4034	271.8013	181.2384	189.0732	298.3022	466.6931	631.6068	768.0520	(97)
Space heating kWh	112.6305	70.8110	42.2095	11.7876	2.2586	0.0000	0.0000	0.0000	0.0000	10.0424	51.2011	114.4121	(98a)
Space heating requirement - total per year (kWh/year)												415.3528	
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	112.6305	70.8110	42.2095	11.7876	2.2586	0.0000	0.0000	0.0000	0.0000	10.0424	51.2011	114.4121	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												415.3528	
Space heating per m2												(98c) / (4) =	5.0653 (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												1.0000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	112.6305	70.8110	42.2095	11.7876	2.2586	0.0000	0.0000	0.0000	0.0000	10.0424	51.2011	114.4121	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													
307a	112.6305	70.8110	42.2095	11.7876	2.2586	0.0000	0.0000	0.0000	0.0000	10.0424	51.2011	114.4121	
Space heating requirement	112.6305	70.8110	42.2095	11.7876	2.2586	0.0000	0.0000	0.0000	0.0000	10.0424	51.2011	114.4121	(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	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310a	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	
Water heating fuel	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(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	18.7349	16.9218	18.7349	18.1305	18.7349	18.1305	18.7349	18.7349	18.1305	18.7349	18.1305	18.7349	(331)
Lighting	24.9564	20.0209	18.0266	13.2071	10.2015	8.3347	9.3062	12.0965	15.7122	20.6152	23.2849	25.6500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												415.3528	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2670.2216	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												4.1535	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)													
mechanical ventilation fans (SFP = 0.7000)												220.5882	(330a)
Total electricity for the above, kWh/year												220.5882	(331)
Electricity for lighting (calculated in Appendix L)												201.4122	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3507.5748	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	415.3528	4.4400	18.4417	(340a)
Space heating total			18.4417	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2670.2216	4.4400	118.5578	(342a)
Water heating total			118.5578	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	220.5882	16.4900	36.3750	(349)
Energy for lighting	201.4122	16.4900	33.2129	(350)
Additional standing charges			92.0000	(351)
Total energy cost			298.5874	(355)

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11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.8464 (357)
SAP value		86.2800
SAP rating (Section 12)		86 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Efficiency of heat source Heat pump			262.0000 (367)
Space and Water heating from Heat pump	1177.7001	0.1586	25.1438 (367)
Electrical energy for heat distribution (space & water)	4.1535	0.0000	4.4205 (372)
Overall CO ₂ factor for heat network			0.0561 (386)
Total CO ₂ associated with community systems			173.1434 (373)
Space and water heating			173.1434 (376)
Pumps, fans and electric keep-hot	220.5882	0.1387	30.5983 (378)
Energy for lighting	201.4122	0.1443	29.0700 (379)
Total CO ₂ , kg/year			232.8117 (383)
CO ₂ emissions per m ²			2.8400 (384)
EI value			97.5436 (384a)
EI rating			98 (385)
EI band			A

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	82.0000 (1b)	x 3.1500 (2b)	= 258.3000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	258.3000 (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		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1500	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.8000	4.5000	4.4000	3.9000	3.9000	3.6000	3.7000	3.5000	3.7000	4.0000	4.1000	4.4000 (22)
Wind factor	1.2000	1.1250	1.1000	0.9750	0.9750	0.9000	0.9250	0.8750	0.9250	1.0000	1.0250	1.1000 (22a)
Adj infilt rate	0.1800	0.1687	0.1650	0.1462	0.1462	0.1350	0.1388	0.1313	0.1388	0.1500	0.1537	0.1650 (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	0.2750	0.2637	0.2600	0.2412	0.2412	0.2300	0.2337	0.2262	0.2337	0.2450	0.2487	0.2600 (25)

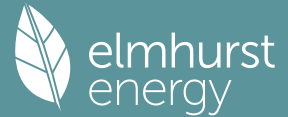
3. Heat losses and heat loss parameter

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							
Glazing			14.8000	0.7752	11.4729		(27)
External Wall North	34.6500	7.4000	27.2500	0.1400	3.8150	70.0000	1907.5000 (29a)
External Wall West	27.7200		27.7200	0.1400	3.8808	70.0000	1940.4000 (29a)
External Wall South	37.8000	7.4000	30.4000	0.1400	4.2560	70.0000	2128.0000 (29a)
Total net area of external elements Aum(A, m ²)			100.1700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	23.4247		(33)

elmhurst
energy

6. Solar gains						
[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	7.4000	12.7054	0.3500	0.8500	0.7700	19.3838 (74)
South	7.4000	53.5774	0.3500	0.8500	0.7700	81.7397 (78)

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Solar gains	101.1236	151.9331	207.2974	276.6322	306.7359	330.5462	312.8445	282.0126	241.7787	179.2674	121.9575	83.9595 (83)
Total gains	717.8041	766.4751	803.8077	841.8792	838.4596	830.1444	792.0829	767.5401	743.7883	713.1363	693.1501	686.4256 (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	75.6916	77.2187	77.7416	80.4656	80.4656	82.1937	81.6095	82.7863	81.6095	79.9056	79.3534	77.7416
alpha	6.0461	6.1479	6.1828	6.3644	6.3644	6.4796	6.4406	6.5191	6.4406	6.3270	6.2902	6.1828
util living area	0.8892	0.8454	0.7606	0.6111	0.4553	0.3011	0.2044	0.2022	0.3624	0.5894	0.7906	0.8939 (86)
MIT	20.7086	20.8014	20.9047	20.9785	20.9969	20.9998	21.0000	21.0000	20.9995	20.9854	20.8961	20.7184 (87)
Th 2	20.4378	20.4484	20.4519	20.4695	20.4695	20.4802	20.4766	20.4837	20.4766	20.4660	20.4625	20.4519 (88)
util rest of house	0.8754	0.8287	0.7386	0.5853	0.4270	0.2732	0.1747	0.1723	0.3310	0.5579	0.7678	0.8805 (89)
MIT 2	20.1112	20.2299	20.3518	20.4488	20.4670	20.4801	20.4766	20.4837	20.4763	20.4529	20.3541	20.1361 (90)
Living area fraction	20.2569	20.3693	20.4867	20.5780	20.5962	20.6068	20.6043	20.6096	20.6039	20.5828	20.4863	0.2439 (91)
MIT	20.2569	20.3693	20.4867	20.5780	20.5962	20.6068	20.6043	20.6096	20.6039	20.5828	20.4863	0.2000 (92)
Temperature adjustment	20.2569	20.3693	20.4867	20.5780	20.5962	20.6068	20.6043	20.6096	20.6039	20.5828	20.4863	0.0000 (93)
adjusted MIT	20.2569	20.3693	20.4867	20.5780	20.5962	20.6068	20.6043	20.6096	20.6039	20.5828	20.4863	20.2781 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8707	0.8261	0.7400	0.5907	0.4338	0.2800	0.1819	0.1796	0.3386	0.5648	0.7689	0.8759 (94)
Useful gains	624.9806	633.2158	594.8403	497.2569	363.6885	232.4553	144.1013	137.8577	251.8621	402.8093	532.9486	601.2549 (95)
Ext temp.	5.0000	5.4000	7.1000	9.5000	12.6000	15.4000	17.4000	17.5000	15.0000	11.7000	8.1000	5.2000 (96)
Heat loss rate W	739.7836	711.4834	631.9812	505.2840	364.7215	232.4991	144.1034	137.8593	252.0187	407.9960	572.8775	711.8361 (97)
Space heating kWh	85.4134	52.5958	27.6328	5.7795	0.7686	0.0000	0.0000	0.0000	0.0000	3.8589	28.7488	82.2724 (98a)
Space heating requirement - total per year (kWh/year)												287.0703
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	85.4134	52.5958	27.6328	5.7795	0.7686	0.0000	0.0000	0.0000	0.0000	3.8589	28.7488	82.2724 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												287.0703
Space heating per m2										(98c) / (4) =		3.5009 (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												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	85.4134	52.5958	27.6328	5.7795	0.7686	0.0000	0.0000	0.0000	0.0000	3.8589	28.7488	82.2724 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	85.4134	52.5958	27.6328	5.7795	0.7686	0.0000	0.0000	0.0000	0.0000	3.8589	28.7488	82.2724
Space heating requirement	85.4134	52.5958	27.6328	5.7795	0.7686	0.0000	0.0000	0.0000	0.0000	3.8589	28.7488	82.2724 (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	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00												
310a	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374
Water heating fuel	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374 (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	18.7349	16.9218	18.7349	18.1305	18.7349	18.1305	18.7349	18.1305	18.1305	18.7349	18.1305	18.7349 (331)
Lighting	24.9564	20.0209	18.0266	13.2071	10.2015	8.3347	9.3062	12.0965	15.7122	20.6152	23.2849	25.6500 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												287.0703 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2670.2216 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												2.8707 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)												
mechanical ventilation fans (SFP = 0.7000)												220.5882 (330a)
Total electricity for the above, kWh/year												220.5882 (331)
Electricity for lighting (calculated in Appendix L)												201.4122 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												

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PV generation	0.0000 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	3379.2922 (338)

10b. Fuel costs - using BEDF prices (568)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating from Heat pump	287.0703	5.6000	16.0759 (340a)
Space heating total			16.0759 (340)
Total CO2 associated with community systems			0.0000 (473)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Heat pump	2670.2216	5.6000	149.5324 (342a)
Water heating total			149.5324 (342)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (347a)
Pumps, fans and electric keep-hot	220.5882	26.0600	57.4853 (349)
Energy for lighting	201.4122	26.0600	52.4880 (350)
Additional standing charges			99.0000 (351)
Total energy cost			374.5816 (355)

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			262.0000 (367)
Space and Water heating from Heat pump	1128.7373	0.1594	17.4694 (367)
Electrical energy for heat distribution (space & water)	2.8707	0.0000	4.2195 (372)
Overall CO2 factor for heat network			0.0559 (386)
Total CO2 associated with community systems			165.2680 (373)
Space and water heating			165.2680 (376)
Pumps, fans and electric keep-hot	220.5882	0.1387	30.5983 (378)
Energy for lighting	201.4122	0.1443	29.0700 (379)
Total CO2, kg/year			224.9363 (383)

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			262.0000 (467a)
Space and Water heating from Heat pump	1128.7373	1.5902	174.2330 (467)
Electrical energy for heat distribution (space & water)	2.8707	0.0000	45.1767 (472)
Overall CO2 factor for heat network			0.5983 (486)
Total CO2 associated with community systems			1769.4798 (473)
Space and water heating			1769.4798 (476)
Pumps, fans and electric keep-hot	220.5882	1.5128	333.7058 (478)
Energy for lighting	201.4122	1.5338	308.9328 (479)
Total Primary energy kWh/year			2412.1184 (483)

SAP 10 EPC IMPROVEMENTS

0301_2B4P_BL

Current energy efficiency rating:	B 86
Current environmental impact rating:	A 98

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures: (none)	SAP change	Cost change	CO2 change
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Recommended measures (none)	Typical annual savings	Energy efficiency	Environmental impact
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Total Savings £0 0.00 kg/m²

Potential energy efficiency rating:	B 86
Potential environmental impact rating:	A 98

Fuel prices for cost data on this page from database revision number 568 TEST (31 Mar 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, South East England):

	Current	Potential	Saving
Electricity	£110	£110	£0
Community scheme	£265	£265	£0
Space heating	£173	£173	£0
Water heating	£150	£150	£0
Lighting	£52	£52	£0
Total cost of fuels	£375	£375	£0
Total cost of uses	£375	£375	£0
Delivered energy	41 kWh/m²	41 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	3 kg/m²	3 kg/m²	0 kg/m²
Primary energy	29 kWh/m²	29 kWh/m²	0 kWh/m²

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SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	82.0000 (1b)	x 3.1500 (2b)	= 258.3000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.0000		(4)
Dwelling volume		(3a) + (3b) + (3c) + (3d) + (3e) ... (3n) =	258.3000 (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	0	(19)

Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1500 (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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (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	0.2862	0.2825	0.2787	0.2600	0.2562	0.2375	0.2375	0.2337	0.2450	0.2562	0.2637	0.2712 (25)

3. Heat losses and heat loss parameter

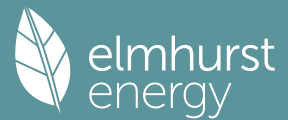
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Glazing			14.8000	0.7752	11.4729		(27)
External Wall North	34.6500	7.4000	27.2500	0.1400	3.8150	70.0000	1907.5000 (29a)
External Wall West	27.7200		27.7200	0.1400	3.8808	70.0000	1940.4000 (29a)
External Wall South	37.8000	7.4000	30.4000	0.1400	4.2560	70.0000	2128.0000 (29a)
Total net area of external elements Aum(A, m ²)			100.1700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.4247		(33)
Main dwelling							
Party Wall 1 East			30.5600	0.0000	0.0000	45.0000	1375.2000 (32)
Party Floor 1			82.0000			30.0000	2460.0000 (32d)
Party Ceiling 1			82.0000			30.0000	2460.0000 (32b)
Internal Wall 1			104.6100			9.0000	941.4900 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13212.5900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		161.1291 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450
E18 Party wall between dwellings	12.6000	0.0300	0.3780
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			1.6230 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	25.0477 (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	24.3997	24.0800	23.7604	22.1621	21.8425	20.2443	20.2443	19.9246	20.8836	21.8425	22.4818	23.1211 (38)
Average = Sum(39)m / 12 =	49.4473	49.1277	48.8080	47.2098	46.8902	45.2919	45.2919	44.9723	45.9312	46.8902	47.5295	48.1687 (39)
												47.1299
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.6030	0.5991	0.5952	0.5757	0.5718	0.5523	0.5523	0.5484	0.5601	0.5718	0.5796	0.5874 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4997 (42)
Hot water usage for mixer showers												72.4531 (42a)
Hot water usage for baths												27.9032 (42b)
Hot water usage for other uses												40.2296 (42c)
Average daily hot water use (litres/day)												129.3222 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	140.6734	137.6787	133.9799	129.1019	124.5744	118.8423	115.5015	120.9154	124.3880	130.0799	135.9449	140.5859 (44)
Distribution loss (46)m = 0.15 x (45)m	207.0955	182.1768	191.4545	168.6393	160.5267	137.4371	127.6326	142.3196	144.2839	167.6210	183.7340	206.4606 (45)
Water storage loss:												
Store volume												110.0000 (47)
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	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374 (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	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374 (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	113.0807	100.5157	107.8801	98.8675	97.5966	88.4928	86.6593	91.5427	90.7693	99.9554	103.8865	112.8696 (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	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.5120	25.3241	20.5949	15.5917	11.6550	9.8396	10.6321	13.8199	18.5491	23.5523	27.4891	29.3044 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	333.6861	337.1487	328.4230	309.8470	286.3982	264.3597	249.6366	246.1740	254.8996	273.4756	296.9244	318.9629 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980 (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)	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886 (71)
Water heating gains (Table 5)	151.9902	149.5770	145.0001	137.3160	131.1782	122.9066	116.4775	123.0413	126.0685	134.3487	144.2868	151.7065 (72)
Total internal gains	616.6805	614.5420	596.5103	565.2470	531.7237	499.5982	479.2384	485.5275	502.0096	533.8689	571.1926	602.4661 (73)

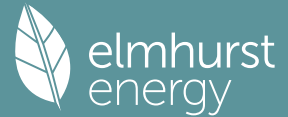
6. Solar gains

[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					7.4000	10.6334	0.3500	0.8500	0.7700	16.2227 (74)		
South					7.4000	46.7521	0.3500	0.8500	0.7700	71.3268 (78)		
Solar gains	87.5495	147.8174	201.4822	252.7968	289.2411	290.6849	278.7168	250.4198	218.7800	162.9002	104.5594	75.1570 (83)
Total gains	704.2300	762.3594	797.9925	818.0438	820.9648	790.2832	757.9552	735.9473	720.7896	696.7691	675.7520	677.6231 (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	74.2237	74.7066	75.1959	77.7416	78.2715	81.0335	81.0335	81.6095	79.9056	78.2715	77.2187	76.1939
alpha	5.9482	5.9804	6.0131	6.1828	6.2181	6.4022	6.4022	6.4406	6.3270	6.2181	6.1479	6.0796
util living area	0.9147	0.8720	0.8012	0.6735	0.5263	0.3664	0.2629	0.2810	0.4383	0.6752	0.8502	0.9227 (86)
MIT	20.6166	20.7334	20.8554	20.9569	20.9914	20.9994	20.9999	20.9999	20.9979	20.9633	20.8169	20.6099 (87)
Th 2	20.4273	20.4308	20.4343	20.4519	20.4554	20.4731	20.4731	20.4766	20.4660	20.4554	20.4484	20.4413 (88)
util rest of house	0.9035	0.8571	0.7808	0.6475	0.4967	0.3364	0.2314	0.2491	0.4049	0.6449	0.8316	0.9125 (89)
MIT 2	19.9908	20.1337	20.2796	20.4091	20.4478	20.4726	20.4731	20.4766	20.4644	20.4205	20.2506	19.9951 (90)
Living area fraction	20.1434	20.2799	20.4200	20.5427	20.5804	20.6011	20.6016	20.6042	20.5945	20.5529	20.3887	20.1450 (91)
MIT	20.1434	20.2799	20.4200	20.5427	20.5804	20.6011	20.6016	20.6042	20.5945	20.5529	20.3887	20.1450 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1434	20.2799	20.4200	20.5427	20.5804	20.6011	20.6016	20.6042	20.5945	20.5529	20.3887	20.1450 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8975	0.8529	0.7803	0.6519	0.5035	0.3437	0.2391	0.2569	0.4129	0.6504	0.8294	0.9065	(94)
Useful gains	632.0305	650.2077	622.6752	533.2787	413.3677	271.6092	181.2239	189.0510	297.6428	453.1952	560.4942	614.2723	(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	783.4156	755.5813	679.4083	549.6504	416.4034	271.8013	181.2384	189.0732	298.3022	466.6931	631.6068	768.0520	(97)
Space heating kWh	112.6305	70.8110	42.2095	11.7876	2.2586	0.0000	0.0000	0.0000	0.0000	10.0424	51.2011	114.4121	(98a)
Space heating requirement - total per year (kWh/year)												415.3528	
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	112.6305	70.8110	42.2095	11.7876	2.2586	0.0000	0.0000	0.0000	0.0000	10.0424	51.2011	114.4121	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												415.3528	
Space heating per m2												5.0653	(99)
											(98c) / (4) =		

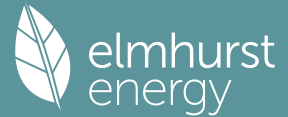
9b. Energy requirements

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												1.0000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	112.6305	70.8110	42.2095	11.7876	2.2586	0.0000	0.0000	0.0000	0.0000	10.0424	51.2011	114.4121	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													
307a	112.6305	70.8110	42.2095	11.7876	2.2586	0.0000	0.0000	0.0000	0.0000	10.0424	51.2011	114.4121	
Space heating requirement	112.6305	70.8110	42.2095	11.7876	2.2586	0.0000	0.0000	0.0000	0.0000	10.0424	51.2011	114.4121	(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	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310a	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	
Water heating fuel	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(310)
Cooling System Energy Efficiency Ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	18.7349	16.9218	18.7349	18.1305	18.7349	18.1305	18.7349	18.7349	18.1305	18.7349	18.1305	18.7349	(331)
Lighting	24.9564	20.0209	18.0266	13.2071	10.2015	8.3347	9.3062	12.0965	15.7122	20.6152	23.2849	25.6500	(332)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												415.3528	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2670.2216	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												4.1535	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)													
mechanical ventilation fans (SFP = 0.7000)												220.5882	(330a)
Total electricity for the above, kWh/year												220.5882	(331)
Electricity for lighting (calculated in Appendix L)												201.4122	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3507.5748	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	415.3528	4.4400	18.4417	(340a)
Space heating total			18.4417	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2670.2216	4.4400	118.5578	(342a)
Water heating total			118.5578	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	220.5882	16.4900	36.3750	(349)
Energy for lighting	201.4122	16.4900	33.2129	(350)
Additional standing charges			92.0000	(351)
Total energy cost			298.5874	(355)

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11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.8464 (357)
SAP value		86.2800
SAP rating (Section 12)		86 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Efficiency of heat source Heat pump			262.0000 (367)
Space and Water heating from Heat pump	1177.7001	0.1586	25.1438 (367)
Electrical energy for heat distribution (space & water)	4.1535	0.0000	4.4205 (372)
Overall CO ₂ factor for heat network			0.0561 (386)
Total CO ₂ associated with community systems			173.1434 (373)
Space and water heating			173.1434 (376)
Pumps, fans and electric keep-hot	220.5882	0.1387	30.5983 (378)
Energy for lighting	201.4122	0.1443	29.0700 (379)
Total CO ₂ , kg/year			232.8117 (383)
CO ₂ emissions per m ²			2.8400 (384)
EI value			97.5436 (384a)
EI rating			98 (385)
EI band			A

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	82.0000 (1b)	x 3.1500 (2b)	= 258.3000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	258.3000 (5)

2. Ventilation rate

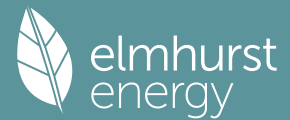
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.8000	4.5000	4.4000	3.9000	3.9000	3.6000	3.7000	3.5000	3.7000	4.0000	4.1000	4.4000 (22)
Wind factor	1.2000	1.1250	1.1000	0.9750	0.9750	0.9000	0.9250	0.8750	0.9250	1.0000	1.0250	1.1000 (22a)
Adj infilt rate	0.1800	0.1687	0.1650	0.1462	0.1462	0.1350	0.1388	0.1313	0.1388	0.1500	0.1537	0.1650 (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	0.2750	0.2637	0.2600	0.2412	0.2412	0.2300	0.2337	0.2262	0.2337	0.2450	0.2487	0.2600 (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							
Glazing			14.8000	0.7752	11.4729		(27)
External Wall North	34.6500	7.4000	27.2500	0.1400	3.8150	70.0000	1907.5000 (29a)
External Wall West	27.7200		27.7200	0.1400	3.8808	70.0000	1940.4000 (29a)
External Wall South	37.8000	7.4000	30.4000	0.1400	4.2560	70.0000	2128.0000 (29a)
Total net area of external elements Aum(A, m ²)			100.1700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.4247		(33)
Main dwelling							
Party Wall 1 East			30.5600	0.0000	0.0000	45.0000	1375.2000 (32)
Party Floor 1			82.0000			30.0000	2460.0000 (32d)

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Party Ceiling 1	82.0000										30.0000	2460.0000	(32b)		
Internal Wall 1	104.6100										9.0000	941.4900	(32c)		
Heat capacity Cm = Sum(A x k)										(28)...(30) + (32) + (32a)...(32e) = 13212.5900				(34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K										161.1291				(35)	
List of Thermal Bridges															
K1 Element											Length	Psi-value	Total		
E7 Party floor between dwellings (in blocks of flats)											41.5000	0.0300	1.2450		
E18 Party wall between dwellings											12.6000	0.0300	0.3780		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)														1.6230	(36)
Point Thermal bridges										(36a) =				0.0000	
Total fabric heat loss										(33) + (36) + (36a) =				25.0477	(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	23.4407	22.4818	22.1621	20.5639	20.5639	19.6050	19.9246	19.2853	19.9246	20.8836	21.2032	22.1621	(38)		
Average = Sum(39)m / 12 =	48.4884	47.5295	47.2098	45.6116	45.6116	44.6526	44.9723	44.3330	44.9723	45.9312	46.2509	47.2098	(39)		
												46.0644			
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(40)		
HLP (average)	0.5913	0.5796	0.5757	0.5562	0.5562	0.5445	0.5484	0.5406	0.5484	0.5601	0.5640	0.5757	(40)		
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31			
												0.5618			
												31			

4. Water heating energy requirements (kWh/year)															

Assumed occupancy													2.4997	(42)	
Hot water usage for mixer showers															
	72.5185	71.4083	69.7721	67.2550	64.9998	61.8448	59.3493	62.2666	63.7339	66.8588	70.1132	72.4531	(42a)		
Hot water usage for baths	27.9253	27.5038	26.9041	26.0060	25.1966	24.0824	23.2371	24.2707	24.8132	25.9172	27.0651	27.9032	(42b)		
Hot water usage for other uses	40.2296	38.7667	37.3038	35.8409	34.3780	32.9151	32.9151	34.3780	35.8409	37.3038	38.7667	40.2296	(42c)		
Average daily hot water use (litres/day)												129.3222	(43)		
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Energy conte	140.6734	137.6787	133.9799	129.1019	124.5744	118.8423	115.5015	120.9154	124.3880	130.0799	135.9449	140.5859	(44)		
Energy content (annual)	207.0955	182.1768	191.4545	168.6393	160.5267	137.4371	127.6326	142.3196	144.2839	167.6210	183.7340	206.4606	(45)		
Distribution loss (46)m = 0.15 x (45)m	31.0643	27.3265	28.7182	25.2959	24.0790	20.6156	19.1449	21.3479	21.6426	25.1432	27.5601	30.9691	(46)		
Water storage loss:															
Store volume												110.0000	(47)		
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	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(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	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(64)		
												2670.2216	(64)		
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)		
												0.0000	(64a)		
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =															
Heat gains from water heating, kWh/month	113.0807	100.5157	107.8801	98.8675	97.5966	88.4928	86.6593	91.5427	90.7693	99.9554	103.8865	112.8696	(65)		

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

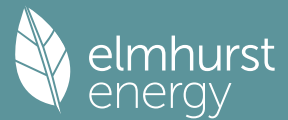
Metabolic gains (Table 5), Watts															
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	(66)		
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	28.5120	25.3241	20.5949	15.5917	11.6550	9.8396	10.6321	13.8199	18.5491	23.5523	27.4891	29.3044	(67)		
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	333.6861	337.1487	328.4230	309.8470	286.3982	264.3597	249.6366	246.1740	254.8996	273.4756	296.9244	318.9629	(68)		
Pumps, fans	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	(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)	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	(71)		
Total internal gains	151.9902	149.5770	145.0001	137.3160	131.1782	122.9066	116.4775	123.0413	126.0685	134.3487	144.2868	151.7065	(72)		
	616.6805	614.5420	596.5103	565.2470	531.7237	499.5982	479.2384	485.5275	502.0096	533.8689	571.1926	602.4661	(73)		

6. Solar gains															

[Jan]															
	Area														
	m2														
	Solar flux														
	Table 6a														
	W/m2														
	Specific data														
	or Table 6b														
	Specific data														
	or Table 6c														
	Access														
	factor														
	Table 6d														
	Gains														
	W														
North	7.4000												19.3838	(74)	
South	7.4000												81.7397	(78)	

Solar gains	101.1236	151.9331	207.2974	276.6322	306.7359	330.5462	312.8445	282.0126	241.7787	179.2674	121.9575	83.9595	(83)		

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Total gains 717.8041 766.4751 803.8077 841.8792 838.4596 830.1444 792.0829 767.5401 743.7883 713.1363 693.1501 686.4256 (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	75.6916	77.2187	77.7416	80.4656	80.4656	82.1937	81.6095	82.7863	81.6095	79.9056	79.3534	77.7416
alpha	6.0461	6.1479	6.1828	6.3644	6.3644	6.4796	6.4406	6.5191	6.4406	6.3270	6.2902	6.1828
util living area	0.8892	0.8454	0.7606	0.6111	0.4553	0.3011	0.2044	0.2022	0.3624	0.5894	0.7906	0.8939 (86)
MIT	20.7086	20.8014	20.9047	20.9785	20.9969	20.9998	21.0000	21.0000	20.9995	20.9854	20.8961	20.7184 (87)
Th 2	20.4378	20.4484	20.4519	20.4695	20.4695	20.4802	20.4766	20.4837	20.4766	20.4660	20.4625	20.4519 (88)
util rest of house	0.8754	0.8287	0.7386	0.5853	0.4270	0.2732	0.1747	0.1723	0.3310	0.5579	0.7678	0.8805 (89)
MIT 2	20.1112	20.2299	20.3518	20.4488	20.4670	20.4801	20.4766	20.4837	20.4763	20.4529	20.3541	20.1361 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	20.2569	20.3693	20.4867	20.5780	20.5962	20.6068	20.6043	20.6096	20.6039	20.5828	20.4863	20.2781 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2569	20.3693	20.4867	20.5780	20.5962	20.6068	20.6043	20.6096	20.6039	20.5828	20.4863	20.2781 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8707	0.8261	0.7400	0.5907	0.4338	0.2800	0.1819	0.1796	0.3386	0.5648	0.7689	0.8759 (94)
Useful gains	624.9806	633.2158	594.8403	497.2569	363.6885	232.4553	144.1013	137.8577	251.8621	402.8093	532.9486	601.2549 (95)
Ext temp.	5.0000	5.4000	7.1000	9.5000	12.6000	15.4000	17.4000	17.5000	15.0000	11.7000	8.1000	5.2000 (96)
Heat loss rate W	739.7836	711.4834	631.9812	505.2840	364.7215	232.4991	144.1034	137.8593	252.0187	407.9960	572.8775	711.8361 (97)
Space heating kWh	85.4134	52.5958	27.6328	5.7795	0.7686	0.0000	0.0000	0.0000	0.0000	3.8589	28.7488	82.2724 (98a)
Space heating requirement - total per year (kWh/year)												287.0703
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	85.4134	52.5958	27.6328	5.7795	0.7686	0.0000	0.0000	0.0000	0.0000	3.8589	28.7488	82.2724 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												287.0703
Space heating per m2										(98c) / (4) =		3.5009 (99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)
Fraction of space heat from community system
Fraction of heat from community Heat pump-Space and Water
Factor for control and charging method (Table 4c(3)) for space heating
Factor for charging method (Table 4c(3)) for water heating
Distribution loss factor (Table 12c) for community heating system
Efficiency of secondary/supplementary heating system, %

0.0000 (301)
1.0000 (302)
1.0000 (303a)
1.0000 (305)
1.0000 (305a)
1.0000 (306)
0.0000 (208)

Space heating:

Space heating requirement	85.4134	52.5958	27.6328	5.7795	0.7686	0.0000	0.0000	0.0000	0.0000	3.8589	28.7488	82.2724 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	85.4134	52.5958	27.6328	5.7795	0.7686	0.0000	0.0000	0.0000	0.0000	3.8589	28.7488	82.2724
Space heating requirement	85.4134	52.5958	27.6328	5.7795	0.7686	0.0000	0.0000	0.0000	0.0000	3.8589	28.7488	82.2724 (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	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00												
310a	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374
Water heating fuel	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374 (310)
Cooling System Energy Efficiency Ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	18.7349	16.9218	18.7349	18.1305	18.7349	18.1305	18.7349	18.7349	18.1305	18.7349	18.1305	18.7349 (331)
Lighting	24.9564	20.0209	18.0266	13.2071	10.2015	8.3347	9.3062	12.0965	15.7122	20.6152	23.2849	25.6500 (332)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												287.0703 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2670.2216 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												2.8707 (313)
Space cooling fuel												0.0000 (321)

Electricity for pumps and fans:

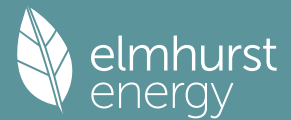
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)
mechanical ventilation fans (SFP = 0.7000)

Total electricity for the above, kWh/year 220.5882 (330a)
Electricity for lighting (calculated in Appendix L) 201.4122 (332)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation 0.0000 (333)
Wind generation 0.0000 (334)
Hydro-electric generation (Appendix N) 0.0000 (335a)

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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	3379.2922 (338)

10b. Fuel costs - using BEDF prices (568)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating from Heat pump	287.0703	5.6000	16.0759 (340a)
Space heating total			16.0759 (340)
Total CO2 associated with community systems			0.0000 (473)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Heat pump	2670.2216	5.6000	149.5324 (342a)
Water heating total			149.5324 (342)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (347a)
Pumps, fans and electric keep-hot	220.5882	26.0600	57.4853 (349)
Energy for lighting	201.4122	26.0600	52.4880 (350)
Additional standing charges			99.0000 (351)
Total energy cost			374.5816 (355)

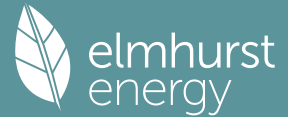
12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			262.0000 (367)
Space and Water heating from Heat pump	1128.7373	0.1594	17.4694 (367)
Electrical energy for heat distribution (space & water)	2.8707	0.0000	4.2195 (372)
Overall CO2 factor for heat network			0.0559 (386)
Total CO2 associated with community systems			165.2680 (373)
Space and water heating			165.2680 (376)
Pumps, fans and electric keep-hot	220.5882	0.1387	30.5983 (378)
Energy for lighting	201.4122	0.1443	29.0700 (379)
Total CO2, kg/year			224.9363 (383)

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			262.0000 (467a)
Space and Water heating from Heat pump	1128.7373	1.5902	174.2330 (467)
Electrical energy for heat distribution (space & water)	2.8707	0.0000	45.1767 (472)
Overall CO2 factor for heat network			0.5983 (486)
Total CO2 associated with community systems			1769.4798 (473)
Space and water heating			1769.4798 (476)
Pumps, fans and electric keep-hot	220.5882	1.5128	333.7058 (478)
Energy for lighting	201.4122	1.5338	308.9328 (479)
Total Primary energy kWh/year			2412.1184 (483)

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Property Reference	Be Lean				Issued on Date	08/04/2025
Assessment Reference	0302_1B2P_BL		Prop Type Ref			
Property						
SAP Rating	86 B	DER	3.12	TER	13.47	
Environmental	98 A	% DER < TER				76.84
CO ₂ Emissions (t/year)	0.18	DFEE	22.11	TFEE	28.68	
Compliance Check	See BREL	% DFEE < TFEE				22.89
% DPER < TPER	53.90	DPER	33.48	TPER	72.63	
Assessor Details	Alfie Gamble-Thornton				Assessor ID	CM02-0001
Client	Fifth State, Fifth State					

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	60.0000 (1b)	3.1500 (2b)	189.0000 (1b)	- (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.0000			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	189.0000 (5)	

2. Ventilation rate

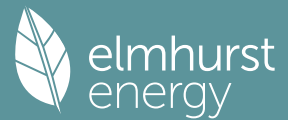
	m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	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	0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1500 (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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762	(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	0.2862	0.2825	0.2787	0.2600	0.2562	0.2375	0.2375	0.2337	0.2450	0.2562	0.2637	0.2712	(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								
Glazing			10.6500	0.7752	8.2558			(27)
External Wall North	18.0200	2.5100	15.5100	0.1400	2.1714	70.0000	1085.7000	(29a)
External Wall South	35.1500	8.1400	27.0100	0.1400	3.7814	70.0000	1890.7000	(29a)
Total net area of external elements Aum(A, m ²)			53.1700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	14.2086			(33)
Main dwelling								
Party Wall 1 East			22.4900	0.0000	0.0000	45.0000	1012.0500	(32)
Party Wall 2 West			21.8000	0.0000	0.0000	45.0000	981.0000	(32)
Party Floor 1			60.0000			30.0000	1800.0000	(32d)
Party Ceiling 1			60.0000			20.0000	1200.0000	(32b)
Internal Wall 1			56.2600			9.0000	506.3400	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		8475.7900	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							141.2632	(35)
List of Thermal Bridges								

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K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450
E18 Party wall between dwellings	12.6000	0.0300	0.3780
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			1.6230 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	15.8316 (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	17.8534	17.6195	17.3856	16.2162	15.9823	14.8129	14.8129	14.5790	15.2806	15.9823	16.4501	16.9179 (38)
Heat transfer coeff												
	33.6850	33.4511	33.2173	32.0478	31.8139	30.6445	30.6445	30.4106	31.1123	31.8139	32.2817	32.7495 (39)
Average = Sum(39)m / 12 =												31.9893
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.5614	0.5575	0.5536	0.5341	0.5302	0.5107	0.5107	0.5068	0.5185	0.5302	0.5380	0.5458 (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													1.9816 (42)
Hot water usage for mixer showers													
62.9929	62.0285	60.6072	58.4208	56.4618	53.7212	51.5536	54.0877	55.3622	58.0767	60.9035	62.9361	(42a)	
Hot water usage for baths													
24.2730	23.9066	23.3854	22.6047	21.9012	20.9327	20.1980	21.0965	21.5680	22.5276	23.5253	24.2538	(42b)	
Hot water usage for other uses													
34.9239	33.6540	32.3840	31.1140	29.8441	28.5741	28.5741	29.8441	31.1140	32.3840	33.6540	34.9239	(42c)	
Average daily hot water use (litres/day)													112.3305 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
122.1899	119.5891	116.3766	112.1396	108.2071	103.2281	100.3257	105.0282	108.0442	112.9883	118.0828	122.1138	(44)	
Energy conte	179.8846	158.2406	166.2998	146.4823	139.4358	119.3798	110.8628	123.6201	125.3259	145.5968	159.5928	179.3331	(45)
Energy content (annual)										Total = Sum(45)m =			1754.0545
Distribution loss (46)m = 0.15 x (45)m													
26.9827	23.7361	24.9450	21.9723	20.9154	17.9070	16.6294	18.5430	18.7989	21.8395	23.9389	26.9000	(46)	
Water storage loss:													
Store volume													110.0000 (47)
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													
235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099	(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	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099	(64)
										Total per year (kWh/year) = Sum(64)m =			2404.8943 (64)
12Total per year (kWh/year)													2405 (64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000 (64a)
Heat gains from water heating, kWh/month													
104.0331	92.5569	99.5161	91.5003	90.5838	82.4887	81.0833	85.3251	84.4658	92.6324	95.8596	103.8497	(65)	

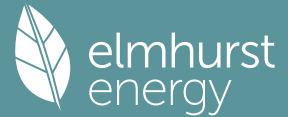
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	87.3348	96.6921	87.3348	90.2460	87.3348	90.2460	87.3348	87.3348	90.2460	87.3348	90.2460	87.3348	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	172.9469	174.7416	170.2191	160.5914	148.4380	137.0156	129.3847	127.5901	132.1125	141.7403	153.8936	165.3161	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	(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)	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	(71)
Water heating gains (Table 5)	139.8294	137.7335	133.7582	127.0838	121.7525	114.5677	108.9830	114.6843	117.3136	124.5059	133.1383	139.5829	(72)
Total internal gains	452.8357	461.8917	444.0367	430.6456	410.2498	394.5538	378.4270	382.3337	392.3966	406.3055	430.0024	444.9583	(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		2.5100	10.6334	0.3500	0.8500	0.7700	5.5026 (74)					
South		8.1400	46.7521	0.3500	0.8500	0.7700	78.4595 (78)					
Solar gains	83.9620	139.0121	181.5504	213.6975	231.4410	226.9125	219.9096	206.6932	192.4688	151.1130	99.7894	72.3834 (83)
Total gains	536.7977	600.9038	625.5870	644.3431	641.6908	621.4663	598.3366	589.0269	584.8654	557.4185	529.7917	517.3417 (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, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	69.8941	70.3828	70.8784	73.4648	74.0049	76.8290	76.8290	77.4199	75.6739	74.0049	72.9325	71.8908
alpha	5.6596	5.6922	5.7252	5.8977	5.9337	6.1219	6.1219	6.1613	6.0449	5.9337	5.8622	5.7927
util living area	0.8690	0.8003	0.7220	0.5895	0.4586	0.3154	0.2253	0.2375	0.3665	0.5823	0.7750	0.8777 (86)
MIT	20.6874	20.8121	20.9022	20.9738	20.9947	20.9996	21.0000	20.9999	20.9990	20.9794	20.8749	20.6855 (87)
Th 2	20.4648	20.4684	20.4719	20.4896	20.4932	20.5110	20.5110	20.5146	20.5039	20.4932	20.4861	20.4790 (88)
util rest of house	0.8558	0.7836	0.7018	0.5667	0.4342	0.2914	0.2003	0.2124	0.3403	0.5562	0.7552	0.8653 (89)
MIT 2	20.1094	20.2597	20.3671	20.4633	20.4884	20.5107	20.5110	20.5145	20.5030	20.4734	20.3512	20.1202 (90)
Living area fraction	20.4393	20.5750	20.6726	20.7547	20.7774	20.7898	20.7901	20.7916	fLA = Living area / (4) =	20.7861	20.6502	0.5708 (91)
MIT	20.4393	20.5750	20.6726	20.7547	20.7774	20.7898	20.7901	20.7916	20.7861	20.7622	20.6502	20.4429 (92)
Temperature adjustment												0.0000
adjusted MIT	20.4393	20.5750	20.6726	20.7547	20.7774	20.7898	20.7901	20.7916	20.7861	20.7622	20.6502	20.4429 (93)

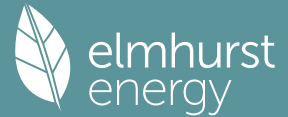
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8552	0.7871	0.7096	0.5786	0.4479	0.3051	0.2146	0.2267	0.3552	0.5702	0.7616	0.8644 (94)
Useful gains	459.0589	472.9447	443.9290	372.8177	287.3902	189.5909	128.3955	133.5409	207.7612	317.8159	403.5079	447.1828 (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	543.6540	524.3482	470.7732	379.9184	288.7870	189.6831	128.4036	133.5520	208.0204	323.3007	437.4226	531.9464 (97)
Space heating kWh	62.9387	34.5432	19.9721	5.1125	1.0392	0.0000	0.0000	0.0000	0.0000	4.0807	24.4186	63.0641 (98a)
Space heating requirement - total per year (kWh/year)												215.1692
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	62.9387	34.5432	19.9721	5.1125	1.0392	0.0000	0.0000	0.0000	0.0000	4.0807	24.4186	63.0641 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												215.1692
Space heating per m2										(98c) / (4) =		3.5862 (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												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	62.9387	34.5432	19.9721	5.1125	1.0392	0.0000	0.0000	0.0000	0.0000	4.0807	24.4186	63.0641 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	62.9387	34.5432	19.9721	5.1125	1.0392	0.0000	0.0000	0.0000	0.0000	4.0807	24.4186	63.0641
Space heating requirement	62.9387	34.5432	19.9721	5.1125	1.0392	0.0000	0.0000	0.0000	0.0000	4.0807	24.4186	63.0641 (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	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00												
310a	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099
Water heating fuel	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099 (310)
Cooling System Energy Efficiency Ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	13.7085	12.3818	13.7085	13.2662	13.7085	13.2662	13.7085	13.7085	13.2662	13.7085	13.2662	13.7085 (313)
Lighting	16.0447	12.8716	11.5895	8.4909	6.5586	5.3585	5.9830	7.7770	10.1015	13.2537	14.9700	16.4906 (332)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												215.1692 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2404.8943 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												2.1517 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)												
mechanical ventilation fans (SFP = 0.7000)												161.4060 (330a)
Total electricity for the above, kWh/year												161.4060 (331)
Electricity for lighting (calculated in Appendix L)												129.4896 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (333)
Wind generation												0.0000 (334)
Hydro-electric generation (Appendix N)												0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)
Appendix Q - special features												
Energy saved or generated												-0.0000 (336)
Energy used												0.0000 (337)
Total delivered energy for all uses												2910.9590 (338)

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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			262.0000 (367)
Space and Water heating from Heat pump	1000.0242	0.1591	13.0655 (367)
Electrical energy for heat distribution (space & water)	2.1517	0.0000	3.7284 (372)
Overall CO2 factor for heat network			0.0557 (386)
Total CO2 associated with community systems			146.0356 (373)
Space and water heating			146.0356 (376)
Pumps, fans and electric keep-hot	161.4060	0.1387	22.3890 (378)
Energy for lighting	129.4896	0.1443	18.6893 (379)
Total CO2, kg/year			187.1139 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.1200 (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			262.0000 (467a)
Space and Water heating from Heat pump	1000.0242	1.5889	130.4867 (467)
Electrical energy for heat distribution (space & water)	2.1517	0.0000	39.9882 (472)
Overall CO2 factor for heat network			0.5978 (486)
Total CO2 associated with community systems			1566.2569 (473)
Space and water heating			1566.2569 (476)
Pumps, fans and electric keep-hot	161.4060	1.5128	244.1750 (478)
Energy for lighting	129.4896	1.5338	198.6154 (479)
Total Primary energy kWh/year			2009.0473 (483)
Dwelling Primary energy Rate (DPER)			33.4800 (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	60.0000 (1b)	x 3.1500 (2b)	= 189.0000 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.0000		(3a) + (3b) + (3c) + (3d) + (3e) ... (3n) = 189.0000 (5)
Dwelling volume			

2. Ventilation rate

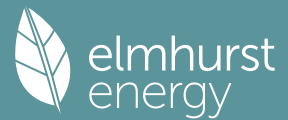
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.1058 (8)
Pressure Test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3558 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3558 (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	0.4537	0.4448	0.4359	0.3914	0.3825	0.3380	0.3380	0.3291	0.3558	0.3825	0.4003	0.4181 (22b)
Effective ac	0.6029	0.5989	0.5950	0.5766	0.5732	0.5571	0.5571	0.5542	0.5633	0.5732	0.5801	0.5874 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opening Type			10.6500	1.1450	12.1947		(27)
External Wall North	18.0200	2.5100	15.5100	0.1800	2.7918		(29a)
External Wall South	35.1500	8.1400	27.0100	0.1800	4.8618		(29a)
Total net area of external elements Aum(A, m2)			53.1700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		19.8483		(33)
Main dwelling							
Party Wall 1 East			22.4900	0.0000	0.0000		(32)

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Party Wall 2 West						21.8000	0.0000	0.0000					(32)												
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K													151.2632	(35)											
List of Thermal Bridges																									
K1 Element							Length	Psi-value	Total																
E7 Party floor between dwellings (in blocks of flats)						41.5000	0.0700	2.9050																	
E18 Party wall between dwellings						12.6000	0.0600	0.7560																	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)													3.6610	(36)											
Point Thermal bridges													0.0000												
Total fabric heat loss													(33) + (36) + (36a) =	23.5093	(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	37.6034	37.3542	37.1099	35.9624	35.7477	34.7483	34.7483	34.5632	35.1333	35.7477	36.1820	36.6361	(38)												
Heat transfer coeff						61.1127	60.8634	60.6191	59.4717	59.2570	58.2576	58.2576	58.0725	58.6425	59.2570	59.6913	60.1453	(39)							
Average = Sum(39)m / 12 =																	59.4706								
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec													
HLP	1.0185	1.0144	1.0103	0.9912	0.9876	0.9710	0.9710	0.9679	0.9774	0.9876	0.9949	1.0024	(40)												
HLP (average)												0.9912													
Days in mont						31	28	31	30	31	30	31	30	31											

4. Water heating energy requirements (kWh/year)																									

Assumed occupancy													1.9816	(42)											
Hot water usage for mixer showers																									
	57.4451	56.5818	55.3238	52.9169	51.1406	49.1598	48.0339	49.2823	50.6509	52.7777	55.2363	57.2250	(42a)												
Hot water usage for baths																									
	24.8265	24.4578	23.9386	22.9812	22.2644	21.4695	21.0401	21.5557	22.1171	22.9676	23.9447	24.7426	(42b)												
Hot water usage for other uses																									
	34.9239	33.6540	32.3840	31.1140	29.8441	28.5741	28.5741	29.8441	31.1140	32.3840	33.6540	34.9239	(42c)												
Average daily hot water use (litres/day)													107.7295	(43)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec													
Daily hot water use	117.1955	114.6935	111.6463	107.0121	103.2491	99.2034	97.6481	100.6821	103.8820	108.1293	112.8350	116.8914	(44)												
Energy conte	185.6090	163.3220	171.5963	146.4943	138.9931	121.9821	118.0969	124.6655	128.0969	146.7305	160.7541	183.0237	(45)												
Energy content (annual)													Total = Sum(45)m =	1789.3645											
Distribution loss (46)m = 0.15 x (45)m																									
	27.8413	24.4983	25.7394	21.9741	20.8490	18.2973	17.7145	18.6998	19.2145	22.0096	24.1131	27.4536	(46)												
Water storage loss:																									
Store volume													150.0000	(47)											
a) If manufacturer declared loss factor is known (kWh/day):																									
Temperature factor from Table 2b													1.3938	(48)											
Enter (49) or (54) in (55)													0.5400	(49)											
Total storage loss													0.7527	(55)											
	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																									
	232.2039	205.4077	218.1912	191.5861	185.5880	167.0740	164.6918	171.2604	173.1888	193.3254	205.8460	229.6186	(62)												
WWHRS	-26.2615	-23.2259	-24.3208	-20.1386	-18.7684	-16.0603	-15.0540	-16.0084	-16.6166	-19.5891	-22.1921	-25.7752	(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						205.9424	182.1819	193.8704	171.4475	166.8196	151.0137	149.6379	155.2520	156.5722	173.7363	183.6539	203.8435	(64)							
													Total per year (kWh/year) = Sum(64)m =	2093.9712	(64)										
														2094	(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						98.9909	87.9731	94.3317	84.7828	83.4911	76.6325	76.5432	78.7272	78.6657	86.0638	89.5242	98.1313	(65)							

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

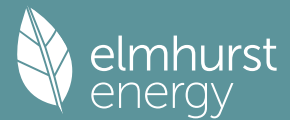
Metabolic gains (Table 5), Watts																									
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec													
(66)m	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	(66)												
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5																									
	89.2975	98.8651	89.2975	92.2741	89.2975	92.2741	89.2975	89.2975	92.2741	89.2975	92.2741	89.2975	(67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5																									
	172.9469	174.7416	170.2191	160.5914	148.4380	137.0156	129.3847	127.5901	132.1125	141.7403	153.8936	165.3161	(68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5																									
	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	(69)												
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)												
Losses e.g. evaporation (negative values) (Table 5)																									
	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	(71)												
Water heating gains (Table 5)																									
	133.0523	130.9124	126.7899	117.7539	112.2193	106.4341	102.8806	105.8161	109.2579	115.6772	124.3392	131.8969	(72)												
Total internal gains													451.0213	460.2436	442.0311	426.3439	405.6793	388.4483	374.2874	375.4283	386.3691	402.4395	426.2315	442.2350	(73)

6. Solar gains																									

[Jan]				Area	Solar flux		g	FF		Access		Gains													
				m2	Table 6a		Specific data	Specific data		factor		W													
					W/m2		or Table 6b	or Table 6c		Table 6d															
North				2.5100	10.6334		0.6300	0.7000		0.7700		8.1568	(74)												
South				8.1400	46.7521		0.6300	0.7000		0.7700		116.3046	(78)												

Solar gains	124.4614	206.0650	269.1217	316.7752	343.0772	336.3645	325.9837	306.3922	285.3067	224.0028	147.9231	107.2978	(83)												
Total gains	575.4827	666.3086	711.1528	743.1191	748.7565	724.8128	700.2710	681.8205	671.6758	626.4423	574.1545	549.5328	(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, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	41.2525	41.4215	41.5884	42.3908	42.5444	43.2743	43.2743	43.4122	42.9902	42.5444	42.2349	41.9160
alpha	3.7502	3.7614	3.7726	3.8261	3.8363	3.8850	3.8850	3.8941	3.8660	3.8363	3.8157	3.7944
util living area	0.9455	0.9108	0.8651	0.7799	0.6584	0.4948	0.3613	0.3855	0.5655	0.7867	0.9090	0.9522 (86)
MIT	19.7177	19.9948	20.2884	20.6201	20.8424	20.9612	20.9910	20.9883	20.9325	20.6649	20.1661	19.6830 (87)
Th 2	20.0679	20.0714	20.0747	20.0907	20.0937	20.1076	20.1076	20.1102	20.1022	20.0937	20.0876	20.0813 (88)
util rest of house	0.9362	0.8965	0.8439	0.7470	0.6104	0.4321	0.2901	0.3136	0.5026	0.7486	0.8921	0.9439 (89)
MIT 2	18.6007	18.9442	19.3038	19.7064	19.9531	20.0807	20.1034	20.1044	20.0519	19.7676	19.1733	18.5672 (90)
Living area fraction	FLA = Living area / (4) = 0.5708 (91)											
MIT	19.2383	19.5439	19.8659	20.2280	20.4607	20.5833	20.6101	20.6090	20.5546	20.2798	19.7400	19.2042 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.2383	19.5439	19.8659	20.2280	20.4607	20.5833	20.6101	20.6090	20.5546	20.2798	19.7400	19.2042 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9263	0.8873	0.8387	0.7522	0.6305	0.4660	0.3305	0.3542	0.5350	0.7569	0.8848	0.9344 (94)
Useful gains	533.0504	591.2013	596.4209	559.0088	472.0661	337.7409	231.4180	241.5191	359.3459	474.1616	508.0052	513.4667 (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	912.9216	891.2796	810.2271	673.6959	519.1345	348.5729	233.6162	244.4251	378.5151	573.5948	754.4986	902.4299 (97)
Space heating kWh	282.6242	201.6526	159.0718	82.5747	35.0189	0.0000	0.0000	0.0000	0.0000	73.9784	177.4753	289.3886 (98a)
Space heating requirement - total per year (kWh/year)												1301.7846
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	282.6242	201.6526	159.0718	82.5747	35.0189	0.0000	0.0000	0.0000	0.0000	73.9784	177.4753	289.3886 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1301.7846
Space heating per m2										(98c) / (4) =		21.6964 (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	282.6242	201.6526	159.0718	82.5747	35.0189	0.0000	0.0000	0.0000	0.0000	73.9784	177.4753	289.3886 (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)	306.2017	218.4752	172.3422	89.4634	37.9403	0.0000	0.0000	0.0000	0.0000	80.1499	192.2809	313.5305 (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	205.9424	182.1819	193.8704	171.4475	166.8196	151.0137	149.6379	155.2520	156.5722	173.7363	183.6539	203.8435 (64)
Efficiency of water heater	84.7700	84.2880	83.6197	82.5187	81.2284	79.8000	79.8000	79.8000	79.8000	82.2908	83.9831	79.8000 (216)
Fuel for water heating, kWh/month	242.9425	216.1421	231.8478	207.7681	205.3711	189.2402	187.5162	194.5514	196.2057	211.1249	218.6796	240.2531 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (221)
Lighting	18.5543	14.8849	13.4022	9.8190	7.5845	6.1966	6.9188	8.9934	11.6815	15.3268	17.3115	19.0699 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-9.9698	-15.2187	-23.6641	-28.8568	-33.1506	-31.7048	-31.3272	-28.5528	-24.0440	-18.3559	-11.3677	-8.4898 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-2.5805	-5.6189	-11.5335	-17.8749	-24.1866	-24.5009	-24.2061	-20.2339	-14.4981	-8.2042	-3.4982	-2.0263 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1410.3841 (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												2541.6427 (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)												149.7435 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-423.6643 (233)
Wind generation												0.0000 (234)

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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	3764.1061 (238)

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

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	1410.3841	0.2100	296.1807 (261)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating (other fuel)	2541.6427	0.2100	533.7450 (264)
Space and water heating			829.9256 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	149.7435	0.1443	21.6126 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-264.7021	0.1330	-35.1930
PV Unit electricity exported	-158.9622	0.1250	-19.8698
Total			-55.0628 (269)
Total CO ₂ , kg/year			808.4047 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.4700 (273)

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

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	1410.3841	1.1300	1593.7341 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	2541.6427	1.1300	2872.0563 (278)
Space and water heating			4465.7904 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	149.7435	1.5338	229.6816 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-264.7021	1.4913	-394.7446
PV Unit electricity exported	-158.9622	0.4588	-72.9290
Total			-467.6737 (283)
Total Primary energy kWh/year			4357.8991 (286)
Target Primary Energy Rate (TPER)			72.6300 (287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

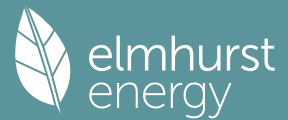
	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	60.0000 (1b)	x 3.1500 (2b)	= 189.0000 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.0000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 189.0000 (5)

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) = 0.1058 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2558 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2558 (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	0.3262	0.3198	0.3134	0.2814	0.2750	0.2430	0.2430	0.2366	0.2558	0.2750	0.2878	0.3006 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5532	0.5511	0.5491	0.5396	0.5378	0.5295	0.5295	0.5280	0.5327	0.5378	0.5414	0.5452 (25)

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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								
Glazing			10.6500	0.7752	8.2558			(27)
External Wall North	18.0200	2.5100	15.5100	0.1400	2.1714	70.0000	1085.7000	(29a)
External Wall South	35.1500	8.1400	27.0100	0.1400	3.7814	70.0000	1890.7000	(29a)
Total net area of external elements Aum(A, m2)			53.1700					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	14.2086		(33)
Main dwelling								
Party Wall 1 East			22.4900	0.0000	0.0000	45.0000	1012.0500	(32)
Party Wall 2 West			21.8000	0.0000	0.0000	45.0000	981.0000	(32)
Party Floor 1			60.0000			30.0000	1800.0000	(32d)
Party Ceiling 1			60.0000			30.0000	1800.0000	(32b)
Internal Wall 1			56.2600			9.0000	506.3400	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9075.7900 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 151.2632 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450	
E18 Party wall between dwellings	12.6000	0.0300	0.3780	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				1.6230 (36)
Point Thermal bridges				(36a) = 0.0000
Total fabric heat loss				(33) + (36) + (36a) = 15.8316 (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	34.5027	34.3739	34.2476	33.6545	33.5435	33.0269	33.0269	32.9312	33.2259	33.5435	33.7680	34.0027	(38)
Average = Sum(39)m / 12 =	50.3343	50.2055	50.0792	49.4861	49.3751	48.8585	48.8585	48.7628	49.0575	49.3751	49.5996	49.8343	(39)
												49.4855	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8389	0.8368	0.8347	0.8248	0.8229	0.8143	0.8143	0.8127	0.8176	0.8229	0.8267	0.8306	(40)
HLP (average)												0.8248	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

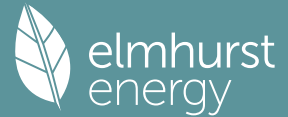
Assumed occupancy													1.9816 (42)
Hot water usage for mixer showers													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
24.2730	23.9066	23.3854	22.6047	21.9012	20.9327	20.1980	21.0965	21.5680	22.5276	23.5253	24.2538		(42b)
Hot water usage for other uses													
34.9239	33.6540	32.3840	31.1140	29.8441	28.5741	28.5741	29.8441	31.1140	32.3840	33.6540	34.9239		(42c)
Average daily hot water use (litres/day)												54.2559	(43)
Daily hot water use													
59.1970	57.5606	55.7694	53.7188	51.7453	49.5068	48.7721	50.9405	52.6820	54.9116	57.1793	59.1777		(44)
Energy conte	87.1481	76.1643	79.6933	70.1701	66.6790	57.2530	53.8946	59.9579	61.1085	70.7591	77.2797	86.9068	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)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	0.0000	(46)
Water storage 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	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	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	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													
74.0759	64.7397	67.7393	59.6446	56.6772	48.6651	45.8104	50.9642	51.9422	60.1453	65.6877	73.8708		(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													
74.0759	64.7397	67.7393	59.6446	56.6772	48.6651	45.8104	50.9642	51.9422	60.1453	65.6877	73.8708		(64)
12Total per year (kWh/year)													
Electric shower(s)	46.0039	40.9899	44.7594	42.7133	43.5148	41.5089	42.8925	43.5148	42.7133	44.7594	43.9177	46.0039	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												523.2919	(64a)
Heat gains from water heating, kWh/month													
30.0200	26.4324	28.1247	25.5895	25.0480	22.5435	22.1757	23.6198	23.6639	26.2262	27.4014	29.9687		(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	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
87.3348	96.6921	87.3348	90.2460	87.3348	90.2460	87.3348	87.3348	90.2460	87.3348	90.2460	87.3348		(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
172.9469	174.7416	170.2191	160.5914	148.4380	137.0156	129.3847	127.5901	132.1125	141.7403	153.8936	165.3161		(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082		(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)													
-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	(71)
Water heating gains (Table 5)													
40.3494	39.3339	37.8020	35.5409	33.6667	31.3104	29.8061	31.7470	32.8665	35.2502	38.0574	40.2805		(72)
Total internal gains													
353.3557	363.4921	348.0804	339.1028	322.1640	311.2965	299.2501	299.3964	307.9495	317.0498	334.9216	345.6558		(73)

6. Solar gains

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[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			2.5100	10.6334	0.3500	0.8500	0.7700	5.5026 (74)
South			8.1400	46.7521	0.3500	0.8500	0.7700	78.4595 (78)

Solar gains	83.9620	139.0121	181.5504	213.6975	231.4410	226.9125	219.9096	206.6932	192.4688	151.1130	99.7894	72.3834 (83)
Total gains	437.3177	502.5042	529.6308	552.8003	553.6050	538.2090	519.1598	506.0896	500.4183	468.1628	434.7109	418.0393 (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	50.0862	50.2147	50.3413	50.9447	51.0592	51.5991	51.5991	51.7003	51.3898	51.0592	50.8281	50.5887	
alpha	4.3391	4.3476	4.3561	4.3963	4.4039	4.4399	4.4399	4.4467	4.4260	4.4039	4.3885	4.3726	
util living area	0.9710	0.9480	0.9161	0.8457	0.7318	0.5579	0.4092	0.4365	0.6323	0.8505	0.9467	0.9754 (86)	
MIT	19.8224	20.0598	20.3170	20.6268	20.8463	20.9646	20.9928	20.9903	20.9372	20.6721	20.2106	19.7813 (87)	
Th 2	20.2197	20.2216	20.2234	20.2319	20.2335	20.2409	20.2409	20.2423	20.2381	20.2335	20.2303	20.2269 (88)	
util rest of house	0.9658	0.9393	0.9020	0.8205	0.6902	0.4989	0.3407	0.3674	0.5747	0.8214	0.9364	0.9710 (89)	
MIT 2	19.1470	19.3797	19.6295	19.9272	20.1220	20.2208	20.2381	20.2383	20.1996	19.9744	19.5365	19.1123 (90)	
Living area fraction									fLA = Living area / (4) =				0.5708 (91)
MIT	19.5326	19.7679	20.0220	20.3266	20.5354	20.6454	20.6689	20.6676	20.6206	20.3726	19.9213	19.4942 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.5326	19.7679	20.0220	20.3266	20.5354	20.6454	20.6689	20.6676	20.6206	20.3726	19.9213	19.4942 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9604	0.9335	0.8979	0.8238	0.7072	0.5309	0.3796	0.4065	0.6043	0.8270	0.9316	0.9660 (94)
Useful gains	420.0165	469.0846	475.5726	455.3906	391.5165	285.7158	197.0611	205.7246	302.4196	387.1926	404.9742	403.8178 (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	766.7211	746.4495	677.1684	565.4554	436.2506	295.3691	198.7995	208.0984	319.8850	482.5242	635.9312	762.1757 (97)
Space heating kWh	257.9482	186.3892	149.9872	79.2467	33.2821	0.0000	0.0000	0.0000	0.0000	70.9267	166.2890	266.6182 (98a)
Space heating requirement - total per year (kWh/year)												1210.6874
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	257.9482	186.3892	149.9872	79.2467	33.2821	0.0000	0.0000	0.0000	0.0000	70.9267	166.2890	266.6182 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1210.6874
Space heating per m2	(98c) / (4) =											20.1781 (99)

8c. Space cooling requirement

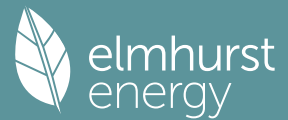
Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	459.2699	361.5529	370.5975	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9053	0.9491	0.9407	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	415.7939	343.1335	348.6176	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	597.1793	576.7159	563.0061	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	130.5975	173.7853	159.5050	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	32.6494	43.4463	39.8763	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												115.9719 (107)
Energy for space heating												20.1781 (99)
Energy for space cooling												1.9329 (108)
Total												22.1110 (109)
Fabric Energy Efficiency (DFEE)												22.1 (109)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	60.0000 (1b)	x	189.0000 (1b) - (3b)
Ground floor		3.1500 (2b)	=
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	60.0000		189.0000 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n) =	189.0000 (5)

Full SAP Calculation Printout



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)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1058	(8)
Pressure test	Yes		
Pressure Test Method	Blower Door		
Measured/design AP50	5.0000 (17)		
Infiltration rate	0.3558 (18)		
Number of sides sheltered	0 (19)		
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3558	(21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	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	0.4537	0.4448	0.4359	0.3914	0.3825	0.3380	0.3380	0.3291	0.3558	0.3825	0.4003	0.4181	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													(23c)
Effective ac	0.6029	0.5989	0.5950	0.5766	0.5732	0.5571	0.5571	0.5542	0.5633	0.5732	0.5801	0.5874	(25)

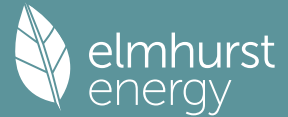
3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Main dwelling													
TER Opening Type			10.6500	1.1450	12.1947			(27)					
External Wall North	18.0200	2.5100	15.5100	0.1800	2.7918			(29a)					
External Wall South	35.1500	8.1400	27.0100	0.1800	4.8618			(29a)					
Total net area of external elements Aum(A, m2)			53.1700					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)... (30) + (32) =		19.8483			(33)					
Main dwelling													
Party Wall 1 East			22.4900	0.0000	0.0000			(32)					
Party Wall 2 West			21.8000	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								151.2632 (35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
E7 Party floor between dwellings (in blocks of flats)				41.5000	0.0700	2.9050							
E18 Party wall between dwellings				12.6000	0.0600	0.7560							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.6610	(36)					
Point Thermal bridges							(36a) =	0.0000					
Total fabric heat loss							(33) + (36) + (36a) =	23.5093 (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	
	37.6034	37.3542	37.1099	35.9624	35.7477	34.7483	34.7483	34.5632	35.1333	35.7477	36.1820	36.6361	(38)
Heat transfer coeff	61.1127	60.8634	60.6191	59.4717	59.2570	58.2576	58.2576	58.0725	58.6425	59.2570	59.6913	60.1453	(39)
Average = Sum(39)m / 12 =												59.4706	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	1.0185	1.0144	1.0103	0.9912	0.9876	0.9710	0.9710	0.9679	0.9774	0.9876	0.9949	1.0024	(40)
HLP (average)												0.9912	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.9816 (42)
Hot water usage for mixer showers													
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000													(42a)
Hot water usage for baths													
24.8265 24.4578 23.9386 22.9812 22.2644 21.4695 21.0401 21.5557 22.1171 22.9676 23.9447 24.7426													(42b)
Hot water usage for other uses													
34.9239 33.6540 32.3840 31.1140 29.8441 28.5741 28.5741 29.8441 31.1140 32.3840 33.6540 34.9239													(42c)
Average daily hot water use (litres/day)												54.7671	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	59.7504	58.1117	56.3226	54.0952	52.1084	50.0436	49.6143	51.3998	53.2311	55.3516	57.5987	59.6665	(44)
Energy conte	94.6300	82.7503	86.5657	74.0537	70.1480	61.5345	60.0041	63.6437	65.6393	75.1117	82.0599	93.4233	(45)
Energy content (annual)												909.5641	
Distribution loss (46)m = 0.15 x (45)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													(46)
Water storage 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	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	80.4355	70.3378	73.5808	62.9456	59.6258	52.3043	51.0035	54.0971	55.7934	63.8449	69.7509	79.4098	(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	80.4355	70.3378	73.5808	62.9456	59.6258	52.3043	51.0035	54.0971	55.7934	63.8449	69.7509	79.4098	(64)
Total per year (kWh/year) = Sum(64)m =												773.1295	(64)
12Total per year (kWh/year)												773	(64)

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Electric shower(s)	46.0039	40.9899	44.7594	42.7133	43.5148	41.5089	42.8925	43.5148	42.7133	44.7594	43.9177	46.0039 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												523.2919 (64a)
Heat gains from water heating, kWh/month	31.6099	27.8319	29.5850	26.4147	25.7852	23.4533	23.4740	24.4030	24.6267	27.1511	28.4172	31.3534 (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	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	89.2975	98.8651	89.2975	92.2741	89.2975	92.2741	89.2975	89.2975	92.2741	89.2975	92.2741	89.2975	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	172.9469	174.7416	170.2191	160.5914	148.4380	137.0156	129.3847	127.5901	132.1125	141.7403	153.8936	165.3161	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	(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)	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	(71)
Water heating gains (Table 5)	42.4864	41.4165	39.7648	36.6871	34.6575	32.5740	31.5511	32.7997	34.2037	36.4934	39.4683	42.1417	(72)
Total internal gains	357.4554	367.7478	352.0060	342.2771	325.1175	314.5883	302.9579	302.4118	311.3149	320.2557	338.3605	349.4798	(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				2.5100	10.6334	0.6300	0.7000	0.7700			8.1568 (74)	
South				8.1400	46.7521	0.6300	0.7000	0.7700			116.3046 (78)	
Solar gains	124.4614	206.0650	269.1217	316.7752	343.0772	336.3645	325.9837	306.3922	285.3067	224.0028	147.9231	107.2978 (83)
Total gains	481.9167	573.8128	621.1277	659.0523	668.1947	650.9527	628.9416	608.8041	596.6216	544.2585	486.2836	456.7776 (84)

7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, nil,m (see Table 9a)													21.0000 (85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	41.2525	41.4215	41.5884	42.3908	42.5444	43.2743	43.2743	43.4122	42.9902	42.5444	42.2349	41.9160	
alpha	3.7502	3.7614	3.7726	3.8261	3.8363	3.8850	3.8850	3.8941	3.8660	3.8363	3.8157	3.7944	
util living area	0.9674	0.9399	0.9022	0.8261	0.7109	0.5427	0.4001	0.4286	0.6209	0.8394	0.9417	0.9724	(86)
MIT	19.5080	19.8130	20.1406	20.5250	20.7935	20.9466	20.9872	20.9832	20.9069	20.5673	19.9928	19.4692	(87)
Th 2	20.0679	20.0714	20.0747	20.0907	20.0937	20.1076	20.1076	20.1102	20.1022	20.0937	20.0876	20.0813	(88)
util rest of house	0.9614	0.9294	0.8852	0.7966	0.6637	0.4764	0.3221	0.3499	0.5559	0.8061	0.9297	0.9673	(89)
MIT 2	18.7214	19.0204	19.3381	19.7097	19.9474	20.0783	20.1028	20.1035	20.0469	19.7576	19.2122	18.6936	(90)
Living area fraction													
MIT	19.1704	19.4728	19.7962	20.1751	20.4304	20.5740	20.6076	20.6056	20.5378	20.2198	19.6578	19.1364	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1704	19.4728	19.7962	20.1751	20.4304	20.5740	20.6076	20.6056	20.5378	20.2198	19.6578	19.1364	(93)

8. Space heating requirement

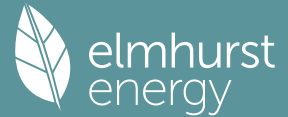
Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9542	0.9215	0.8794	0.7996	0.6820	0.5117	0.3662	0.3942	0.5884	0.8112	0.9230	0.9607	(94)
Useful gains	459.8584	528.7758	546.2099	526.9721	455.6885	333.1066	230.3257	240.0108	351.0406	441.4873	448.8596	438.8307	(95)
Ext temp.	4.3000	4.9000	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	908.7710	886.9509	806.0029	670.5500	517.3351	348.0288	233.4750	244.2316	377.5313	570.0391	749.5909	898.3520	(97)
Space heating kWh	333.9910	240.6937	193.2860	103.3761	45.8650	0.0000	0.0000	0.0000	0.0000	95.6425	216.5265	341.8839	(98a)
Space heating requirement - total per year (kWh/year)												1571.2646	
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	333.9910	240.6937	193.2860	103.3761	45.8650	0.0000	0.0000	0.0000	0.0000	95.6425	216.5265	341.8839	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1571.2646	
Space heating per m ²										(98c) / (4) =		26.1877	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	547.6211	431.1060	441.3510	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8903	0.9362	0.9261	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	487.5617	403.6012	408.7399	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	726.5455	702.6291	680.8314	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	172.0684	222.4767	202.4361	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction													
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	43.0171	55.6192	50.6090	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling requirement												149.2453	(107)

Full SAP Calculation Printout



Energy for space heating	26.1877 (99)
Energy for space cooling	2.4874 (108)
Total	28.6752 (109)
Fabric Energy Efficiency (TFEE)	28.7 (109)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	60.0000 (1b)	3.1500 (2b)	189.0000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.0000		189.0000 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	189.0000 (5)

2. Ventilation rate

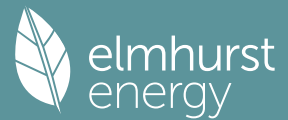
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	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	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (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	0.2862	0.2825	0.2787	0.2600	0.2562	0.2375	0.2375	0.2337	0.2450	0.2562	0.2637	0.2712 (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												
Glazing					10.6500	0.7752	8.2558			(27)		
External Wall North		18.0200	2.5100		15.5100	0.1400	2.1714	70.0000	1085.7000	(29a)		
External Wall South		35.1500	8.1400		27.0100	0.1400	3.7814	70.0000	1890.7000	(29a)		
Total net area of external elements Aum(A, m2)					53.1700					(31)		
Fabric heat loss, W/K = Sum (A x U)					(26) ... (30) + (32) =		14.2086			(33)		
Main dwelling												
Party Wall 1 East					22.4900	0.0000	0.0000	45.0000	1012.0500	(32)		
Party Wall 2 West					21.8000	0.0000	0.0000	45.0000	981.0000	(32)		
Party Floor 1					60.0000			30.0000	1800.0000	(32d)		
Party Ceiling 1					60.0000			30.0000	1800.0000	(32b)		
Internal Wall 1					56.2600			9.0000	506.3400	(32c)		
Heat capacity Cm = Sum(A x k)							(28) ... (30) + (32) + (32a) ... (32e) =		9075.7900	(34)		
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K									151.2632	(35)		
List of Thermal Bridges												
K1 Element						Length	Psi-value	Total				
E7 Party floor between dwellings (in blocks of flats)						41.5000	0.0300	1.2450				
E18 Party wall between dwellings						12.6000	0.0300	0.3780				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)									1.6230	(36)		
Point Thermal bridges								(36a) =	0.0000			
Total fabric heat loss								(33) + (36) + (36a) =	15.8316	(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	17.8534	17.6195	17.3856	16.2162	15.9823	14.8129	14.8129	14.5790	15.2806	15.9823	16.4501	16.9179 (38)
Average = Sum(39)m / 12 =	33.6850	33.4511	33.2173	32.0478	31.8139	30.6445	30.6445	30.4106	31.1123	31.8139	32.2817	32.7495 (39)
												31.9893
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.5614	0.5575	0.5536	0.5341	0.5302	0.5107	0.5107	0.5068	0.5185	0.5302	0.5380	0.5458 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9816 (42)
Hot water usage for mixer showers												62.9361 (42a)
Hot water usage for baths												24.2538 (42b)
Hot water usage for other uses												34.9239 (42c)
Average daily hot water use (litres/day)												112.3305 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	122.1899	119.5891	116.3766	112.1396	108.2071	103.2281	100.3257	105.0282	108.0442	112.9883	118.0828	122.1138 (44)
Energy content (annual)	179.8846	158.2406	166.2998	146.4823	139.4358	119.3798	110.8628	123.6201	125.3259	145.5968	159.5928	179.3331 (45)
Distribution loss (46)m = 0.15 x (45)m												1754.0545
Water storage loss:												
Store volume												110.0000 (47)
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												
If cylinder contains dedicated solar storage												
Primary 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)
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 (57)
Total heat required for water heating calculated for each month												
WWHRS	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099 (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	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099 (64)
Electric shower(s)												
Total per year (kWh/year) = Sum(64)m =												2404.8943 (64)
Heat gains from water heating, kWh/month												
Total Energy used by instantaneous electric shower (s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
												0.0000 (64a)
Heat gains from water heating, kWh/month	104.0331	92.5569	99.5161	91.5003	90.5838	82.4887	81.0833	85.3251	84.4658	92.6324	95.8596	103.8497 (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	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3306	16.2811	13.2407	10.0240	7.4931	6.3260	6.8354	8.8850	11.9254	15.1420	17.6729	18.8401 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	258.1297	260.8083	254.0584	239.6886	221.5493	204.5009	193.1115	190.4330	197.1829	211.5527	229.6920	246.7404 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714 (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)	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654 (71)
Water heating gains (Table 5)	139.8294	137.7335	133.7582	127.0838	121.7525	114.5677	108.9830	114.6843	117.3136	124.5059	133.1383	139.5829 (72)
Total internal gains	504.7939	503.3271	489.5614	465.3005	439.2990	413.8987	397.4341	402.5064	414.9260	439.7047	469.0073	493.6675 (73)

6. Solar gains

[Jan]												Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W
North												2.5100	10.6334	0.3500	0.8500	0.7700	5.5026 (74)
South												8.1400	46.7521	0.3500	0.8500	0.7700	78.4595 (78)
Solar gains	83.9620	139.0121	181.5504	213.6975	231.4410	226.9125	219.9096	206.6932	192.4688	151.1130	99.7894	72.3834 (83)					
Total gains	588.7559	642.3392	671.1118	678.9981	670.7399	640.8112	617.3437	609.1995	607.3948	590.8177	568.7967	566.0509 (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	74.8419	75.3652	75.8959	78.6654	79.2437	82.2677	82.2677	82.9005	81.0308	79.2437	78.0954	76.9799
alpha	5.9895	6.0243	6.0597	6.2444	6.2829	6.4845	6.4845	6.5267	6.4021	6.2829	6.2064	6.1320
util living area	0.8367	0.7724	0.6877	0.5636	0.4397	0.3060	0.2184	0.2296	0.3531	0.5535	0.7422	0.8473 (86)
MIT	20.7848	20.8694	20.9378	20.9841	20.9970	20.9998	21.0000	21.0000	20.9994	20.9880	20.9177	20.7817 (87)
Th 2	20.4648	20.4684	20.4719	20.4896	20.4932	20.5110	20.5110	20.5146	20.5039	20.4932	20.4861	20.4790 (88)
util rest of house	0.8214	0.7545	0.6669	0.5412	0.4161	0.2826	0.1941	0.2054	0.3278	0.5279	0.7212	0.8328 (89)
MIT 2	20.2243	20.3256	20.4064	20.4740	20.4905	20.5109	20.5110	20.5146	20.5034	20.4819	20.3990	20.2340 (90)
Living area fraction												
MIT	20.5443	20.6360	20.7098	20.7652	20.7796	20.7900	20.7901	20.7916	20.7866	20.7708	20.6951	20.5466 (92)
Temperature adjustment												0.0000
adjusted MIT	20.5443	20.6360	20.7098	20.7652	20.7796	20.7900	20.7901	20.7916	20.7866	20.7708	20.6951	20.5466 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8237	0.7603	0.6763	0.5533	0.4294	0.2959	0.2080	0.2192	0.3423	0.5420	0.7299	0.8347	(94)
Useful gains	484.9822	488.3541	453.9028	375.7052	288.0302	189.6384	128.4003	133.5475	207.8910	320.1993	415.1639	472.4872	(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	547.1884	526.3869	472.0096	380.2526	288.8587	189.6882	128.4042	133.5527	208.0345	323.5722	438.8731	535.3441	(97)
Space heating kWh	46.2814	25.5580	13.4714	3.2741	0.6164	0.0000	0.0000	0.0000	0.0000	2.5094	17.0706	46.7655	(98a)
Space heating requirement - total per year (kWh/year)												155.5469	
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	46.2814	25.5580	13.4714	3.2741	0.6164	0.0000	0.0000	0.0000	0.0000	2.5094	17.0706	46.7655	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												155.5469	
Space heating per m2										(98c) / (4) =		2.5924	(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												1.0000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	46.2814	25.5580	13.4714	3.2741	0.6164	0.0000	0.0000	0.0000	0.0000	2.5094	17.0706	46.7655	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													
307a	46.2814	25.5580	13.4714	3.2741	0.6164	0.0000	0.0000	0.0000	0.0000	2.5094	17.0706	46.7655	
Space heating requirement	46.2814	25.5580	13.4714	3.2741	0.6164	0.0000	0.0000	0.0000	0.0000	2.5094	17.0706	46.7655	(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	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310a	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099	
Water heating fuel	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	13.7085	12.3818	13.7085	13.2662	13.7085	13.2662	13.7085	13.7085	13.2662	13.7085	13.2662	13.7085	(331)
Lighting	16.0447	12.8716	11.5895	8.4909	6.5586	5.3585	5.9830	7.7770	10.1015	13.2537	14.9700	16.4906	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												155.5469	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2404.8943	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												1.5555	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)													
mechanical ventilation fans (SFP = 0.7000)												161.4060	(330a)
Total electricity for the above, kWh/year												161.4060	(331)
Electricity for lighting (calculated in Appendix L)												129.4896	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2851.3367	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	155.5469	4.4400	6.9063	(340a)
Space heating total			6.9063	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2404.8943	4.4400	106.7773	(342a)
Water heating total			106.7773	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	161.4060	16.4900	26.6158	(349)
Energy for lighting	129.4896	16.4900	21.3528	(350)
Additional standing charges			92.0000	(351)
Total energy cost			253.6523	(355)

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11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.8697 (357)
SAP value		85.9027
SAP rating (Section 12)		86 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Efficiency of heat source Heat pump			262.0000 (367)
Space and Water heating from Heat pump	977.2676	0.1593	9.4601 (367)
Electrical energy for heat distribution (space & water)	1.5555	0.0000	3.6340 (372)
Overall CO ₂ factor for heat network			0.0556 (386)
Total CO ₂ associated with community systems			142.3358 (373)
Space and water heating			142.3358 (376)
Pumps, fans and electric keep-hot	161.4060	0.1387	22.3890 (378)
Energy for lighting	129.4896	0.1443	18.6893 (379)
Total CO ₂ , kg/year			183.4141 (383)
CO ₂ emissions per m ²			3.0600 (384)
EI value			97.6593 (384a)
EI rating			98 (385)
EI band			A

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	60.0000 (1b)	x 3.1500 (2b)	= 189.0000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	189.0000 (5)

2. Ventilation rate

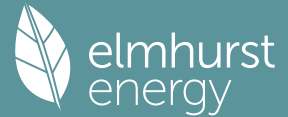
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	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	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.8000	4.5000	4.4000	3.9000	3.9000	3.6000	3.7000	3.5000	3.7000	4.0000	4.1000	4.4000 (22)
Wind factor	1.2000	1.1250	1.1000	0.9750	0.9750	0.9000	0.9250	0.8750	0.9250	1.0000	1.0250	1.1000 (22a)
Adj infilt rate	0.1800	0.1687	0.1650	0.1462	0.1462	0.1350	0.1388	0.1313	0.1388	0.1500	0.1537	0.1650 (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	0.2750	0.2637	0.2600	0.2412	0.2412	0.2300	0.2337	0.2262	0.2337	0.2450	0.2487	0.2600 (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							
Glazing			10.6500	0.7752	8.2558		(27)
External Wall North	18.0200	2.5100	15.5100	0.1400	2.1714	70.0000	1085.7000 (29a)
External Wall South	35.1500	8.1400	27.0100	0.1400	3.7814	70.0000	1890.7000 (29a)
Total net area of external elements Aum(A, m ²)			53.1700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	14.2086		(33)
Main dwelling							

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Party Wall 1 East	22.4900	0.0000	0.0000	45.0000	1012.0500 (32)
Party Wall 2 West	21.8000	0.0000	0.0000	45.0000	981.0000 (32)
Party Floor 1	60.0000			30.0000	1800.0000 (32d)
Party Ceiling 1	60.0000			30.0000	1800.0000 (32b)
Internal Wall 1	56.2600			9.0000	506.3400 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9075.7900 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 151.2632 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	41.5000	0.0300	1.2450
E7 Party floor between dwellings (in blocks of flats)	12.6000	0.0300	0.3780
E18 Party wall between dwellings			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			1.6230 (36)
Point Thermal bridges			0.0000 (36a) =
Total fabric heat loss			(33) + (36) + (36a) = 15.8316 (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	17.1517	16.4501	16.2162	15.0468	15.0468	14.3451	14.5790	14.1112	14.5790	15.2806	15.5145	16.2162	(38)
Average = Sum(39)m / 12 =	32.9834	32.2817	32.0478	30.8784	30.8784	30.1767	30.4106	29.9428	30.4106	31.1123	31.3462	32.0478	(39)
												31.2097	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.5497	0.5380	0.5341	0.5146	0.5146	0.5029	0.5068	0.4990	0.5068	0.5185	0.5224	0.5341	(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													1.9816 (42)
Hot water usage for mixer showers													
Hot water usage for baths	62.9929	62.0285	60.6072	58.4208	56.4618	53.7212	51.5536	54.0877	55.3622	58.0767	60.9035	62.9361	(42a)
Hot water usage for other uses	24.2730	23.9066	23.3854	22.6047	21.9012	20.9327	20.1980	21.0965	21.5680	22.5276	23.5253	24.2538	(42b)
Average daily hot water use (litres/day)	34.9239	33.6540	32.3840	31.1140	29.8441	28.5741	28.5741	29.8441	31.1140	32.3840	33.6540	34.9239	(42c)
												112.3305	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	122.1899	119.5891	116.3766	112.1396	108.2071	103.2281	100.3257	105.0282	108.0442	112.9883	118.0828	122.1138	(44)
Energy content (annual)	179.8846	158.2406	166.2998	146.4823	139.4358	119.3798	110.8628	123.6201	125.3259	145.5968	159.5928	179.3331	(45)
Distribution loss (46)m = 0.15 x (45)m													
Water storage loss:	26.9827	23.7361	24.9450	21.9723	20.9154	17.9070	16.6294	18.5430	18.7989	21.8395	23.9389	26.9000	(46)
Store volume													110.0000 (47)
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													
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	(56)
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	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099	(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	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099	(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	104.0331	92.5569	99.5161	91.5003	90.5838	82.4887	81.0833	85.3251	84.4658	92.6324	95.8596	103.8497	(65)

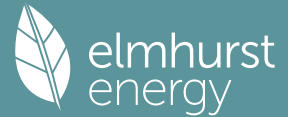
5. Internal gains (see Table 5 and 5a)

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	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	18.3306	16.2811	13.2407	10.0240	7.4931	6.3260	6.8354	8.8850	11.9254	15.1420	17.6729	18.8401	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	258.1297	260.8083	254.0584	239.6886	221.5493	204.5009	193.1115	190.4330	197.1829	211.5527	229.6920	246.7404	(68)
Pumps, fans	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	(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)	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	(71)
Total internal gains	139.8294	137.7335	133.7582	127.0838	121.7525	114.5677	108.9830	114.6843	117.3136	124.5059	133.1383	139.5829	(72)
	504.7939	503.3271	489.5614	465.3005	439.2990	413.8987	397.4341	402.5064	414.9260	439.7047	469.0073	493.6675	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
	m2	Table 6a	Specific data	Specific data	factor	W
		W/m2	or Table 6b	or Table 6c	Table 6d	
North	2.5100	12.7054	0.3500	0.8500	0.7700	6.5748 (74)
South	8.1400	53.5774	0.3500	0.8500	0.7700	89.9137 (78)

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Solar gains	96.4885	141.7867	184.5905	230.4448	242.0170	254.7350	243.5420	229.3662	209.8802	164.7657	115.7229	80.5032 (83)
Total gains	601.2824	645.1138	674.1519	695.7453	681.3159	668.6337	640.9761	631.8726	624.8062	604.4704	584.7303	574.1707 (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	76.4341	78.0954	78.6654	81.6446	81.6446	83.5430	82.9005	84.1956	82.9005	81.0308	80.4262	78.6654
alpha	6.0956	6.2064	6.2444	6.4430	6.4430	6.5695	6.5267	6.6130	6.5267	6.4021	6.3617	6.2444
util living area	0.7974	0.7364	0.6430	0.5071	0.3802	0.2527	0.1708	0.1659	0.2920	0.4764	0.6697	0.8024 (86)
MIT	20.8509	20.9115	20.9629	20.9928	20.9990	21.0000	21.0000	21.0000	20.9999	20.9958	20.9602	20.8583 (87)
Th 2	20.4755	20.4861	20.4896	20.5074	20.5074	20.5181	20.5146	20.5217	20.5146	20.5039	20.5003	20.4896 (88)
util rest of house	0.7801	0.7177	0.6222	0.4860	0.3581	0.2310	0.1478	0.1432	0.2684	0.4516	0.6473	0.7853 (89)
MIT 2	20.3116	20.3906	20.4512	20.5005	20.5066	20.5181	20.5146	20.5217	20.5145	20.5001	20.4595	20.3339 (90)
Living area fraction									fLA =	Living area / (4) =		0.5708 (91)
MIT	20.6195	20.6879	20.7433	20.7815	20.7877	20.7932	20.7917	20.7947	20.7916	20.7830	20.7453	20.6333 (92)
Temperature adjustment												0.0000
adjusted MIT	20.6195	20.6879	20.7433	20.7815	20.7877	20.7932	20.7917	20.7947	20.7916	20.7830	20.7453	20.6333 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.7850	0.7251	0.6326	0.4978	0.3707	0.2434	0.1609	0.1561	0.2818	0.4656	0.6584	0.7902 (94)
Useful gains	472.0009	467.7905	426.4814	346.3266	252.5543	162.7364	103.1420	98.6532	176.0920	281.4325	384.9647	453.7274 (95)
Ext temp.	5.0000	5.4000	7.1000	9.5000	12.6000	15.4000	17.4000	17.5000	15.0000	11.7000	8.1000	5.2000 (96)
Heat loss rate W	515.1824	493.5207	437.2371	348.3556	252.8221	162.7478	103.1426	98.6536	176.1246	282.5939	396.3816	494.6026 (97)
Space heating kWh	32.1270	17.2907	8.0023	1.4608	0.1992	0.0000	0.0000	0.0000	0.0000	0.8641	8.2202	30.4111 (98a)
Space heating requirement - total per year (kWh/year)												98.5754
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	32.1270	17.2907	8.0023	1.4608	0.1992	0.0000	0.0000	0.0000	0.0000	0.8641	8.2202	30.4111 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												98.5754
Space heating per m2										(98c) / (4) =		1.6429 (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												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	32.1270	17.2907	8.0023	1.4608	0.1992	0.0000	0.0000	0.0000	0.0000	0.8641	8.2202	30.4111 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	32.1270	17.2907	8.0023	1.4608	0.1992	0.0000	0.0000	0.0000	0.0000	0.8641	8.2202	30.4111
Space heating requirement	32.1270	17.2907	8.0023	1.4608	0.1992	0.0000	0.0000	0.0000	0.0000	0.8641	8.2202	30.4111 (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	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00												
310a	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099
Water heating fuel	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	13.7085	12.3818	13.7085	13.2662	13.7085	13.2662	13.7085	13.7085	13.2662	13.7085	13.2662	13.7085 (331)
Lighting	16.0447	12.8716	11.5895	8.4909	6.5586	5.3585	5.9830	7.7770	10.1015	13.2537	14.9700	16.4906 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												98.5754 (307)
Space heating fuel - community heating												0.0000 (309)
Space heating fuel - secondary												2404.8943 (310)
Water heating fuel - community heating												0.0000 (311)
Efficiency of water heater												0.9858 (313)
Electricity used for heat distribution												0.0000 (321)
Space cooling fuel												
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)												
mechanical ventilation fans (SFP = 0.7000)												161.4060 (330a)
Total electricity for the above, kWh/year												161.4060 (331)
Electricity for lighting (calculated in Appendix L)												129.4896 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												

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PV generation	0.0000 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	2794.3653 (338)

10b. Fuel costs - using BEDF prices (568)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	98.5754	5.6000	5.5202	(340a)
Space heating total			5.5202	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2404.8943	5.6000	134.6741	(342a)
Water heating total			134.6741	(342)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(347a)
Pumps, fans and electric keep-hot	161.4060	26.0600	42.0624	(349)
Energy for lighting	129.4896	26.0600	33.7450	(350)
Additional standing charges			99.0000	(351)
Total energy cost			315.0017	(355)

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			262.0000	(367)
Space and Water heating from Heat pump	955.5228	0.1601	6.0223	(367)
Electrical energy for heat distribution (space & water)	0.9858	0.0000	3.5439	(372)
Overall CO2 factor for heat network			0.0554	(386)
Total CO2 associated with community systems			138.8079	(373)
Space and water heating			138.8079	(376)
Pumps, fans and electric keep-hot	161.4060	0.1387	22.3890	(378)
Energy for lighting	129.4896	0.1443	18.6893	(379)
Total CO2, kg/year			179.8862	(383)

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			262.0000	(467a)
Space and Water heating from Heat pump	955.5228	1.5925	59.9147	(467)
Electrical energy for heat distribution (space & water)	0.9858	0.0000	38.1393	(472)
Overall CO2 factor for heat network			0.5967	(486)
Total CO2 associated with community systems			1493.8359	(473)
Space and water heating			1493.8359	(476)
Pumps, fans and electric keep-hot	161.4060	1.5128	244.1750	(478)
Energy for lighting	129.4896	1.5338	198.6154	(479)
Total Primary energy kWh/year			1936.6263	(483)

SAP 10 EPC IMPROVEMENTS

0302_1B2P_BL

Current energy efficiency rating:	B 86
Current environmental impact rating:	A 98

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures: (none)	SAP change	Cost change	CO2 change
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Recommended measures (none)	Typical annual savings	Energy efficiency	Environmental impact
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Total Savings £0 0.00 kg/m²

Potential energy efficiency rating:	B 86
Potential environmental impact rating:	A 98

Fuel prices for cost data on this page from database revision number 568 TEST (31 Mar 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, South East England):

	Current	Potential	Saving
Electricity	£76	£76	£0
Community scheme	£239	£239	£0
Space heating	£147	£147	£0
Water heating	£135	£135	£0
Lighting	£34	£34	£0
Total cost of fuels	£315	£315	£0
Total cost of uses	£316	£316	£0
Delivered energy	47 kWh/m²	47 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	3 kg/m²	3 kg/m²	0 kg/m²
Primary energy	32 kWh/m²	32 kWh/m²	0 kWh/m²

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SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	60.0000 (1b)	x 3.1500 (2b)	= 189.0000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 189.0000 (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	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		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.1500 (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
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
Adj infilt rate	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762
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	0.2862	0.2825	0.2787	0.2600	0.2562	0.2375	0.2375	0.2337	0.2450	0.2562	0.2637	0.2712 (25)

3. Heat losses and heat loss parameter

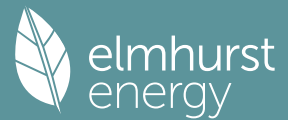
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Glazing			10.6500	0.7752	8.2558		(27)
External Wall North	18.0200	2.5100	15.5100	0.1400	2.1714	70.0000	1085.7000 (29a)
External Wall South	35.1500	8.1400	27.0100	0.1400	3.7814	70.0000	1890.7000 (29a)
Total net area of external elements Aum(A, m ²)			53.1700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		14.2086		(33)
Main dwelling							
Party Wall 1 East			22.4900	0.0000	0.0000	45.0000	1012.0500 (32)
Party Wall 2 West			21.8000	0.0000	0.0000	45.0000	981.0000 (32)
Party Floor 1			60.0000			30.0000	1800.0000 (32d)
Party Ceiling 1			60.0000			30.0000	1800.0000 (32b)
Internal Wall 1			56.2600			9.0000	506.3400 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9075.7900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		151.2632 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450
E18 Party wall between dwellings	12.6000	0.0300	0.3780
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			1.6230 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 15.8316 (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	17.8534	17.6195	17.3856	16.2162	15.9823	14.8129	14.8129	14.5790	15.2806	15.9823	16.4501	16.9179 (38)
Average = Sum(39)m / 12 =	33.6850	33.4511	33.2173	32.0478	31.8139	30.6445	30.6445	30.4106	31.1123	31.8139	32.2817	32.7495 (39)
												31.9893
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.5614	0.5575	0.5536	0.5341	0.5302	0.5107	0.5107	0.5068	0.5185	0.5302	0.5380	0.5458 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9816 (42)
Hot water usage for mixer showers												62.9361 (42a)
62.9929 62.0285 60.6072 58.4208 56.4618 53.7212 51.5536 54.0877 55.3622 58.0767 60.9035												
Hot water usage for baths												24.2538 (42b)
24.2730 23.9066 23.3854 22.6047 21.9012 20.9327 20.1980 21.0965 21.5680 22.5276 23.5253												
Hot water usage for other uses												34.9239 (42c)
34.9239 33.6540 32.3840 31.1140 29.8441 28.5741 28.5741 29.8441 31.1140 32.3840 33.6540												112.3305 (43)
Average daily hot water use (litres/day)												
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec												
Daily hot water use	122.1899	119.5891	116.3766	112.1396	108.2071	103.2281	100.3257	105.0282	108.0442	112.9883	118.0828	122.1138 (44)
Energy conte	179.8846	158.2406	166.2998	146.4823	139.4358	119.3798	110.8628	123.6201	125.3259	145.5968	159.5928	179.3331 (45)
Energy content (annual)												Total = Sum(45)m = 1754.0545
Distribution loss (46)m = 0.15 x (45)m												
26.9827 23.7361 24.9450 21.9723 20.9154 17.9070 16.6294 18.5430 18.7989 21.8395 23.9389 26.9000 (46)												
Water storage loss:												
Store volume												110.0000 (47)
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	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099 (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	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099 (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	104.0331	92.5569	99.5161	91.5003	90.5838	82.4887	81.0833	85.3251	84.4658	92.6324	95.8596	103.8497 (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	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3306	16.2811	13.2407	10.0240	7.4931	6.3260	6.8354	8.8850	11.9254	15.1420	17.6729	18.8401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	258.1297	260.8083	254.0584	239.6886	221.5493	204.5009	193.1115	190.4330	197.1829	211.5527	229.6920	246.7404	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	(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)	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	(71)
Water heating gains (Table 5)	139.8294	137.7335	133.7582	127.0838	121.7525	114.5677	108.9830	114.6843	117.3136	124.5059	133.1383	139.5829	(72)
Total internal gains	504.7939	503.3271	489.5614	465.3005	439.2990	413.8987	397.4341	402.5064	414.9260	439.7047	469.0073	493.6675	(73)

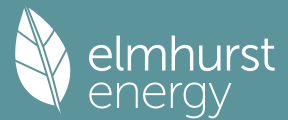
6. Solar gains

[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				2.5100	10.6334		0.3500		0.8500	0.7700	5.5026 (74)	
South				8.1400	46.7521		0.3500		0.8500	0.7700	78.4595 (78)	
Solar gains	83.9620	139.0121	181.5504	213.6975	231.4410	226.9125	219.9096	206.6932	192.4688	151.1130	99.7894	72.3834 (83)
Total gains	588.7559	642.3392	671.1118	678.9981	670.7399	640.8112	617.3437	609.1995	607.3948	590.8177	568.7967	566.0509 (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	74.8419	75.3652	75.8959	78.6654	79.2437	82.2677	82.2677	82.9005	81.0308	79.2437	78.0954	76.9799	
alpha	5.9895	6.0243	6.0597	6.2444	6.2829	6.4845	6.4845	6.5267	6.4021	6.2829	6.2064	6.1320	
util living area	0.8367	0.7724	0.6877	0.5636	0.4397	0.3060	0.2184	0.2296	0.3531	0.5535	0.7422	0.8473 (86)	
MIT	20.7848	20.8694	20.9378	20.9841	20.9970	20.9998	21.0000	21.0000	20.9994	20.9880	20.9177	20.7817 (87)	
Th 2	20.4648	20.4684	20.4719	20.4896	20.4932	20.5110	20.5110	20.5146	20.5039	20.4932	20.4861	20.4790 (88)	
util rest of house	0.8214	0.7545	0.6669	0.5412	0.4161	0.2826	0.1941	0.2054	0.3278	0.5279	0.7212	0.8328 (89)	
MIT 2	20.2243	20.3256	20.4064	20.4740	20.4905	20.5109	20.5110	20.5146	20.5034	20.4819	20.3990	20.2340 (90)	
Living area fraction	20.5443	20.6360	20.7098	20.7652	20.7796	20.7900	20.7901	20.7916	fLA = Living area / (4) =				0.5708 (91)
MIT	20.5443	20.6360	20.7098	20.7652	20.7796	20.7900	20.7901	20.7916	20.7866	20.7708	20.6951	20.5466 (92)	
Temperature adjustment												0.0000	
adjusted MIT	20.5443	20.6360	20.7098	20.7652	20.7796	20.7900	20.7901	20.7916	20.7866	20.7708	20.6951	20.5466 (93)	

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8237	0.7603	0.6763	0.5533	0.4294	0.2959	0.2080	0.2192	0.3423	0.5420	0.7299	0.8347	(94)
Useful gains	484.9822	488.3541	453.9028	375.7052	288.0302	189.6384	128.4003	133.5475	207.8910	320.1993	415.1639	472.4872	(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	547.1884	526.3869	472.0096	380.2526	288.8587	189.6882	128.4042	133.5527	208.0345	323.5722	438.8731	535.3441	(97)
Space heating kWh	46.2814	25.5580	13.4714	3.2741	0.6164	0.0000	0.0000	0.0000	0.0000	2.5094	17.0706	46.7655	(98a)
Space heating requirement - total per year (kWh/year)												155.5469	
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	46.2814	25.5580	13.4714	3.2741	0.6164	0.0000	0.0000	0.0000	0.0000	2.5094	17.0706	46.7655	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												155.5469	
Space heating per m2										(98c) / (4) =		2.5924	(99)

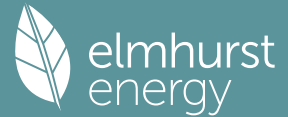
9b. Energy requirements

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												1.0000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	46.2814	25.5580	13.4714	3.2741	0.6164	0.0000	0.0000	0.0000	0.0000	2.5094	17.0706	46.7655	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													
307a	46.2814	25.5580	13.4714	3.2741	0.6164	0.0000	0.0000	0.0000	0.0000	2.5094	17.0706	46.7655	
Space heating requirement	46.2814	25.5580	13.4714	3.2741	0.6164	0.0000	0.0000	0.0000	0.0000	2.5094	17.0706	46.7655	(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	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310a	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099	
Water heating fuel	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099	(310)
Cooling System Energy Efficiency Ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	13.7085	12.3818	13.7085	13.2662	13.7085	13.2662	13.7085	13.7085	13.2662	13.7085	13.2662	13.7085	(331)
Lighting	16.0447	12.8716	11.5895	8.4909	6.5586	5.3585	5.9830	7.7770	10.1015	13.2537	14.9700	16.4906	(332)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												155.5469	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2404.8943	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												1.5555	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)													
mechanical ventilation fans (SFP = 0.7000)												161.4060	(330a)
Total electricity for the above, kWh/year												161.4060	(331)
Electricity for lighting (calculated in Appendix L)												129.4896	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												2851.3367	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating from Heat pump	155.5469	4.4400	6.9063 (340a)
Space heating total			6.9063 (340)
Total CO2 associated with community systems			0.0000 (473)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Heat pump	2404.8943	4.4400	106.7773 (342a)
Water heating total			106.7773 (342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (347a)
Pumps, fans and electric keep-hot	161.4060	16.4900	26.6158 (349)
Energy for lighting	129.4896	16.4900	21.3528 (350)
Additional standing charges			92.0000 (351)
Total energy cost			253.6523 (355)

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11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.8697 (357)
SAP value		85.9027
SAP rating (Section 12)		86 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Efficiency of heat source Heat pump			262.0000 (367)
Space and Water heating from Heat pump	977.2676	0.1593	9.4601 (367)
Electrical energy for heat distribution (space & water)	1.5555	0.0000	3.6340 (372)
Overall CO ₂ factor for heat network			0.0556 (386)
Total CO ₂ associated with community systems			142.3358 (373)
Space and water heating			142.3358 (376)
Pumps, fans and electric keep-hot	161.4060	0.1387	22.3890 (378)
Energy for lighting	129.4896	0.1443	18.6893 (379)
Total CO ₂ , kg/year			183.4141 (383)
CO ₂ emissions per m ²			3.0600 (384)
EI value			97.6593 (384a)
EI rating			98 (385)
EI band			A

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	60.0000 (1b)	x 3.1500 (2b)	= 189.0000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	189.0000 (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	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

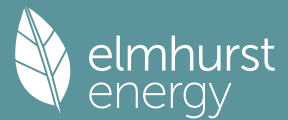
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.1500 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.8000	4.5000	4.4000	3.9000	3.9000	3.6000	3.7000	3.5000	3.7000	4.0000	4.1000	4.4000 (22)
Wind factor	1.2000	1.1250	1.1000	0.9750	0.9750	0.9000	0.9250	0.8750	0.9250	1.0000	1.0250	1.1000 (22a)
Adj infilt rate	0.1800	0.1687	0.1650	0.1462	0.1462	0.1350	0.1388	0.1313	0.1388	0.1500	0.1537	0.1650 (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	0.2750	0.2637	0.2600	0.2412	0.2412	0.2300	0.2337	0.2262	0.2337	0.2450	0.2487	0.2600 (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							
Glazing			10.6500	0.7752	8.2558		(27)
External Wall North	18.0200	2.5100	15.5100	0.1400	2.1714	70.0000	1085.7000 (29a)
External Wall South	35.1500	8.1400	27.0100	0.1400	3.7814	70.0000	1890.7000 (29a)
Total net area of external elements Aum(A, m ²)			53.1700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		14.2086		(33)
Main dwelling							
Party Wall 1 East			22.4900	0.0000	0.0000	45.0000	1012.0500 (32)
Party Wall 2 West			21.8000	0.0000	0.0000	45.0000	981.0000 (32)
Party Floor 1			60.0000			30.0000	1800.0000 (32d)

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Party Ceiling 1	60.0000					30.0000					1800.0000 (32b)			
Internal Wall 1	56.2600					9.0000					506.3400 (32c)			
Heat capacity Cm = Sum(A x k)										(28)...(30) + (32) + (32a)...(32e) =			9075.7900 (34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K													151.2632 (35)	
List of Thermal Bridges														
K1 Element					Length					Psi-value		Total		
E7 Party floor between dwellings (in blocks of flats)					41.5000					0.0300		1.2450		
E18 Party wall between dwellings					12.6000					0.0300		0.3780		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)													1.6230 (36)	
Point Thermal bridges													0.0000	
Total fabric heat loss										(33) + (36) + (36a) =			15.8316 (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	17.1517	16.4501	16.2162	15.0468	15.0468	14.3451	14.5790	14.1112	14.5790	15.2806	15.5145	16.2162	(38)	
Average = Sum(39)m / 12 =	32.9834	32.2817	32.0478	30.8784	30.8784	30.1767	30.4106	29.9428	30.4106	31.1123	31.3462	32.0478	(39)	
												31.2097		
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(40)	
HLP (average)	0.5497	0.5380	0.5341	0.5146	0.5146	0.5029	0.5068	0.4990	0.5068	0.5185	0.5224	0.5341	(40)	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31		
												31		

4. Water heating energy requirements (kWh/year)														

Assumed occupancy													1.9816 (42)	
Hot water usage for mixer showers														
	62.9929	62.0285	60.6072	58.4208	56.4618	53.7212	51.5536	54.0877	55.3622	58.0767	60.9035	62.9361	(42a)	
Hot water usage for baths														
	24.2730	23.9066	23.3854	22.6047	21.9012	20.9327	20.1980	21.0965	21.5680	22.5276	23.5253	24.2538	(42b)	
Hot water usage for other uses														
	34.9239	33.6540	32.3840	31.1140	29.8441	28.5741	28.5741	29.8441	31.1140	32.3840	33.6540	34.9239	(42c)	
Average daily hot water use (litres/day)													112.3305 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use	122.1899	119.5891	116.3766	112.1396	108.2071	103.2281	100.3257	105.0282	108.0442	112.9883	118.0828	122.1138	(44)	
Energy conte	179.8846	158.2406	166.2998	146.4823	139.4358	119.3798	110.8628	123.6201	125.3259	145.5968	159.5928	179.3331	(45)	
Energy content (annual)										Total = Sum(45)m =		1754.0545		
Distribution loss (46)m = 0.15 x (45)m	26.9827	23.7361	24.9450	21.9723	20.9154	17.9070	16.6294	18.5430	18.7989	21.8395	23.9389	26.9000	(46)	
Water storage loss:														
Store volume													110.0000 (47)	
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														
	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099	(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														
	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099	(64)	
Total per year (kWh/year) = Sum(64)m =													2404.8943 (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														
	104.0331	92.5569	99.5161	91.5003	90.5838	82.4887	81.0833	85.3251	84.4658	92.6324	95.8596	103.8497	(65)	

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

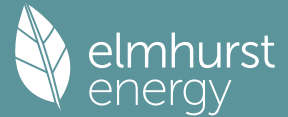
Metabolic gains (Table 5), Watts														
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	(66)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	18.3306	16.2811	13.2407	10.0240	7.4931	6.3260	6.8354	8.8850	11.9254	15.1420	17.6729	18.8401	(67)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	258.1297	260.8083	254.0584	239.6886	221.5493	204.5009	193.1115	190.4330	197.1829	211.5527	229.6920	246.7404	(68)	
Pumps, fans	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	(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)	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	(71)	
Total internal gains	139.8294	137.7335	133.7582	127.0838	121.7525	114.5677	108.9830	114.6843	117.3136	124.5059	133.1383	139.5829	(72)	
	504.7939	503.3271	489.5614	465.3005	439.2990	413.8987	397.4341	402.5064	414.9260	439.7047	469.0073	493.6675	(73)	

6. Solar gains														

[Jan]				Area	Solar flux	g	FF		Access		Gains			
				m2	Table 6a	Specific data	Specific data		factor		W			
					W/m2	or Table 6b	or Table 6c		Table 6d					
North				2.5100	12.7054	0.3500	0.8500		0.7700		6.5748	(74)		
South				8.1400	53.5774	0.3500	0.8500		0.7700		89.9137	(78)		

Solar gains	96.4885	141.7867	184.5905	230.4448	242.0170	254.7350	243.5420	229.3662	209.8802	164.7657	115.7229	80.5032	(83)	

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Total gains 601.2824 645.1138 674.1519 695.7453 681.3159 668.6337 640.9761 631.8726 624.8062 604.4704 584.7303 574.1707 (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	76.4341	78.0954	78.6654	81.6446	81.6446	83.5430	82.9005	84.1956	82.9005	81.0308	80.4262	78.6654
alpha	6.0956	6.2064	6.2444	6.4430	6.4430	6.5695	6.5267	6.6130	6.5267	6.4021	6.3617	6.2444
util living area	0.7974	0.7364	0.6430	0.5071	0.3802	0.2527	0.1708	0.1659	0.2920	0.4764	0.6697	0.8024 (86)
MIT	20.8509	20.9115	20.9629	20.9928	20.9990	21.0000	21.0000	21.0000	20.9999	20.9958	20.9602	20.8583 (87)
Th 2	20.4755	20.4861	20.4896	20.5074	20.5074	20.5181	20.5146	20.5217	20.5146	20.5039	20.5003	20.4896 (88)
util rest of house	0.7801	0.7177	0.6222	0.4860	0.3581	0.2310	0.1478	0.1432	0.2684	0.4516	0.6473	0.7853 (89)
MIT 2	20.3116	20.3906	20.4512	20.5005	20.5066	20.5181	20.5146	20.5217	20.5145	20.5001	20.4595	20.3339 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	20.6195	20.6879	20.7433	20.7815	20.7877	20.7932	20.7917	20.7947	20.7916	20.7830	20.7453	20.6333 (92)
Temperature adjustment	0.0000											
adjusted MIT	20.6195	20.6879	20.7433	20.7815	20.7877	20.7932	20.7917	20.7947	20.7916	20.7830	20.7453	20.6333 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.7850	0.7251	0.6326	0.4978	0.3707	0.2434	0.1609	0.1561	0.2818	0.4656	0.6584	0.7902 (94)
Useful gains	472.0009	467.7905	426.4814	346.3266	252.5543	162.7364	103.1420	98.6532	176.0920	281.4325	384.9647	453.7274 (95)
Ext temp.	5.0000	5.4000	7.1000	9.5000	12.6000	15.4000	17.4000	17.5000	15.0000	11.7000	8.1000	5.2000 (96)
Heat loss rate W	515.1824	493.5207	437.2371	348.3556	252.8221	162.7478	103.1426	98.6536	176.1246	282.5939	396.3816	494.6026 (97)
Space heating kWh	32.1270	17.2907	8.0023	1.4608	0.1992	0.0000	0.0000	0.0000	0.0000	0.8641	8.2202	30.4111 (98a)
Space heating requirement - total per year (kWh/year)	98.5754											
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	32.1270	17.2907	8.0023	1.4608	0.1992	0.0000	0.0000	0.0000	0.0000	0.8641	8.2202	30.4111 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	98.5754											
Space heating per m2	(98c) / (4) = 1.6429 (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												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement												
	32.1270	17.2907	8.0023	1.4608	0.1992	0.0000	0.0000	0.0000	0.0000	0.8641	8.2202	30.4111 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	32.1270	17.2907	8.0023	1.4608	0.1992	0.0000	0.0000	0.0000	0.0000	0.8641	8.2202	30.4111
Space heating requirement												
	32.1270	17.2907	8.0023	1.4608	0.1992	0.0000	0.0000	0.0000	0.0000	0.8641	8.2202	30.4111 (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												
	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00												
310a	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099
Water heating fuel												
	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	13.7085	12.3818	13.7085	13.2662	13.7085	13.2662	13.7085	13.7085	13.2662	13.7085	13.2662	13.7085 (331)
Lighting	16.0447	12.8716	11.5895	8.4909	6.5586	5.3585	5.9830	7.7770	10.1015	13.2537	14.9700	16.4906 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating	98.5754 (307)											
Space heating fuel - secondary	0.0000 (309)											
Water heating fuel - community heating	2404.8943 (310)											
Efficiency of water heater	0.0000 (311)											
Electricity used for heat distribution	0.9858 (313)											
Space cooling fuel	0.0000 (321)											
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)												
mechanical ventilation fans (SFP = 0.7000)												
Total electricity for the above, kWh/year	161.4060 (330a)											
Electricity for lighting (calculated in Appendix L)	129.4896 (332)											
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation	0.0000 (333)											
Wind generation	0.0000 (334)											
Hydro-electric generation (Appendix N)	0.0000 (335a)											

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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	2794.3653 (338)

10b. Fuel costs - using BEDF prices (568)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating from Heat pump	98.5754	5.6000	5.5202 (340a)
Space heating total			5.5202 (340)
Total CO2 associated with community systems			0.0000 (473)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Heat pump	2404.8943	5.6000	134.6741 (342a)
Water heating total			134.6741 (342)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (347a)
Pumps, fans and electric keep-hot	161.4060	26.0600	42.0624 (349)
Energy for lighting	129.4896	26.0600	33.7450 (350)
Additional standing charges			99.0000 (351)
Total energy cost			315.0017 (355)

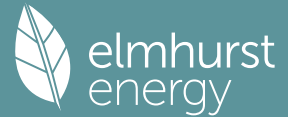
12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			262.0000 (367)
Space and Water heating from Heat pump	955.5228	0.1601	6.0223 (367)
Electrical energy for heat distribution (space & water)	0.9858	0.0000	3.5439 (372)
Overall CO2 factor for heat network			0.0554 (386)
Total CO2 associated with community systems			138.8079 (373)
Space and water heating			138.8079 (376)
Pumps, fans and electric keep-hot	161.4060	0.1387	22.3890 (378)
Energy for lighting	129.4896	0.1443	18.6893 (379)
Total CO2, kg/year			179.8862 (383)

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			262.0000 (467a)
Space and Water heating from Heat pump	955.5228	1.5925	59.9147 (467)
Electrical energy for heat distribution (space & water)	0.9858	0.0000	38.1393 (472)
Overall CO2 factor for heat network			0.5967 (486)
Total CO2 associated with community systems			1493.8359 (473)
Space and water heating			1493.8359 (476)
Pumps, fans and electric keep-hot	161.4060	1.5128	244.1750 (478)
Energy for lighting	129.4896	1.5338	198.6154 (479)
Total Primary energy kWh/year			1936.6263 (483)

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Property Reference	Be Lean				Issued on Date	08/04/2025
Assessment Reference	0305_3B5P_BL		Prop Type Ref			
Property						
SAP Rating	88 B	DER	2.40	TER	10.40	
Environmental	98 A	% DER < TER				76.92
CO ₂ Emissions (t/year)	0.23	DFEE	20.84	TFEE	25.70	
Compliance Check	See BREL	% DFEE < TFEE				18.91
% DPER < TPER	53.77	DPER	25.76	TPER	55.72	
Assessor Details	Alfie Gamble-Thornton				Assessor ID	CM02-0001
Client	Fifth State, Fifth State					

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	99.0000 (1b)	3.1500 (2b)	311.8500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	311.8500 (5)

2. Ventilation rate

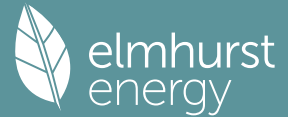
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (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	0.2862	0.2825	0.2787	0.2600	0.2562	0.2375	0.2375	0.2337	0.2450	0.2562	0.2637	0.2712 (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							
Glazing			12.4300	0.7752	9.6357		(27)
External Wall North	32.1000	4.0600	28.0400	0.1400	3.9256	70.0000	1962.8000 (29a)
External Wall South	33.8300	8.3700	25.4600	0.1400	3.5644	70.0000	1782.2000 (29a)
Total net area of external elements Aum(A, m ²)			65.9300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	17.1257		(33)
Main dwelling							
Party Wall 1 East			33.1100	0.0000	0.0000	45.0000	1489.9500 (32)
Party Wall 2 West			32.6000	0.0000	0.0000	45.0000	1467.0000 (32)
Party Floor 1			99.0000			64.0000	6336.0000 (32d)
Party Ceiling 1			99.0000			90.0000	8910.0000 (32b)
Internal Wall 1			142.4400			9.0000	1281.9600 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	23229.9100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							234.6456 (35)
List of Thermal Bridges							

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K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450
E18 Party wall between dwellings	12.6000	0.0300	0.3780
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			1.6230 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	18.7487 (37)

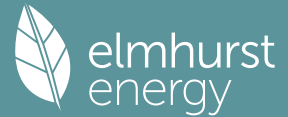
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	29.4581	29.0722	28.6863	26.7567	26.3708	24.4412	24.4412	24.0553	25.2131	26.3708	27.1426	27.9145 (38)
Heat transfer coeff												
	48.2068	47.8209	47.4350	45.5054	45.1195	43.1899	43.1899	42.8040	43.9617	45.1195	45.8913	46.6631 (39)
Average = Sum(39)m / 12 =												45.4089
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.4869	0.4830	0.4791	0.4597	0.4558	0.4363	0.4363	0.4324	0.4441	0.4558	0.4635	0.4713 (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												2.7301 (42)
Hot water usage for mixer showers												
76.7540	75.5789	73.8471	71.1830	68.7961	65.4568	62.8156	65.9033	67.4563	70.7637	74.2081	76.6848	(42a)
Hot water usage for baths												
29.5492	29.1032	28.4686	27.5183	26.6619	25.4829	24.5884	25.6822	26.2562	27.4244	28.6390	29.5258	(42b)
Hot water usage for other uses												
42.5887	41.0400	39.4913	37.9426	36.3940	34.8453	34.8453	36.3940	37.9426	39.4913	41.0400	42.5887	(42c)
Average daily hot water use (litres/day)												136.8774 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
148.8919	145.7221	141.8070	136.6440	131.8519	125.7850	122.2493	127.9795	131.6551	137.6795	143.8871	148.7993	(44)
Energy conte	219.1946	192.8198	202.6394	178.4912	169.9046	145.4661	135.0891	150.6342	177.4139	194.4682	218.5226	(45)
Energy content (annual)												Total = Sum(45)m = 2137.3570
Distribution loss (46)m = 0.15 x (45)m												
32.8792	28.9230	30.3959	26.7737	25.4857	21.8199	20.2634	22.5951	22.9070	26.6121	29.1702	32.7784	(46)
Water storage loss:												
Store volume												110.0000 (47)
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	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	(61)
Total heat required for water heating calculated for each month												
274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994	(62)
WWHRS	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	(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	(63c)
FGHRS	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	274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	(64)
Total per year (kWh/year)												2788.1968 (64)
Electric shower(s)												2788 (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	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
117.1037	104.0545	111.5990	102.1433	100.7147	91.1624	89.1386	94.3073	93.5721	103.2116	107.4556	116.8802	(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
136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
135.3430	149.8440	135.3430	139.8544	135.3430	139.8544	135.3430	135.3430	139.8544	135.3430	139.8544	135.3430	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
254.7009	257.3439	250.6836	236.5047	218.6064	201.7844	190.5464	187.9034	194.5636	208.7426	226.6409	243.4628	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	(71)
Water heating gains (Table 5)												
157.3974	154.8430	149.9987	141.8656	135.3692	126.6145	119.8099	126.7571	129.9613	138.7252	149.2439	157.0971	(72)
Total internal gains												
611.3924	625.9821	599.9765	582.1759	553.2697	532.2045	509.6504	513.9546	528.3305	546.7619	579.6904	599.8540	(73)

6. Solar gains												
[Jan]												
	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
North	4.0600	10.6334	0.3500	0.8500	0.7700	8.9006	(74)					
South	8.3700	46.7521	0.3500	0.8500	0.7700	80.6764	(78)					
Solar gains	89.5770	149.1366	197.2098	236.6489	260.7641	257.7147	248.8950	230.5999	210.5671	162.7591	106.6090	(83)
Total gains	700.9694	775.1187	797.1862	818.8248	814.0338	789.9191	758.5454	744.5545	738.8976	709.5210	686.2994	(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, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	133.8557	134.9359	136.0337	141.8019	143.0148	149.4042	149.4042	150.7512	146.7811	143.0148	140.6095	138.2837
alpha	9.9237	9.9957	10.0689	10.4535	10.5343	10.9603	10.9603	11.0501	10.7854	10.5343	10.3740	10.2189
util living area	0.9580	0.9060	0.8295	0.6689	0.5152	0.3499	0.2505	0.2645	0.4105	0.6585	0.8751	0.9622 (86)
MIT	20.8260	20.9117	20.9654	20.9962	20.9998	21.0000	21.0000	21.0000	21.0000	20.9973	20.9511	20.8267 (87)
Th 2	20.5328	20.5364	20.5400	20.5580	20.5616	20.5796	20.5796	20.5832	20.5724	20.5616	20.5544	20.5472 (88)
util rest of house	0.9500	0.8919	0.8094	0.6454	0.4910	0.3269	0.2266	0.2405	0.3851	0.6316	0.8566	0.9550 (89)
MIT 2	20.3378	20.4419	20.5052	20.5546	20.5614	20.5796	20.5796	20.5832	20.5724	20.5593	20.5046	20.3520 (90)
Living area fraction									fLA = Living area / (4) =			0.2126 (91)
MIT	20.4416	20.5418	20.6030	20.6485	20.6546	20.6690	20.6690	20.6718	20.6633	20.6524	20.5996	20.4529 (92)
Temperature adjustment												0.0000
adjusted MIT	20.4416	20.5418	20.6030	20.6485	20.6546	20.6690	20.6690	20.6718	20.6633	20.6524	20.5996	20.4529 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9483	0.8920	0.8122	0.6503	0.4962	0.3318	0.2317	0.2456	0.3905	0.6372	0.8585	0.9533 (94)
Useful gains	664.7302	691.4265	647.4813	532.4495	403.8988	262.1179	175.7391	182.8515	288.5266	452.0834	589.2139	645.3743 (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	778.1344	748.0040	668.9771	534.6190	404.0258	262.1189	175.7392	182.8515	288.5335	453.5598	619.5133	758.4111 (97)
Space heating kWh	84.3727	38.0201	15.9929	1.5621	0.0945	0.0000	0.0000	0.0000	0.0000	1.0984	21.8156	84.0994 (98a)
Space heating requirement - total per year (kWh/year)												247.0556
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	84.3727	38.0201	15.9929	1.5621	0.0945	0.0000	0.0000	0.0000	0.0000	1.0984	21.8156	84.0994 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												247.0556
Space heating per m2										(98c) / (4) =		2.4955 (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												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	84.3727	38.0201	15.9929	1.5621	0.0945	0.0000	0.0000	0.0000	0.0000	1.0984	21.8156	84.0994 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	84.3727	38.0201	15.9929	1.5621	0.0945	0.0000	0.0000	0.0000	0.0000	1.0984	21.8156	84.0994
Space heating requirement	84.3727	38.0201	15.9929	1.5621	0.0945	0.0000	0.0000	0.0000	0.0000	1.0984	21.8156	84.0994 (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	274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00												
310a	274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994
Water heating fuel	274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994 (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	23.9761	21.6558	23.9761	23.2027	23.9761	23.2027	23.9761	23.9761	23.2027	23.9761	23.2027	23.9761 (331)
Lighting	24.8645	19.9472	17.9602	13.1584	10.1640	8.3040	9.2719	12.0520	15.6543	20.5393	23.1991	25.5555 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												247.0556 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2788.1968 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												2.4706 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7420)												
mechanical ventilation fans (SFP = 0.7420)												282.2991 (330a)
Total electricity for the above, kWh/year												282.2991 (331)
Electricity for lighting (calculated in Appendix L)												200.6704 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (333)
Wind generation												0.0000 (334)
Hydro-electric generation (Appendix N)												0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)
Appendix Q - special features												
Energy saved or generated												-0.0000 (336)
Energy used												0.0000 (337)
Total delivered energy for all uses												3518.2219 (338)

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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			262.0000 (367)
Space and Water heating from Heat pump	1158.4933	0.1606	15.1414 (367)
Electrical energy for heat distribution (space & water)	2.4706	0.0000	4.3255 (372)
Overall CO2 factor for heat network			0.0558 (386)
Total CO2 associated with community systems			169.4211 (373)
Space and water heating			169.4211 (376)
Pumps, fans and electric keep-hot	282.2991	0.1387	39.1584 (378)
Energy for lighting	200.6704	0.1443	28.9629 (379)
Total CO2, kg/year			237.5424 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.4000 (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			262.0000 (467a)
Space and Water heating from Heat pump	1158.4933	1.5943	150.3338 (467)
Electrical energy for heat distribution (space & water)	2.4706	0.0000	46.3480 (472)
Overall CO2 factor for heat network			0.5981 (486)
Total CO2 associated with community systems			1815.3545 (473)
Space and water heating			1815.3545 (476)
Pumps, fans and electric keep-hot	282.2991	1.5128	427.0621 (478)
Energy for lighting	200.6704	1.5338	307.7949 (479)
Total Primary energy kWh/year			2550.2115 (483)
Dwelling Primary energy Rate (DPER)			25.7600 (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	99.0000 (1b)	x 3.1500 (2b)	= 311.8500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 311.8500 (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) = 0.0962 (8)
Pressure Test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3462 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3462 (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	0.4414	0.4328	0.4241	0.3808	0.3722	0.3289	0.3289	0.3202	0.3462	0.3722	0.3895	0.4068 (22b)
Effective ac	0.5974	0.5936	0.5899	0.5725	0.5693	0.5541	0.5541	0.5513	0.5599	0.5693	0.5758	0.5827 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opening Type			12.4300	1.1450	14.2328		(27)
External Wall North	32.1000	4.0600	28.0400	0.1800	5.0472		(29a)
External Wall South	33.8300	8.3700	25.4600	0.1800	4.5828		(29a)
Total net area of external elements Aum(A, m2)			65.9300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32)		23.8628		(33)
Main dwelling							
Party Wall 1 East			33.1100	0.0000	0.0000		(32)

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Party Wall 2 West	32.6000	0.0000	0.0000	(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K				208.6456 (35)
List of Thermal Bridges				
K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0700	2.9050	
E18 Party wall between dwellings	12.6000	0.0600	0.7560	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				3.6610 (36)
Point Thermal Bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	27.5238 (37)

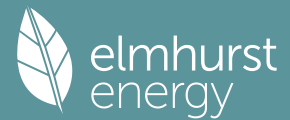
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	61.4807	61.0914	60.7098	58.9175	58.5822	57.0211	57.0211	56.7320	57.6224	58.5822	59.2605	59.9698 (38)
Average = Sum(39)m / 12 =	89.0045	88.6152	88.2336	86.4413	86.1060	84.5449	84.5449	84.2558	85.1462	86.1060	86.7844	87.4936 (39)
												86.4397
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8990	0.8951	0.8912	0.8731	0.8698	0.8540	0.8540	0.8511	0.8601	0.8698	0.8766	0.8838 (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												2.7301 (42)
Hot water usage for mixer showers												
	69.9941	68.9423	67.4095	64.4768	62.3125	59.8989	58.5270	60.0482	61.7157	64.3072	67.3029	69.7260 (42a)
Hot water usage for baths												
	30.2230	29.7741	29.1421	27.9766	27.1039	26.1363	25.6136	26.2413	26.9247	27.9601	29.1495	30.1208 (42b)
Hot water usage for other uses												
	42.5887	41.0400	39.4913	37.9426	36.3940	34.8453	34.8453	36.3940	37.9426	39.4913	41.0400	42.5887 (42c)
Average daily hot water use (litres/day)												131.2707 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	142.8058	139.7564	136.0429	130.3960	125.8104	120.8805	118.9860	122.6835	126.5831	131.7586	137.4924	142.4355 (44)
Energy conte	226.1695	199.0113	209.0928	178.5056	169.3650	148.6367	143.9032	151.9078	156.0896	178.7952	195.8832	223.0195 (45)
Energy content (annual)										Total = Sum(45)m =		2180.3794
Distribution loss (46)m = 0.15 x (45)m												
	33.9254	29.8517	31.3639	26.7758	25.4047	22.2955	21.5855	22.7862	23.4134	26.8193	29.3825	33.4529 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (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												
	272.7644	241.0970	255.6877	223.5975	215.9599	193.7285	190.4981	198.5027	201.1814	225.3901	240.9750	269.6144 (62)
WWHRS	-31.9984	-28.2996	-29.6338	-24.5379	-22.8685	-19.5687	-18.3425	-19.5055	-20.2465	-23.8684	-27.0400	-31.4058 (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	240.7660	212.7973	226.0540	199.0596	193.0914	174.1598	172.1556	178.9972	180.9349	201.5217	213.9350	238.2086 (64)
								Total per year (kWh/year) = Sum(64)m =				2431.6811 (64)
12Total per year (kWh/year)												2432 (64)
Electric shower(s)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												
Heat gains from water heating, kWh/month												
	112.4773	99.8398	106.7993	95.4266	93.5898	85.4952	85.1237	87.7853	87.9733	96.7253	101.2046	111.4299 (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	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037 (66)
	141.1704	156.2958	141.1704	145.8761	141.1704	145.8761	141.1704	141.1704	145.8761	141.1704	145.8761	141.1704 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	254.7009	257.3439	250.6836	236.5047	218.6064	201.7844	190.5464	187.9034	194.5636	208.7426	226.6409	243.4628 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030 (71)
Water heating gains (Table 5)												
	151.1792	148.5712	143.5474	132.5369	125.7927	118.7433	114.4136	117.9909	122.1851	130.0072	140.5620	149.7714 (72)
Total internal gains	614.0016	629.1620	602.3526	581.8689	552.5206	530.3549	510.0815	511.0158	526.5759	546.8713	580.0301	601.3558 (73)

6. Solar gains												
[Jan]												
	Area											
	m2											
	Solar flux											
	Table 6a											
	W/m2											
	Specific data											
	or Table 6b											
	g											
	Specific data											
	or Table 6c											
	FF											
	Access											
	factor											
	Table 6d											
	Gains											
	W											
North	4.0600											13.1938 (74)
South	8.3700											119.5909 (78)
Solar gains	132.7847	221.0731	292.3345	350.7972	386.5444	382.0241	368.9503	341.8304	312.1347	241.2664	158.0322	114.3365 (83)
Total gains	746.7863	850.2351	894.6871	932.6661	939.0651	912.3790	879.0318	852.8462	838.7107	788.1376	738.0623	715.6923 (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, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	64.4658	64.7491	65.0291	66.3774	66.6359	67.8663	67.8663	68.0992	67.3871	66.6359	66.1151	65.5791
alpha	5.2977	5.3166	5.3353	5.4252	5.4424	5.5244	5.5244	5.5399	5.4925	5.4424	5.4077	5.3719
util living area	0.9868	0.9732	0.9502	0.8884	0.7705	0.5791	0.4211	0.4513	0.6675	0.8933	0.9715	0.9891 (86)
MIT	20.0146	20.2114	20.4347	20.7126	20.8978	20.9831	20.9975	20.9964	20.9633	20.7466	20.3535	19.9947 (87)
Th 2	20.1683	20.1717	20.1749	20.1904	20.1933	20.2068	20.2068	20.2093	20.2016	20.1933	20.1874	20.1813 (88)
util rest of house	0.9836	0.9668	0.9383	0.8629	0.7236	0.5128	0.3462	0.3753	0.6017	0.8639	0.9637	0.9864 (89)
MIT 2	19.0247	19.2745	19.5545	19.8999	20.1052	20.1962	20.2058	20.2078	20.1762	19.9468	19.4676	19.0094 (90)
Living area fraction	19.2352	19.4737	19.7417	20.0727	20.2738	20.3635	20.3741	20.3755	20.3436	20.1168	19.6560	0.2126 (91)
MIT	19.2352	19.4737	19.7417	20.0727	20.2738	20.3635	20.3741	20.3755	20.3436	20.1168	19.6560	19.2189 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2352	19.4737	19.7417	20.0727	20.2738	20.3635	20.3741	20.3755	20.3436	20.1168	19.6560	19.2189 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9788	0.9601	0.9309	0.8587	0.7285	0.5262	0.3621	0.3914	0.6138	0.8608	0.9572	0.9822 (94)
Useful gains	730.9431	816.3447	832.8213	800.8854	684.1482	480.0572	318.3310	333.8053	514.8371	678.3918	706.4964	702.9682 (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	1329.3004	1291.4549	1168.3595	965.7818	738.2515	487.2776	319.0849	334.9554	531.6166	819.4572	1089.6606	1314.0557 (97)
Space heating kWh	445.1778	319.2741	249.6404	118.7254	40.2529	0.0000	0.0000	0.0000	0.0000	104.9527	275.8782	454.6492 (98a)
Space heating requirement - total per year (kWh/year)												2008.5506
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	445.1778	319.2741	249.6404	118.7254	40.2529	0.0000	0.0000	0.0000	0.0000	104.9527	275.8782	454.6492 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2008.5506
Space heating per m2										(98c) / (4) =		20.2884 (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	445.1778	319.2741	249.6404	118.7254	40.2529	0.0000	0.0000	0.0000	0.0000	104.9527	275.8782	454.6492 (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)	482.3162	345.9091	270.4663	128.6299	43.6109	0.0000	0.0000	0.0000	0.0000	113.7082	298.8930	492.5776 (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	240.7660	212.7973	226.0540	199.0596	193.0914	174.1598	172.1556	178.9972	180.9349	201.5217	213.9350	238.2086 (64)	
Efficiency of water heater	85.4186	84.9674	84.2829	82.9406	81.2200	79.8000	79.8000	79.8000	79.8000	82.6693	84.6311	79.8000 (216)	
Fuel for water heating, kWh/month	281.8661	250.4457	268.2087	240.0027	237.7387	218.2454	215.7338	224.3073	226.7354	243.7685	252.7853	278.6545 (219)	
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)	
Lighting	29.3324	23.5316	21.1876	15.5229	11.9903	9.7962	10.9380	14.2176	18.4673	24.2301	27.3678	30.1477 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-16.1810	-24.5488	-37.9298	-45.9326	-52.4579	-50.0309	-49.4148	-45.1813	-38.2646	-29.4630	-18.3927	-13.7940 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)	-4.5269	-9.8331	-20.1463	-31.1747	-42.1485	-42.7085	-42.2152	-35.3168	-25.3299	-14.3612	-6.1361	-3.5576 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1													2176.1112 (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													2938.4921 (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)													236.7295 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-699.0461 (233)
Wind generation													0.0000 (234)

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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	4738.2866 (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	2176.1112	0.2100	456.9834 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2938.4921	0.2100	617.0833 (264)
Space and water heating			1074.0667 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	236.7295	0.1443	34.1674 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-421.5914	0.1331	-56.1114
PV Unit electricity exported	-277.4547	0.1250	-34.6894
Total			-90.8008 (269)
Total CO2, kg/year			1029.3625 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.4000 (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	2176.1112	1.1300	2459.0056 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2938.4921	1.1300	3320.4961 (278)
Space and water heating			5779.5017 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	236.7295	1.5338	363.1036 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-421.5914	1.4918	-628.9337
PV Unit electricity exported	-277.4547	0.4589	-127.3219
Total			-756.2556 (283)
Total Primary energy kWh/year			5516.4506 (286)
Target Primary Energy Rate (TPER)			55.7200 (287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

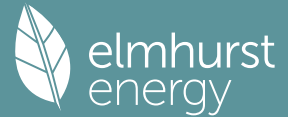
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	99.0000 (1b)	x 3.1500 (2b)	= 311.8500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 311.8500 (5)

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) = 0.0962 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2462 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2462 (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	0.3139	0.3078	0.3016	0.2708	0.2647	0.2339	0.2339	0.2277	0.2462	0.2647	0.2770	0.2893 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5493	0.5474	0.5455	0.5367	0.5350	0.5274	0.5274	0.5259	0.5303	0.5350	0.5384	0.5418 (25)

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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								
Glazing			12.4300	0.7752	9.6357			(27)
External Wall North	32.1000	4.0600	28.0400	0.1400	3.9256	70.0000	1962.8000	(29a)
External Wall South	33.8300	8.3700	25.4600	0.1400	3.5644	70.0000	1782.2000	(29a)
Total net area of external elements Aum(A, m2)			65.9300					(31)
Fabric heat loss, W/K = Sum (A x U)					17.1257			(33)
Main dwelling								
Party Wall 1 East			33.1100	0.0000	0.0000	45.0000	1489.9500	(32)
Party Wall 2 West			32.6000	0.0000	0.0000	45.0000	1467.0000	(32)
Party Floor 1			99.0000			64.0000	6336.0000	(32d)
Party Ceiling 1			99.0000			64.0000	6336.0000	(32b)
Internal Wall 1			142.4400			9.0000	1281.9600	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 20655.9100 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.6456 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450	
E18 Party wall between dwellings	12.6000	0.0300	0.3780	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				1.6230 (36)
Point Thermal Bridges				0.0000 (36a)
Total fabric heat loss				18.7487 (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	56.5255	56.3286	56.1356	55.2292	55.0596	54.2701	54.2701	54.1239	54.5742	55.0596	55.4027	55.7613	(38)
Average = Sum(39)m / 12 =	75.2741	75.0772	74.8843	73.9778	73.8082	73.0187	73.0187	72.8725	73.3228	73.8082	74.1513	74.5100	(39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.7603	0.7584	0.7564	0.7473	0.7455	0.7376	0.7376	0.7361	0.7406	0.7455	0.7490	0.7526	(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													2.7301 (42)
Hot water usage for mixer showers													
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	(42a)
Hot water usage for baths													
29.5492	29.1032	28.4686	27.5183	26.6619	25.4829	24.5884	25.6822	26.2562	27.4244	28.6390	29.5258	29.5258	(42b)
Hot water usage for other uses													
42.5887	41.0400	39.4913	37.9426	36.3940	34.8453	34.8453	36.3940	37.9426	39.4913	41.0400	42.5887	42.5887	(42c)
Average daily hot water use (litres/day)													66.1161 (43)
Daily hot water use													
72.1379	70.1432	67.9599	65.4609	63.0558	60.3281	59.4337	62.0761	64.1988	66.9157	69.6790	72.1145	72.1145	(44)
Energy conte	106.1995	92.8136	97.1134	85.5084	81.2538	69.7675	65.6760	73.0648	74.4675	86.2277	94.1735	105.9054	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)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	0.0000	(46)
Water storage 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	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	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	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													
90.2696	78.8916	82.5464	72.6821	69.0657	59.3024	55.8246	62.1050	63.2973	73.2935	80.0474	90.0196	90.0196	(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	90.2696	78.8916	82.5464	72.6821	69.0657	59.3024	55.8246	62.1050	63.2973	73.2935	80.0474	90.0196	(64)
12Total per year (kWh/year)													877.3452 (64)
Electric shower(s)	56.0536	49.9443	54.5372	52.0442	53.0208	50.5767	52.2626	53.0208	52.0442	54.5372	53.5117	56.0536	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													637.6069 (64a)
Heat gains from water heating, kWh/month	36.5808	32.2090	34.2709	31.1816	30.5216	27.4698	27.0218	28.7815	28.8354	31.9577	33.3898	36.5183	(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	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
135.3430	149.8440	135.3430	139.8544	135.3430	139.8544	135.3430	135.3430	135.3430	139.8544	135.3430	139.8544	135.3430	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
254.7009	257.3439	250.6836	236.5047	218.6064	201.7844	190.5464	187.9034	194.5636	208.7426	226.6409	243.4628	243.4628	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	(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)													
-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	(71)
Water heating gains (Table 5)													
49.1677	47.9300	46.0630	43.3077	41.0237	38.1524	36.3196	38.6848	40.0491	42.9539	46.3747	49.0838	49.0838	(72)
Total internal gains	503.1628	519.0691	496.0408	483.6180	458.9242	443.7424	426.1601	425.8822	438.4183	450.9906	476.8212	491.8407	(73)

6. Solar gains

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[Jan]			Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North			4.0600	10.6334	0.3500	0.8500	0.7700	8.9006 (74)
South			8.3700	46.7521	0.3500	0.8500	0.7700	80.6764 (78)

Solar gains	89.5770	149.1366	197.2098	236.6489	260.7641	257.7147	248.8950	230.5999	210.5671	162.7591	106.6090	77.1318 (83)
Total gains	592.7397	668.2057	693.2505	720.2669	719.6883	701.4571	675.0551	656.4821	648.9854	613.7496	583.4302	568.9725 (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	76.2248	76.4247	76.6216	77.5604	77.7387	78.5792	78.5792	78.7368	78.2533	77.7387	77.3790	77.0065
alpha	6.0817	6.0950	6.1081	6.1707	6.1826	6.2386	6.2386	6.2491	6.2169	6.1826	6.1586	6.1338
util living area	0.9945	0.9878	0.9757	0.9353	0.8396	0.6476	0.4735	0.5068	0.7358	0.9371	0.9867	0.9957 (86)
MIT	20.0944	20.2553	20.4441	20.6987	20.8882	20.9822	20.9978	20.9966	20.9613	20.7381	20.3812	20.0688 (87)
Th 2	20.2878	20.2896	20.2913	20.2993	20.3008	20.3078	20.3078	20.3091	20.3051	20.3008	20.2977	20.2946 (88)
util rest of house	0.9931	0.9847	0.9694	0.9186	0.8014	0.5846	0.4003	0.4326	0.6761	0.9177	0.9829	0.9945 (89)
MIT 2	19.4539	19.6145	19.8015	20.0521	20.2218	20.2986	20.3070	20.3079	20.2830	20.0929	19.7467	19.4340 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.5901	19.7508	19.9382	20.1896	20.3635	20.4439	20.4539	20.4543	20.4272	20.2301	19.8816	19.5690 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.5901	19.7508	19.9382	20.1896	20.3635	20.4439	20.4539	20.4543	20.4272	20.2301	19.8816	19.5690 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9913	0.9818	0.9656	0.9156	0.8051	0.5973	0.4158	0.4484	0.6871	0.9154	0.9800	0.9931 (94)
Useful gains	587.6124	656.0674	669.4217	659.4839	579.4483	418.9827	280.7065	294.3384	445.9187	561.8545	571.7684	565.0233 (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	1150.9471	1114.9565	1006.3071	835.1799	639.4375	426.7175	281.4066	295.4484	463.9299	710.7777	947.7731	1145.1410 (97)
Space heating kWh	419.1210	308.3735	250.6428	126.5011	44.6319	0.0000	0.0000	0.0000	0.0000	110.7989	270.7234	431.6075 (98a)
Space heating requirement - total per year (kWh/year)	1962.4001											
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	419.1210	308.3735	250.6428	126.5011	44.6319	0.0000	0.0000	0.0000	0.0000	110.7989	270.7234	431.6075 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1962.4001											
Space heating per m2	(98c) / (4) = 19.8222 (99)											

8c. Space cooling requirement

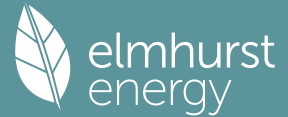
Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	686.3762	540.3387	553.8314	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9022	0.9560	0.9455	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	619.2296	516.5501	523.6454	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	761.1022	733.1411	714.0141	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	102.1483	161.1437	141.6344	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) = 1.0000 (105)											
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	25.5371	40.2859	35.4086	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	101.2316 (107)											
Energy for space heating	19.8222 (99)											
Energy for space cooling	1.0225 (108)											
Total	20.8448 (109)											
Fabric Energy Efficiency (DFEE)	20.8 (109)											

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	99.0000 (1b)	x	311.8500 (1b) - (3b)
Ground floor		3.1500 (2b)	=
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.0000		311.8500 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	311.8500 (5)

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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) = 0.0962 (8)	
Pressure test	Yes		
Pressure Test Method	Blower Door		
Measured/design AP50		5.0000 (17)	
Infiltration rate		0.3462 (18)	
Number of sides sheltered		0 (19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)	
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3462 (21)	

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	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	0.4414	0.4328	0.4241	0.3808	0.3722	0.3289	0.3289	0.3202	0.3462	0.3722	0.3895	0.4068	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													(23c)
Effective ac	0.5974	0.5936	0.5899	0.5725	0.5693	0.5541	0.5541	0.5513	0.5599	0.5693	0.5758	0.5827	(25)

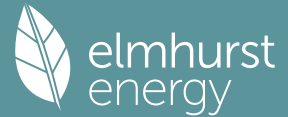
3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K						
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K						
TER Opening Type			12.4300	1.1450	14.2328			(27)					
External Wall North	32.1000	4.0600	28.0400	0.1800	5.0472			(29a)					
External Wall South	33.8300	8.3700	25.4600	0.1800	4.5828			(29a)					
Total net area of external elements Aum(A, m2)			65.9300					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.8628			(33)					
Main dwelling													
Party Wall 1 East			33.1100	0.0000	0.0000			(32)					
Party Wall 2 West			32.6000	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								208.6456 (35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
E7 Party floor between dwellings (in blocks of flats)				41.5000	0.0700	2.9050							
E18 Party wall between dwellings				12.6000	0.0600	0.7560							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.6610	(36)					
Point Thermal bridges							(36a) =	0.0000					
Total fabric heat loss							(33) + (36) + (36a) =	27.5238 (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	
	61.4807	61.0914	60.7098	58.9175	58.5822	57.0211	57.0211	56.7320	57.6224	58.5822	59.2605	59.9698	(38)
Heat transfer coeff	89.0045	88.6152	88.2336	86.4413	86.1060	84.5449	84.5449	84.2558	85.1462	86.1060	86.7844	87.4936	(39)
Average = Sum(39)m / 12 =												86.4397	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.8990	0.8951	0.8912	0.8731	0.8698	0.8540	0.8540	0.8511	0.8601	0.8698	0.8766	0.8838	(40)
HLP (average)												0.8731	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7301 (42)
Hot water usage for mixer showers													
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	(42a)
Hot water usage for baths													
30.2230	29.7741	29.1421	27.9766	27.1039	26.1363	25.6136	26.2413	26.9247	27.9601	29.1495	30.1208	30.1208	(42b)
Hot water usage for other uses													
42.5887	41.0400	39.4913	37.9426	36.3940	34.8453	34.8453	36.3940	37.9426	39.4913	41.0400	42.5887	42.5887	(42c)
Average daily hot water use (litres/day)												66.7385	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	72.8117	70.8141	68.6334	65.9193	63.4979	60.9816	60.4589	62.6352	64.8673	67.4514	70.1896	72.7095	(44)
Energy conte	115.3159	100.8384	105.4870	90.2402	85.4804	74.9840	73.1198	77.5555	79.9879	91.5310	99.9979	113.8455	(45)
Energy content (annual)												Total = Sum(45)m = 1108.3834	
Distribution loss (46)m = 0.15 x (45)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	0.0000	(46)
Water storage 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	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	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													
98.0185	85.7126	89.6639	76.7042	72.6583	63.7364	62.1518	65.9222	67.9897	77.8013	84.9982	96.7687	96.7687	(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	98.0185	85.7126	89.6639	76.7042	72.6583	63.7364	62.1518	65.9222	67.9897	77.8013	84.9982	96.7687	(64)
12Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m = 942.1259	(64)
												942	(64)

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Electric shower(s)	56.0536	49.9443	54.5372	52.0442	53.0208	50.5767	52.2626	53.0208	52.0442	54.5372	53.5117	56.0536 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												637.6069 (64a)
Heat gains from water heating, kWh/month	38.5180	33.9142	36.0503	32.1871	31.4198	28.5783	28.6036	29.7357	30.0085	33.0846	34.6275	38.2056 (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	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	141.1704	156.2958	141.1704	145.8761	141.1704	145.8761	141.1704	141.1704	145.8761	141.1704	145.8761	141.1704	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	254.7009	257.3439	250.6836	236.5047	218.6064	201.7844	190.5464	187.9034	194.5636	208.7426	226.6409	243.4628	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	(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)	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	(71)
Water heating gains (Table 5)	51.7716	50.4676	48.4547	44.7043	42.2309	39.6920	38.4457	39.9674	41.6784	44.4686	48.0937	51.3516	(72)
Total internal gains	511.5940	528.0585	504.2599	491.0362	465.9588	451.3037	434.1136	432.9923	446.0693	458.3327	484.5618	499.9360	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
North					4.0600	10.6334	0.6300	0.7000			0.7700			13.1938 (74)
South					8.3700	46.7521	0.6300	0.7000			0.7700			119.5909 (78)
Solar gains	132.7847	221.0731	292.3345	350.7972	386.5444	382.0241	368.9503	341.8304	312.1347	241.2664	158.0322			114.3365 (83)
Total gains	644.3787	749.1315	796.5943	841.8334	852.5032	833.3278	803.0639	774.8227	758.2040	699.5990	642.5941			614.2725 (84)

7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	21.0000 (85)
tau	64.4658	64.7491	65.0291	66.3774	66.6359	67.8663	67.8663	68.0992	67.3871	66.6359	66.1151	65.5791	
alpha	5.2977	5.3166	5.3353	5.4252	5.4424	5.5244	5.5244	5.5399	5.4925	5.4424	5.4077	5.3719	
util living area	0.9932	0.9843	0.9683	0.9201	0.8172	0.6270	0.4597	0.4948	0.7217	0.9283	0.9842	0.9946	(86)
MIT	19.8871	20.0928	20.3308	20.6411	20.8622	20.9753	20.9962	20.9944	20.9466	20.6744	20.2417	19.8668	(87)
Th 2	20.1683	20.1717	20.1749	20.1904	20.1933	20.2068	20.2068	20.2093	20.2016	20.1933	20.1874	20.1813	(88)
util rest of house	0.9914	0.9803	0.9600	0.8995	0.7735	0.5577	0.3786	0.4124	0.6556	0.9057	0.9795	0.9932	(89)
MIT 2	19.1513	19.3571	19.5930	19.9011	20.0981	20.1944	20.2056	20.2074	20.1718	19.9386	19.5183	19.1415	(90)
Living area fraction	19.3078	19.5136	19.7499	20.0585	20.2606	20.3605	20.3737	20.3747	20.3366	20.0951	19.6721	19.2957	(91)
MIT	19.3078	19.5136	19.7499	20.0585	20.2606	20.3605	20.3737	20.3747	20.3366	20.0951	19.6721	19.2957	(92)
Temperature adjustment	19.3078	19.5136	19.7499	20.0585	20.2606	20.3605	20.3737	20.3747	20.3366	20.0951	19.6721	19.2957	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9890	0.9763	0.9549	0.8957	0.7774	0.5715	0.3958	0.4299	0.6674	0.9025	0.9757	0.9912	(94)
Useful gains	637.2932	731.3699	760.6520	754.0090	662.7753	476.2856	317.8709	333.0630	506.0481	631.3691	626.9849	608.8530	(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	1335.7583	1294.9852	1169.0863	964.5542	737.1169	487.0198	319.0467	334.8941	531.0195	817.5819	1091.0653	1320.7786	(97)
Space heating kWh	519.6580	378.7495	303.8752	151.5925	55.3101	0.0000	0.0000	0.0000	0.0000	138.5423	334.1379	529.6727	(98a)
Space heating requirement - total per year (kWh/year)												2411.5382	
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	519.6580	378.7495	303.8752	151.5925	55.3101	0.0000	0.0000	0.0000	0.0000	138.5423	334.1379	529.6727	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2411.5382	
Space heating per m ²										(98c) / (4) =		24.3590	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	794.7223	625.6324	640.3444	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8973	0.9499	0.9380	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	713.0900	594.3178	600.6532	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	908.4483	876.1424	846.0226	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	140.6580	209.6775	182.5549	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									f _c = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	35.1645	52.4194	45.6387	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												133.2226	(107)

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Energy for space heating	24.3590 (99)
Energy for space cooling	1.3457 (108)
Total	25.7047 (109)
Fabric Energy Efficiency (TFEE)	25.7 (109)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	99.0000 (1b)	3.1500 (2b)	311.8500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.0000		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 311.8500 (5)
Dwelling volume			

2. Ventilation rate

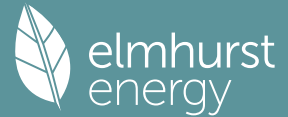
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (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	0.2862	0.2825	0.2787	0.2600	0.2562	0.2375	0.2375	0.2337	0.2450	0.2562	0.2637	0.2712 (25)

3. Heat losses and heat loss parameter

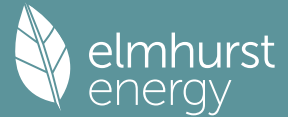
Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K					
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K					
Glazing			12.4300	0.7752	9.6357			(27)				
External Wall North	32.1000	4.0600	28.0400	0.1400	3.9256	70.0000	1962.8000	(29a)				
External Wall South	33.8300	8.3700	25.4600	0.1400	3.5644	70.0000	1782.2000	(29a)				
Total net area of external elements Aum(A, m2)			65.9300					(31)				
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		17.1257			(33)				
Main dwelling												
Party Wall 1 East			33.1100	0.0000	0.0000	45.0000	1489.9500	(32)				
Party Wall 2 West			32.6000	0.0000	0.0000	45.0000	1467.0000	(32)				
Party Floor 1			99.0000			64.0000	6336.0000	(32d)				
Party Ceiling 1			99.0000			64.0000	6336.0000	(32b)				
Internal Wall 1			142.4400			9.0000	1281.9600	(32c)				
Heat capacity Cm = Sum(A x k)					(28) ... (30) + (32) + (32a) ... (32e) =		20655.9100	(34)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							208.6456	(35)				
List of Thermal Bridges												
K1 Element				Length	Psi-value	Total						
E7 Party floor between dwellings (in blocks of flats)				41.5000	0.0300	1.2450						
E18 Party wall between dwellings				12.6000	0.0300	0.3780						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							1.6230	(36)				
Point Thermal bridges						(36a) =	0.0000					
Total fabric heat loss						(33) + (36) + (36a) =	18.7487	(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	29.4581	29.0722	28.6863	26.7567	26.3708	24.4412	24.4412	24.0553	25.2131	26.3708	27.1426	27.9145 (38)
Average = Sum(39)m / 12 =	48.2068	47.8209	47.4350	45.5054	45.1195	43.1899	43.1899	42.8040	43.9617	45.1195	45.8913	46.6631 (39)
												45.4089
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.4869	0.4830	0.4791	0.4597	0.4558	0.4363	0.4363	0.4324	0.4441	0.4558	0.4635	0.4713 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

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4. Water heating energy requirements (kWh/year)													
Assumed occupancy												2.7301 (42)	
Hot water usage for mixer showers													76.6848 (42a)
Hot water usage for baths													29.5258 (42b)
Hot water usage for other uses													42.5887 (42c)
Average daily hot water use (litres/day)													136.8774 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.8919	145.7221	141.8070	136.6440	131.8519	125.7850	122.2493	127.9795	131.6551	137.6795	143.8871	148.7993 (44)	
Energy content	219.1946	192.8198	202.6394	178.4912	169.9046	145.4661	135.0891	150.6342	152.7134	177.4139	194.4682	218.5226 (45)	
Energy content (annual)	Total = Sum(45)m =											2137.3570	
Distribution loss (46)m = 0.15 x (45)m													32.7784 (46)
Water storage loss:	32.8792	28.9230	30.3959	26.7737	25.4857	21.8199	20.2634	22.5951	22.9070	26.6121	29.1702	32.7784 (46)	
Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													0.0152 (51)
Hot water storage loss factor from Table 2 (kWh/litre/day)													1.0294 (52)
Volume factor from Table 2a													0.6000 (53)
Temperature factor from Table 2b													1.0327 (55)
Enter (49) or (54) in (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	274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994 (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	274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994 (64)	
	Total per year (kWh/year) = Sum(64)m =											2788.1968 (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	117.1037	104.0545	111.5990	102.1433	100.7147	91.1624	89.1386	94.3073	93.5721	103.2116	107.4556	116.8802 (65)	
5. Internal gains (see Table 5 and 5a)													
Metabolic gains (Table 5), Watts	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044 (66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.4070	25.2308	20.5191	15.5343	11.6120	9.8034	10.5929	13.7690	18.4808	23.4656	27.3878	29.1965 (67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	380.1506	384.0954	374.1547	352.9921	326.2782	301.1708	284.3976	280.4528	290.3935	311.5561	338.2700	363.3774 (68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105 (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)	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030 (71)	
Water heating gains (Table 5)	157.3974	154.8430	149.9987	141.8656	135.3692	126.6145	119.8099	126.7571	129.9613	138.7252	149.2439	157.0971 (72)	
Total internal gains	674.6670	672.8812	653.3845	619.1040	581.9714	546.3007	523.5123	529.6909	547.5476	582.4589	623.6138	658.3829 (73)	
6. Solar gains													
[Jan]													
	Area	Solar flux		g		FF		Access		Gains			
	m2	Table 6a		Specific data		Specific data		factor		W			
		W/m2		or Table 6b		or Table 6c		Table 6d					
North	4.0600	10.6334		0.3500		0.8500		0.7700		8.9006		(74)	
South	8.3700	46.7521		0.3500		0.8500		0.7700		80.6764		(78)	
Solar gains	89.5770	149.1366	197.2098	236.6489	260.7641	257.7147	248.8950	230.5999	210.5671	162.7591	106.6090	77.1318 (83)	
Total gains	764.2439	822.0178	850.5942	855.7529	842.7355	804.0153	772.4074	760.2908	758.1147	745.2179	730.2228	735.5147 (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	119.0237	119.9843	120.9604	126.0895	127.1680	132.8494	132.8494	134.0472	130.5170	127.1680	125.0292	122.9612	
alpha	8.9349	8.9990	9.0640	9.4060	9.4779	9.8566	9.8566	9.9365	9.7011	9.4779	9.3353	9.1974	
util living area	0.9211	0.8681	0.7830	0.6398	0.4976	0.3438	0.2460	0.2590	0.4001	0.6267	0.8320	0.9281 (86)	
MIT	20.8537	20.9184	20.9685	20.9954	20.9996	21.0000	21.0000	21.0000	21.0000	20.9968	20.9559	20.8529 (87)	
Th 2	20.5328	20.5364	20.5400	20.5580	20.5616	20.5796	20.5796	20.5832	20.5724	20.5616	20.5544	20.5472 (88)	
util rest of house	0.9096	0.8524	0.7627	0.6173	0.4742	0.3212	0.2225	0.2355	0.3753	0.6011	0.8124	0.9175 (89)	
MIT 2	20.3707	20.4489	20.5080	20.5537	20.5612	20.5796	20.5796	20.5832	20.5723	20.5588	20.5092	20.3833 (90)	
Living area fraction	fLA = Living area / (4) =												0.2126 (91)
MIT	20.4734	20.5488	20.6059	20.6476	20.6544	20.6690	20.6690	20.6718	20.6633	20.6519	20.6042	20.4831 (92)	
Temperature adjustment													0.0000
adjusted MIT	20.4734	20.5488	20.6059	20.6476	20.6544	20.6690	20.6690	20.6718	20.6633	20.6519	20.6042	20.4831 (93)	

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9081	0.8528	0.7657	0.6219	0.4792	0.3260	0.2275	0.2405	0.3806	0.6064	0.8147	0.9159	(94)
Useful gains	694.0018	701.0266	651.3065	532.1620	403.8210	262.1159	175.7391	182.8514	288.5176	451.9245	594.8974	673.6850	(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	779.6669	748.3370	669.1130	534.5813	404.0191	262.1187	175.7392	182.8515	288.5328	453.5371	619.7241	759.8220	(97)
Space heating kWh	63.7349	31.7926	13.2480	1.7419	0.1474	0.0000	0.0000	0.0000	0.0000	1.1998	17.8752	64.0859	(98a)
Space heating requirement - total per year (kWh/year)												193.8257	
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	63.7349	31.7926	13.2480	1.7419	0.1474	0.0000	0.0000	0.0000	0.0000	1.1998	17.8752	64.0859	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												193.8257	
Space heating per m2										(98c) / (4) =		1.9578	(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												1.0000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	63.7349	31.7926	13.2480	1.7419	0.1474	0.0000	0.0000	0.0000	0.0000	1.1998	17.8752	64.0859	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													
307a	63.7349	31.7926	13.2480	1.7419	0.1474	0.0000	0.0000	0.0000	0.0000	1.1998	17.8752	64.0859	
Space heating requirement	63.7349	31.7926	13.2480	1.7419	0.1474	0.0000	0.0000	0.0000	0.0000	1.1998	17.8752	64.0859	(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	274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310a	274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994	
Water heating fuel	274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994	(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	23.9761	21.6558	23.9761	23.2027	23.9761	23.2027	23.9761	23.2027	23.9761	23.2027	23.9761	23.9761	(331)
Lighting	24.8645	19.9472	17.9602	13.1584	10.1640	8.3040	9.2719	12.0520	15.6543	20.5393	23.1991	25.5555	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												193.8257	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2788.1968	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												1.9383	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7420)													
mechanical ventilation fans (SFP = 0.7420)												282.2991	(330a)
Total electricity for the above, kWh/year												282.2991	(331)
Electricity for lighting (calculated in Appendix L)												200.6704	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3464.9919	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	193.8257	4.4400	8.6059	(340a)
Space heating total			8.6059	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2788.1968	4.4400	123.7959	(342a)
Water heating total			123.7959	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	282.2991	16.4900	46.5511	(349)
Energy for lighting	200.6704	16.4900	33.0905	(350)
Additional standing charges			92.0000	(351)
Total energy cost			304.0435	(355)

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11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.7601 (357)
SAP value		87.6786
SAP rating (Section 12)		88 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Efficiency of heat source Heat pump			262.0000 (367)
Space and Water heating from Heat pump	1138.1765	0.1603	11.8624 (367)
Electrical energy for heat distribution (space & water)	1.9383	0.0000	4.2396 (372)
Overall CO ₂ factor for heat network			0.0557 (386)
Total CO ₂ associated with community systems			166.0561 (373)
Space and water heating			166.0561 (376)
Pumps, fans and electric keep-hot	282.2991	0.1387	39.1584 (378)
Energy for lighting	200.6704	0.1443	28.9629 (379)
Total CO ₂ , kg/year			234.1774 (383)
CO ₂ emissions per m ²			2.3700 (384)
EI value			97.8208 (384a)
EI rating			98 (385)
EI band			A

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	99.0000 (1b)	x 3.1500 (2b)	= 311.8500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	311.8500 (5)

2. Ventilation rate

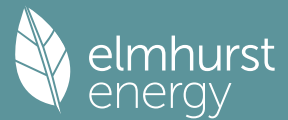
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.8000	4.5000	4.4000	3.9000	3.9000	3.6000	3.7000	3.5000	3.7000	4.0000	4.1000	4.4000 (22)
Wind factor	1.2000	1.1250	1.1000	0.9750	0.9750	0.9000	0.9250	0.8750	0.9250	1.0000	1.0250	1.1000 (22a)
Adj infilt rate	0.1800	0.1687	0.1650	0.1462	0.1462	0.1350	0.1388	0.1313	0.1388	0.1500	0.1537	0.1650 (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	0.2750	0.2637	0.2600	0.2412	0.2412	0.2300	0.2337	0.2262	0.2337	0.2450	0.2487	0.2600 (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							
Glazing			12.4300	0.7752	9.6357		(27)
External Wall North	32.1000	4.0600	28.0400	0.1400	3.9256	70.0000	1962.8000 (29a)
External Wall South	33.8300	8.3700	25.4600	0.1400	3.5644	70.0000	1782.2000 (29a)
Total net area of external elements Aum(A, m ²)			65.9300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.1257		(33)
Main dwelling							

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Party Wall 1 East	33.1100	0.0000	0.0000	45.0000	1489.9500 (32)
Party Wall 2 West	32.6000	0.0000	0.0000	45.0000	1467.0000 (32)
Party Floor 1	99.0000			64.0000	6336.0000 (32d)
Party Ceiling 1	99.0000			64.0000	6336.0000 (32b)
Internal Wall 1	142.4400			9.0000	1281.9600 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 20655.9100 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.6456 (35)

List of Thermal Bridges					
K1 Element					
E7 Party floor between dwellings (in blocks of flats)	Length	Psi-value	Total		
E18 Party wall between dwellings	41.5000	0.0300	1.2450		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	12.6000	0.0300	0.3780		
Point Thermal bridges				(36a) =	1.6230 (36)
Total fabric heat loss				(33) + (36) + (36a) =	18.7487 (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	28.3004	27.1426	26.7567	24.8272	24.8272	23.6694	24.0553	23.2835	24.0553	25.2131	25.5990	26.7567	(38)
Average = Sum(39)m / 12 =	47.0490	45.8913	45.5054	43.5758	43.5758	42.4181	42.8040	42.0322	42.8040	43.9617	44.3476	45.5054	(39)
	44.1225												
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.4752	0.4635	0.4597	0.4402	0.4402	0.4285	0.4324	0.4246	0.4324	0.4441	0.4480	0.4597	(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													2.7301 (42)
Hot water usage for mixer showers													
Hot water usage for baths	76.7540	75.5789	73.8471	71.1830	68.7961	65.4568	62.8156	65.9033	67.4563	70.7637	74.2081	76.6848	(42a)
Hot water usage for other uses	29.5492	29.1032	28.4686	27.5183	26.6619	25.4829	24.5884	25.6822	26.2562	27.4244	28.6390	29.5258	(42b)
Average daily hot water use (litres/day)	42.5887	41.0400	39.4913	37.9426	36.3940	34.8453	34.8453	36.3940	37.9426	39.4913	41.0400	42.5887	(42c)
	136.8774												(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	148.8919	145.7221	141.8070	136.6440	131.8519	125.7850	122.2493	127.9795	131.6551	137.6795	143.8871	148.7993	(44)
Energy content (annual)	219.1946	192.8198	202.6394	178.4912	169.9046	145.4661	135.0891	150.6342	152.7134	177.4139	194.4682	218.5226	(45)
Distribution loss (46)m = 0.15 x (45)m													
Water storage loss:	32.8792	28.9230	30.3959	26.7737	25.4857	21.8199	20.2634	22.5951	22.9070	26.6121	29.1702	32.7784	(46)
Store volume													110.0000 (47)
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	274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994	(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	274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994	(64)
													2788.1968 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
													0.0000 (64a)
Heat gains from water heating, kWh/month	117.1037	104.0545	111.5990	102.1433	100.7147	91.1624	89.1386	94.3073	93.5721	103.2116	107.4556	116.8802	(65)

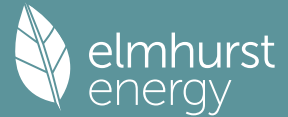
5. Internal gains (see Table 5 and 5a)

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	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	28.4070	25.2308	20.5191	15.5343	11.6120	9.8034	10.5929	13.7690	18.4808	23.4656	27.3878	29.1965	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	380.1506	384.0954	374.1547	352.9921	326.2782	301.1708	284.3976	280.4528	290.3935	311.5561	338.2700	363.3774	(68)
Pumps, fans	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	(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)	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	(71)
Total internal gains	157.3974	154.8430	149.9987	141.8656	135.3692	126.6145	119.8099	126.7571	129.9613	138.7252	149.2439	157.0971	(72)
	674.6670	672.8812	653.3845	619.1040	581.9714	546.3007	523.5123	529.6909	547.5476	582.4589	623.6138	658.3829	(73)

6. Solar gains

[Jan]													
	Area	Solar flux	g	FF	Access	Gains							
	m2	Table 6a	Specific data	Specific data	factor	W							
		W/m2	or Table 6b	or Table 6c	Table 6d								
North	4.0600	12.7054	0.3500	0.8500	0.7700	10.6349	(74)						
South	8.3700	53.5774	0.3500	0.8500	0.7700	92.4543	(78)						

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Solar gains	103.0892	152.4501	201.2176	256.3577	273.9162	290.5332	276.8490	257.0869	230.5425	177.9406	123.8346	85.8916 (83)
Total gains	777.7561	825.3313	854.6021	875.4617	855.8876	836.8339	800.3613	786.7778	778.0901	760.3995	747.4484	744.2745 (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	121.9526	125.0292	126.0895	131.6729	131.6729	135.2667	134.0472	136.5086	134.0472	130.5170	129.3812	126.0895
alpha	9.1302	9.3353	9.4060	9.7782	9.7782	10.0178	9.9365	10.1006	9.9365	9.7011	9.6254	9.4060
util living area	0.8859	0.8278	0.7283	0.5714	0.4276	0.2839	0.1925	0.1870	0.3301	0.5371	0.7508	0.8875 (86)
MIT	20.9075	20.9525	20.9852	20.9987	20.9999	21.0000	21.0000	21.0000	21.0000	20.9993	20.9841	20.9149 (87)
Th 2	20.5436	20.5544	20.5580	20.5760	20.5760	20.5868	20.5832	20.5905	20.5832	20.5724	20.5688	20.5580 (88)
util rest of house	0.8713	0.8103	0.7075	0.5506	0.4060	0.2629	0.1702	0.1651	0.3071	0.5126	0.7288	0.8731 (89)
MIT 2	20.4437	20.5046	20.5434	20.5748	20.5759	20.5868	20.5832	20.5905	20.5832	20.5718	20.5533	20.4662 (90)
Living area fraction	20.5423	20.5998	20.6373	20.6649	20.6661	20.6747	20.6718	20.6775	20.6718	20.6627	20.6449	20.5616 (92)
MIT	20.5423	20.5998	20.6373	20.6649	20.6661	20.6747	20.6718	20.6775	20.6718	20.6627	20.6449	20.5616 (93)
Temperature adjustment												0.0000
adjusted MIT	20.5423	20.5998	20.6373	20.6649	20.6661	20.6747	20.6718	20.6775	20.6718	20.6627	20.6449	20.5616 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8713	0.8121	0.7113	0.5549	0.4106	0.2674	0.1750	0.1698	0.3120	0.5177	0.7327	0.8732 (94)
Useful gains	677.6421	670.2892	607.8391	485.8269	351.4516	223.7416	140.0475	133.5586	242.7754	393.6941	547.6695	649.8860 (95)
Ext temp.	5.0000	5.4000	7.1000	9.5000	12.6000	15.4000	17.4000	17.5000	15.0000	11.7000	8.1000	5.2000 (96)
Heat loss rate W	731.2523	697.5382	616.0216	486.5199	351.4860	223.7419	140.0476	133.5586	242.7770	394.0168	556.3374	699.0375 (97)
Space heating kWh	39.8860	18.3113	6.0878	0.4990	0.0256	0.0000	0.0000	0.0000	0.0000	0.2401	6.2409	36.5687 (98a)
Space heating requirement - total per year (kWh/year)												107.8595
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	39.8860	18.3113	6.0878	0.4990	0.0256	0.0000	0.0000	0.0000	0.0000	0.2401	6.2409	36.5687 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												107.8595
Space heating per m2										(98c) / (4) =		1.0895 (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	1.0000 (306)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)
Space heating:	
Space heating requirement	
39.8860 18.3113 6.0878 0.4990 0.0256 0.0000 0.0000 0.0000 0.0000 0.2401 6.2409 36.5687 (98)	
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00	
307a 39.8860 18.3113 6.0878 0.4990 0.0256 0.0000 0.0000 0.0000 0.0000 0.2401 6.2409 36.5687	
Space heating requirement	
39.8860 18.3113 6.0878 0.4990 0.0256 0.0000 0.0000 0.0000 0.0000 0.2401 6.2409 36.5687 (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	
274.4714 242.7472 257.9162 231.9849 225.1814 198.9598 190.3659 205.9110 206.2071 232.6907 247.9619 273.7994 (64)	
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00	
310a 274.4714 242.7472 257.9162 231.9849 225.1814 198.9598 190.3659 205.9110 206.2071 232.6907 247.9619 273.7994	
Water heating fuel	
274.4714 242.7472 257.9162 231.9849 225.1814 198.9598 190.3659 205.9110 206.2071 232.6907 247.9619 273.7994 (310)	
Cooling System Energy Efficiency Ratio	
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 (314)	
Pumps and Fa 23.9761 21.6558 23.9761 23.2027 23.9761 23.2027 23.9761 23.9761 23.2027 23.9761 23.2027 23.9761 (315)	
Lighting 24.8645 19.9472 17.9602 13.1584 10.1640 8.3040 9.2719 12.0520 15.6543 20.5393 23.1991 25.5555 (332)	
Electricity generated by PVs (Appendix M) (negative quantity)	
(333a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (333a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	
(334a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (334a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	
(335a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (335a)	
Electricity generated by PVs (Appendix M) (negative quantity)	
(333b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (333b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	
(334b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (334b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	
(335b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (335b)	
Annual totals kWh/year	
Space heating fuel - community heating	107.8595 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	2788.1968 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	1.0786 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7420)	
mechanical ventilation fans (SFP = 0.7420)	282.2991 (330a)
Total electricity for the above, kWh/year	282.2991 (331)
Electricity for lighting (calculated in Appendix L)	200.6704 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	

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PV generation	0.0000 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	3379.0257 (338)

10b. Fuel costs - using BEDF prices (568)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating from Heat pump	107.8595	5.6000	6.0401 (340a)
Space heating total			6.0401 (340)
Total CO2 associated with community systems			0.0000 (473)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Heat pump	2788.1968	5.6000	156.1390 (342a)
Water heating total			156.1390 (342)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (347a)
Pumps, fans and electric keep-hot	282.2991	26.0600	73.5671 (349)
Energy for lighting	200.6704	26.0600	52.2947 (350)
Additional standing charges			99.0000 (351)
Total energy cost			387.0410 (355)

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			262.0000 (367)
Space and Water heating from Heat pump	1105.3650	0.1611	6.6310 (367)
Electrical energy for heat distribution (space & water)	1.0786	0.0000	4.1025 (372)
Overall CO2 factor for heat network			0.0555 (386)
Total CO2 associated with community systems			160.6877 (373)
Space and water heating			160.6877 (376)
Pumps, fans and electric keep-hot	282.2991	0.1387	39.1584 (378)
Energy for lighting	200.6704	0.1443	28.9629 (379)
Total CO2, kg/year			228.8090 (383)

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			262.0000 (467a)
Space and Water heating from Heat pump	1105.3650	1.5961	65.7081 (467)
Electrical energy for heat distribution (space & water)	1.0786	0.0000	44.1308 (472)
Overall CO2 factor for heat network			0.5969 (486)
Total CO2 associated with community systems			1728.5116 (473)
Space and water heating			1728.5116 (476)
Pumps, fans and electric keep-hot	282.2991	1.5128	427.0621 (478)
Energy for lighting	200.6704	1.5338	307.7949 (479)
Total Primary energy kWh/year			2463.3686 (483)

SAP 10 EPC IMPROVEMENTS

0305_3B5P_BL

Current energy efficiency rating:	B 88
Current environmental impact rating:	A 98

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures: (none)	SAP change	Cost change	CO2 change
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Recommended measures (none)	Typical annual savings	Energy efficiency	Environmental impact
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Total Savings £0 0.00 kg/m²

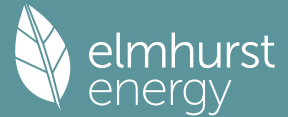
Potential energy efficiency rating:	B 88
Potential environmental impact rating:	A 98

Fuel prices for cost data on this page from database revision number 568 TEST (31 Mar 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, South East England):

	Current	Potential	Saving
Electricity	£126	£126	£0
Community scheme	£261	£261	£0
Space heating	£179	£179	£0
Water heating	£156	£156	£0
Lighting	£52	£52	£0
Total cost of fuels	£387	£387	£0
Total cost of uses	£387	£387	£0
Delivered energy	34 kWh/m²	34 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	2 kg/m²	2 kg/m²	0 kg/m²
Primary energy	25 kWh/m²	25 kWh/m²	0 kWh/m²

Full SAP Calculation Printout



SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

Main dwelling	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	99.0000 (1b)	x 3.1500 (2b)	= 311.8500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 311.8500 (5)

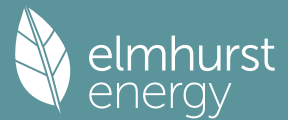
2. Ventilation rate

											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											3.0000 (17)		
Infiltration rate											0.1500 (18)		
Number of sides sheltered											0 (19)		
Shelter factor											(20) = 1 - [0.075 x (19)] =	1.0000 (20)	
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1500 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762	(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	0.2862	0.2825	0.2787	0.2600	0.2562	0.2375	0.2375	0.2337	0.2450	0.2562	0.2637	0.2712	(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													
Glazing			12.4300	0.7752	9.6357			(27)					
External Wall North	32.1000	4.0600	28.0400	0.1400	3.9256	70.0000	1962.8000	(29a)					
External Wall South	33.8300	8.3700	25.4600	0.1400	3.5644	70.0000	1782.2000	(29a)					
Total net area of external elements Aum(A, m2)			65.9300					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		17.1257			(33)					
Main dwelling													
Party Wall 1 East			33.1100	0.0000	0.0000	45.0000	1489.9500	(32)					
Party Wall 2 West			32.6000	0.0000	0.0000	45.0000	1467.0000	(32)					
Party Floor 1			99.0000			64.0000	6336.0000	(32d)					
Party Ceiling 1			99.0000			64.0000	6336.0000	(32b)					
Internal Wall 1			142.4400			9.0000	1281.9600	(32c)					
Heat capacity Cm = Sum(A x k)						(28) ... (30) + (32) + (32a) ... (32e) =	20655.9100	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							208.6456	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
E7 Party floor between dwellings (in blocks of flats)				41.5000	0.0300	1.2450							
E18 Party wall between dwellings				12.6000	0.0300	0.3780							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								1.6230 (36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	18.7487	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 29.4581	Feb 29.0722	Mar 28.6863	Apr 26.7567	May 26.3708	Jun 24.4412	Jul 24.4412	Aug 24.0553	Sep 25.2131	Oct 26.3708	Nov 27.1426	Dec 27.9145	(38)
Heat transfer coeff	48.2068	47.8209	47.4350	45.5054	45.1195	43.1899	43.1899	42.8040	43.9617	45.1195	45.8913	46.6631	(39)
Average = Sum(39)m / 12 =												45.4089	
HLP	Jan 0.4869	Feb 0.4830	Mar 0.4791	Apr 0.4597	May 0.4558	Jun 0.4363	Jul 0.4363	Aug 0.4324	Sep 0.4441	Oct 0.4558	Nov 0.4635	Dec 0.4713	(40)
HLP (average)												0.4587	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7301 (42)
Hot water usage for mixer showers												76.6848 (42a)
Hot water usage for baths												29.5258 (42b)
Hot water usage for other uses												42.5887 (42c)
Average daily hot water use (litres/day)												136.8774 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	148.8919	145.7221	141.8070	136.6440	131.8519	125.7850	122.2493	127.9795	131.6551	137.6795	143.8871	148.7993 (44)
Energy content (annual)	219.1946	192.8198	202.6394	178.4912	169.9046	145.4661	135.0891	150.6342	152.7134	177.4139	194.4682	218.5226 (45)
Distribution loss (46)m = 0.15 x (45)m												2137.3570
Water storage loss:												
Store volume												110.0000 (47)
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	274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994 (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	274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994 (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	117.1037	104.0545	111.5990	102.1433	100.7147	91.1624	89.1386	94.3073	93.5721	103.2116	107.4556	116.8802 (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	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.4070	25.2308	20.5191	15.5343	11.6120	9.8034	10.5929	13.7690	18.4808	23.4656	27.3878	29.1965 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	380.1506	384.0954	374.1547	352.9921	326.2782	301.1708	284.3976	280.4528	290.3935	311.5561	338.2700	363.3774 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105 (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)	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030 (71)
Water heating gains (Table 5)	157.3974	154.8430	149.9987	141.8656	135.3692	126.6145	119.8099	126.7571	129.9613	138.7252	149.2439	157.0971 (72)
Total internal gains	674.6670	672.8812	653.3845	619.1040	581.9714	546.3007	523.5123	529.6909	547.5476	582.4589	623.6138	658.3829 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North					4.0600	10.6334	0.3500	0.8500	0.7700		8.9006 (74)	
South					8.3700	46.7521	0.3500	0.8500	0.7700		80.6764 (78)	
Solar gains	89.5770	149.1366	197.2098	236.6489	260.7641	257.7147	248.8950	230.5999	210.5671	162.7591	106.6090	77.1318 (83)
Total gains	764.2439	822.0178	850.5942	855.7529	842.7355	804.0153	772.4074	760.2908	758.1147	745.2179	730.2228	735.5147 (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	119.0237	119.9843	120.9604	126.0895	127.1680	132.8494	132.8494	134.0472	130.5170	127.1680	125.0292	122.9612
alpha	8.9349	8.9990	9.0640	9.4060	9.4779	9.8566	9.8566	9.9365	9.7011	9.4779	9.3353	9.1974
util living area	0.9211	0.8681	0.7830	0.6398	0.4976	0.3438	0.2460	0.2590	0.4001	0.6267	0.8320	0.9281 (86)
MIT	20.8537	20.9184	20.9685	20.9954	20.9996	21.0000	21.0000	21.0000	21.0000	20.9968	20.9559	20.8529 (87)
Th 2	20.5328	20.5364	20.5400	20.5580	20.5616	20.5796	20.5796	20.5832	20.5724	20.5616	20.5544	20.5472 (88)
util rest of house	0.9096	0.8524	0.7627	0.6173	0.4742	0.3212	0.2225	0.2355	0.3753	0.6011	0.8124	0.9175 (89)
MIT 2	20.3707	20.4489	20.5080	20.5537	20.5612	20.5796	20.5796	20.5832	20.5723	20.5588	20.5092	20.3833 (90)
Living area fraction	20.4734	20.5488	20.6059	20.6476	20.6544	20.6690	20.6690	20.6718	20.6633	20.6519	20.6042	20.4831 (91)
MIT	20.4734	20.5488	20.6059	20.6476	20.6544	20.6690	20.6690	20.6718	20.6633	20.6519	20.6042	20.4831 (92)
Temperature adjustment	20.4734	20.5488	20.6059	20.6476	20.6544	20.6690	20.6690	20.6718	20.6633	20.6519	20.6042	20.4831 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9081	0.8528	0.7657	0.6219	0.4792	0.3260	0.2275	0.2405	0.3806	0.6064	0.8147	0.9159	(94)
Useful gains	694.0018	701.0266	651.3065	532.1620	403.8210	262.1159	175.7391	182.8514	288.5176	451.9245	594.8974	673.6850	(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	779.6669	748.3370	669.1130	534.5813	404.0191	262.1187	175.7392	182.8515	288.5328	453.5371	619.7241	759.8220	(97)
Space heating kWh	63.7349	31.7926	13.2480	1.7419	0.1474	0.0000	0.0000	0.0000	0.0000	1.1998	17.8752	64.0859	(98a)
Space heating requirement - total per year (kWh/year)												193.8257	
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	63.7349	31.7926	13.2480	1.7419	0.1474	0.0000	0.0000	0.0000	0.0000	1.1998	17.8752	64.0859	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												193.8257	
Space heating per m ²										(98c) / (4) =		1.9578	(99)

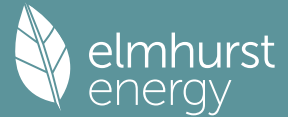
9b. Energy requirements

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													1.0000	(306)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating:														
Space heating requirement	63.7349	31.7926	13.2480	1.7419	0.1474	0.0000	0.0000	0.0000	0.0000	1.1998	17.8752	64.0859	(98)	
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00														
307a	63.7349	31.7926	13.2480	1.7419	0.1474	0.0000	0.0000	0.0000	0.0000	1.1998	17.8752	64.0859		
Space heating requirement	63.7349	31.7926	13.2480	1.7419	0.1474	0.0000	0.0000	0.0000	0.0000	1.1998	17.8752	64.0859	(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	274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994	(64)	
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00														
310a	274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994		
Water heating fuel	274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994	(310)	
Cooling System Energy Efficiency Ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	23.9761	21.6558	23.9761	23.2027	23.9761	23.2027	23.9761	23.9761	23.2027	23.9761	23.2027	23.9761	(331)	
Lighting	24.8645	19.9472	17.9602	13.1584	10.1640	8.3040	9.2719	12.0520	15.6543	20.5393	23.1991	25.5555	(332)	
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)	
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)	
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(336a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(337a)	
(337a)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	(338a)	
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(339a)	
(339a)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	(340a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(341a)	
(341a)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	(342a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(343a)	
(343a)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	(344a)	
Annual totals kWh/year														
Space heating fuel - community heating													193.8257	(307)
Space heating fuel - secondary													0.0000	(309)
Water heating fuel - community heating													2788.1968	(310)
Efficiency of water heater													0.0000	(311)
Electricity used for heat distribution													1.9383	(313)
Space cooling fuel													0.0000	(321)
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7420)													282.2991	(330a)
mechanical ventilation fans (SFP = 0.7420)													282.2991	(331)
Total electricity for the above, kWh/year													200.6704	(332)
Electricity for lighting (calculated in Appendix L)														
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													0.0000	(333)
Wind generation													0.0000	(334)
Hydro-electric generation (Appendix N)													0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)													0.0000	(335)
Appendix Q - special features														
Energy saved or generated													-0.0000	(336)
Energy used													0.0000	(337)
Total delivered energy for all uses													3464.9919	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating from Heat pump	193.8257	4.4400	8.6059 (340a)
Space heating total			8.6059 (340)
Total CO2 associated with community systems			0.0000 (473)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Heat pump	2788.1968	4.4400	123.7959 (342a)
Water heating total			123.7959 (342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (347a)
Pumps, fans and electric keep-hot	282.2991	16.4900	46.5511 (349)
Energy for lighting	200.6704	16.4900	33.0905 (350)
Additional standing charges			92.0000 (351)
Total energy cost			304.0435 (355)

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11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.7601 (357)
SAP value		87.6786
SAP rating (Section 12)		88 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Efficiency of heat source Heat pump			262.0000 (367)
Space and Water heating from Heat pump	1138.1765	0.1603	11.8624 (367)
Electrical energy for heat distribution (space & water)	1.9383	0.0000	4.2396 (372)
Overall CO ₂ factor for heat network			0.0557 (386)
Total CO ₂ associated with community systems			166.0561 (373)
Space and water heating			166.0561 (376)
Pumps, fans and electric keep-hot	282.2991	0.1387	39.1584 (378)
Energy for lighting	200.6704	0.1443	28.9629 (379)
Total CO ₂ , kg/year			234.1774 (383)
CO ₂ emissions per m ²			2.3700 (384)
EI value			97.8208 (384a)
EI rating			98 (385)
EI band			A

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	99.0000 (1b)	x 3.1500 (2b)	= 311.8500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	311.8500 (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	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.8000	4.5000	4.4000	3.9000	3.9000	3.6000	3.7000	3.5000	3.7000	4.0000	4.1000	4.4000 (22)
Wind factor	1.2000	1.1250	1.1000	0.9750	0.9750	0.9000	0.9250	0.8750	0.9250	1.0000	1.0250	1.1000 (22a)
Adj infilt rate	0.1800	0.1687	0.1650	0.1462	0.1462	0.1350	0.1388	0.1313	0.1388	0.1500	0.1537	0.1650 (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	0.2750	0.2637	0.2600	0.2412	0.2412	0.2300	0.2337	0.2262	0.2337	0.2450	0.2487	0.2600 (25)

3. Heat losses and heat loss parameter

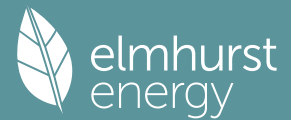
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Glazing			12.4300	0.7752	9.6357		(27)
External Wall North	32.1000	4.0600	28.0400	0.1400	3.9256	70.0000	1962.8000 (29a)
External Wall South	33.8300	8.3700	25.4600	0.1400	3.5644	70.0000	1782.2000 (29a)
Total net area of external elements Aum(A, m ²)			65.9300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.1257		(33)
Main dwelling							
Party Wall 1 East			33.1100	0.0000	0.0000	45.0000	1489.9500 (32)
Party Wall 2 West			32.6000	0.0000	0.0000	45.0000	1467.0000 (32)
Party Floor 1			99.0000			64.0000	6336.0000 (32d)

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.7301 (42)
Hot water usage for mixer showers	76.7540	75.5789	73.8471	71.1830	68.7961	65.4568	62.8156	65.9033	67.4563	70.7637	74.2081	76.6848 (42a)
Hot water usage for baths	29.5492	29.1032	28.4686	27.5183	26.6619	25.4829	24.5884	25.6822	26.2562	27.4244	28.6390	29.5258 (42b)
Hot water usage for other uses	42.5887	41.0400	39.4913	37.9426	36.3940	34.8453	34.8453	36.3940	37.9426	39.4913	41.0400	42.5887 (42c)
Average daily hot water use (litres/day)												136.8774 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	219.1946	192.8198	202.6394	178.4912	169.9046	145.4661	135.0891	150.6342	152.7134	177.4139	194.4682	218.5226 (45)
Distribution loss (46)m = 0.15 x (45)m	32.8792	28.9230	30.3959	26.7737	25.4857	21.8199	20.2634	22.5951	22.9070	26.6121	29.1702	32.7784 (46)
Water storage loss:												
Store volume												110.0000 (47)
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	274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994 (62)
VVHRS	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	274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994 (64)
	Total per year (kWh/year) = Sum(64)m =											2788.1968 (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	117.1037	104.0545	111.5990	102.1433	100.7147	91.1624	89.1386	94.3073	93.5721	103.2116	107.4556	116.8802 (65)

6. Solar gains													
[Jan]				Area m ²	Solar flux Table 6a W/m ²		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				4.0600	12.7054		0.3500		0.8500		0.7700		10.6349 (74)
South				8.3700	53.5774		0.3500		0.8500		0.7700		92.4543 (78)
Solar gains	103.0892	152.4501	201.2176	256.3577	273.9162	290.5332	276.8490	257.0869	230.5425	177.9406	123.8346		85.8916 (83)

elmhurst
energy

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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	3379.0257 (338)

10b. Fuel costs - using BEDF prices (568)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating from Heat pump	107.8595	5.6000	6.0401 (340a)
Space heating total			6.0401 (340)
Total CO2 associated with community systems			0.0000 (473)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Heat pump	2788.1968	5.6000	156.1390 (342a)
Water heating total			156.1390 (342)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (347a)
Pumps, fans and electric keep-hot	282.2991	26.0600	73.5671 (349)
Energy for lighting	200.6704	26.0600	52.2947 (350)
Additional standing charges			99.0000 (351)
Total energy cost			387.0410 (355)

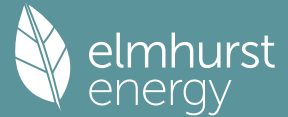
12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			262.0000 (367)
Space and Water heating from Heat pump	1105.3650	0.1611	6.6310 (367)
Electrical energy for heat distribution (space & water)	1.0786	0.0000	4.1025 (372)
Overall CO2 factor for heat network			0.0555 (386)
Total CO2 associated with community systems			160.6877 (373)
Space and water heating			160.6877 (376)
Pumps, fans and electric keep-hot	282.2991	0.1387	39.1584 (378)
Energy for lighting	200.6704	0.1443	28.9629 (379)
Total CO2, kg/year			228.8090 (383)

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			262.0000 (467a)
Space and Water heating from Heat pump	1105.3650	1.5961	65.7081 (467)
Electrical energy for heat distribution (space & water)	1.0786	0.0000	44.1308 (472)
Overall CO2 factor for heat network			0.5969 (486)
Total CO2 associated with community systems			1728.5116 (473)
Space and water heating			1728.5116 (476)
Pumps, fans and electric keep-hot	282.2991	1.5128	427.0621 (478)
Energy for lighting	200.6704	1.5338	307.7949 (479)
Total Primary energy kWh/year			2463.3686 (483)

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Property Reference	Be Lean				Issued on Date	08/04/2025
Assessment Reference	0306_3B6P_BL		Prop Type Ref			
Property						
SAP Rating	88 B	DER	2.40	TER	10.34	
Environmental	98 A	% DER < TER				76.79
CO ₂ Emissions (t/year)	0.24	DFEE	21.85	TFEE	26.75	
Compliance Check	See BREL	% DFEE < TFEE				18.31
% DPER < TPER	53.50	DPER	25.72	TPER	55.31	
Assessor Details	Alfie Gamble-Thornton				Assessor ID	CM02-0001
Client	Fifth State, Fifth State					

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	105.0000 (1b)	3.1500 (2b)	330.7500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	330.7500 (5)

2. Ventilation rate

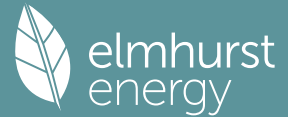
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (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	0.2862	0.2825	0.2787	0.2600	0.2562	0.2375	0.2375	0.2337	0.2450	0.2562	0.2637	0.2712 (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							
Glazing			14.4900	0.7752	11.2326		(27)
External Wall North	21.2600	5.1200	16.1400	0.1400	2.2596	70.0000	1129.8000 (29a)
External Wall South	38.7100	9.3700	29.3400	0.1400	4.1076	70.0000	2053.8000 (29a)
Total net area of external elements Aum(A, m ²)			59.9700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.5998		(33)
Main dwelling							
Party Wall 1 East			32.4800	0.0000	0.0000	45.0000	1461.6000 (32)
Party Wall 2 West			35.0600	0.0000	0.0000	45.0000	1577.7000 (32)
Party Floor 1			105.0000			30.0000	3150.0000 (32d)
Party Ceiling 1			105.0000			20.0000	2100.0000 (32b)
Internal Wall 1			117.9400			9.0000	1061.4600 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	12534.3600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							119.3749 (35)
List of Thermal Bridges							

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K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450
E18 Party wall between dwellings	12.6000	0.0300	0.3780
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			1.6230 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	19.2228 (37)

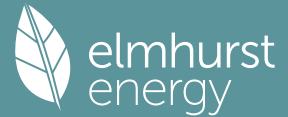
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	31.2435	30.8342	30.4249	28.3784	27.9690	25.9225	25.9225	25.5132	26.7411	27.9690	28.7877	29.6063
Average = Sum(39)m / 12 =	50.4662	50.0569	49.6476	47.6011	47.1918	45.1453	45.1453	44.7360	45.9639	47.1918	48.0104	48.8290
												47.4988
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.4806	0.4767	0.4728	0.4533	0.4494	0.4300	0.4300	0.4261	0.4378	0.4494	0.4572	0.4650
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.7812 (42)
Hot water usage for mixer showers												77.6247 (42a)
Hot water usage for baths												29.8862 (42b)
Hot water usage for other uses												43.1127 (42c)
Average daily hot water use (litres/day)												138.5556 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	150.7174	147.5087	143.5457	138.3193	133.4685	127.3271	123.7482	129.5486	133.2693	139.3675	145.6513	150.6237
Energy content (annual)	221.8821	195.1838	205.1238	180.6795	171.9876	147.2495	136.7454	152.4810	154.5858	179.5891	196.8525	221.2019
Distribution loss (46)m = 0.15 x (45)m												2163.5622
Water storage loss:												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												0.0152 (51)
Hot water storage loss factor from Table 2 (kWh/litre/day)												1.0294 (52)
Volume factor from Table 2a												0.6000 (53)
Temperature factor from Table 2b												1.0327 (55)
Enter (49) or (54) in (55)												
Total storage loss												
If cylinder contains dedicated solar storage												
Primary 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
Combi loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624
Total heat required for water heating calculated for each month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
WWHRS	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Output from w/h	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787
12Total per year (kWh/year)												2814.4020
Electric shower(s)												2814
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
	117.9972	104.8406	112.4251	102.8709	101.4073	91.7554	89.6893	94.9214	94.1947	103.9348	108.2484	117.7711

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	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	137.7833	152.5458	137.7833	142.3761	137.7833	142.3761	137.7833	137.7833	142.3761	137.7833	142.3761	137.7833
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	264.1668	266.9081	260.0003	245.2944	226.7308	209.2837	197.6280	194.8868	201.7946	216.5004	235.0640	252.5111
Pumps, fans	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062
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
Water heating gains (Table 5)	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497
Total internal gains	158.5984	156.0128	151.1090	142.8762	136.3002	127.4381	120.5501	127.5825	130.8260	139.6974	150.3450	158.2944
	625.2672	640.1853	613.6112	595.2654	565.5330	543.8166	520.6801	524.9712	539.7153	558.6998	592.5037	613.3075

6. Solar gains												
[Jan]												
			Area	Solar flux	g			FF		Access		Gains
			m2	Table 6a	Specific data	Specific data				factor		W
				W/m2	or Table 6b	or Table 6c				Table 6d		
North			5.1200	10.6334	0.3500	0.8500				0.7700		11.2244 (74)
South			9.3700	46.7521	0.3500	0.8500				0.7700		90.3151 (78)
Solar gains	101.5395	169.3633	224.8642	271.4967	300.7750	297.9858	287.4832	265.1733	240.6455	185.0718	120.9010	87.3978 (83)
Total gains	726.8068	809.5486	838.4755	866.7621	866.3079	841.8024	808.1633	790.1445	780.3608	743.7716	713.4047	700.7053 (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, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	68.9920	69.5561	70.1296	73.1447	73.7791	77.1236	77.1236	77.8292	75.7500	73.7791	72.5211	71.3053
alpha	5.5995	5.6371	5.6753	5.8763	5.9186	6.1416	6.1416	6.1886	6.0500	5.9186	5.8347	5.7537
util living area	0.9037	0.8474	0.7785	0.6430	0.5021	0.3429	0.2458	0.2604	0.4054	0.6396	0.8237	0.9101 (86)
MIT	20.5917	20.7364	20.8522	20.9587	20.9913	20.9994	20.9999	20.9999	20.9982	20.9664	20.8234	20.5966 (87)
Th 2	20.5386	20.5422	20.5458	20.5638	20.5674	20.5854	20.5854	20.5891	20.5782	20.5674	20.5602	20.5530 (88)
util rest of house	0.8944	0.8348	0.7622	0.6229	0.4797	0.3208	0.2226	0.2372	0.3809	0.6163	0.8083	0.9015 (89)
MIT 2	20.0613	20.2398	20.3812	20.5203	20.5590	20.5850	20.5854	20.5890	20.5767	20.5332	20.3624	20.0801 (90)
Living area fraction									fLA = Living area / (4) =			0.2204 (91)
MIT	20.1782	20.3492	20.4850	20.6169	20.6543	20.6763	20.6768	20.6796	20.6696	20.6287	20.4640	20.1939 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1782	20.3492	20.4850	20.6169	20.6543	20.6763	20.6768	20.6796	20.6696	20.6287	20.4640	20.1939 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8866	0.8292	0.7599	0.6254	0.4842	0.3256	0.2277	0.2423	0.3862	0.6196	0.8048	0.8939 (94)
Useful gains	644.4046	671.3050	637.1839	542.0745	419.4565	274.1271	184.0306	191.4283	301.3692	460.8748	574.1748	626.3950 (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	801.3140	773.3417	694.3209	557.7368	422.5690	274.3161	184.0467	191.4508	301.9625	473.2714	641.6126	780.9687 (97)
Space heating kWh	116.7406	68.5687	42.5099	11.2768	2.3157	0.0000	0.0000	0.0000	0.0000	9.2231	48.5552	115.0028 (98a)
Space heating requirement - total per year (kWh/year)												414.1928
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	116.7406	68.5687	42.5099	11.2768	2.3157	0.0000	0.0000	0.0000	0.0000	9.2231	48.5552	115.0028 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												414.1928
Space heating per m2										(98c) / (4) =		3.9447 (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												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	116.7406	68.5687	42.5099	11.2768	2.3157	0.0000	0.0000	0.0000	0.0000	9.2231	48.5552	115.0028 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	116.7406	68.5687	42.5099	11.2768	2.3157	0.0000	0.0000	0.0000	0.0000	9.2231	48.5552	115.0028
Space heating requirement	116.7406	68.5687	42.5099	11.2768	2.3157	0.0000	0.0000	0.0000	0.0000	9.2231	48.5552	115.0028 (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	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00												
310a	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787
Water heating fuel	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787 (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	25.4292	22.9683	25.4292	24.6089	25.4292	24.6089	25.4292	25.4292	24.6089	25.4292	24.6089	25.4292 (331)
Lighting	25.3128	20.3068	18.2841	13.3957	10.3472	8.4538	9.4391	12.2693	15.9366	20.9096	23.6174	26.0163 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												414.1928 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2814.4020 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												4.1419 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7420)												
mechanical ventilation fans (SFP = 0.7420)												299.4081 (330a)
Total electricity for the above, kWh/year												299.4081 (331)
Electricity for lighting (calculated in Appendix L)												204.2886 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (333)
Wind generation												0.0000 (334)
Hydro-electric generation (Appendix N)												0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)
Appendix Q - special features												
Energy saved or generated												-0.0000 (336)
Energy used												0.0000 (337)
Total delivered energy for all uses												3732.2915 (338)

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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			262.0000 (367)
Space and Water heating from Heat pump	1232.2881	0.1588	25.0968 (367)
Electrical energy for heat distribution (space & water)	4.1419	0.0000	4.6234 (372)
Overall CO2 factor for heat network			0.0561 (386)
Total CO2 associated with community systems			181.0905 (373)
Space and water heating			181.0905 (376)
Pumps, fans and electric keep-hot	299.4081	0.1387	41.5316 (378)
Energy for lighting	204.2886	0.1443	29.4852 (379)
Total CO2, kg/year			252.1072 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.4000 (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			262.0000 (467a)
Space and Water heating from Heat pump	1232.2881	1.5876	250.9870 (467)
Electrical energy for heat distribution (space & water)	4.1419	0.0000	49.3843 (472)
Overall CO2 factor for heat network			0.5991 (486)
Total CO2 associated with community systems			1934.2824 (473)
Space and water heating			1934.2824 (476)
Pumps, fans and electric keep-hot	299.4081	1.5128	452.9446 (478)
Energy for lighting	204.2886	1.5338	313.3447 (479)
Total Primary energy kWh/year			2700.5717 (483)
Dwelling Primary energy Rate (DPER)			25.7200 (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	105.0000 (1b)	x 3.1500 (2b)	= 330.7500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 330.7500 (5)

2. Ventilation rate

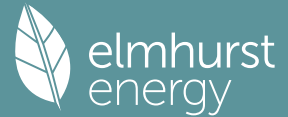
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (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)	40.0000 / (5) = 0.1209 (8)
Pressure Test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3709 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3709 (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	0.4729	0.4637	0.4544	0.4080	0.3988	0.3524	0.3524	0.3431	0.3709	0.3988	0.4173	0.4359 (22b)
Effective ac	0.6118	0.6075	0.6032	0.5832	0.5795	0.5621	0.5621	0.5589	0.5688	0.5795	0.5871	0.5950 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opening Type			14.4900	1.1450	16.5916		(27)
External Wall North	21.2600	5.1200	16.1400	0.1800	2.9052		(29a)
External Wall South	38.7100	9.3700	29.3400	0.1800	5.2812		(29a)
Total net area of external elements Aum(A, m2)			59.9700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.7780		(33)
Main dwelling							
Party Wall 1 East			32.4800	0.0000	0.0000		(32)

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Party Wall 2 West	35.0600	0.0000	0.0000	(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K				129.3749 (35)
List of Thermal Bridges				
K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0700	2.9050	
E18 Party wall between dwellings	12.6000	0.0600	0.7560	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				3.6610 (36)
Point Thermal Bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	28.4390 (37)

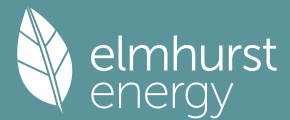
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	66.7806	66.3066	65.8420	63.6597	63.2514	61.3507	61.3507	60.9987	62.0828	63.2514	64.0774	64.9409 (38)
Average = Sum(39)m / 12 =	95.2196	94.7456	94.2810	92.0987	91.6904	89.7897	89.7897	89.4377	90.5218	91.6904	92.5164	93.3799 (39)
												92.0967
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9069	0.9023	0.8979	0.8771	0.8732	0.8551	0.8551	0.8518	0.8621	0.8732	0.8811	0.8893 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.7812 (42)
Hot water usage for mixer showers												
	70.8521	69.7873	68.2357	65.2671	63.0763	60.6331	59.2444	60.7843	62.4722	65.0954	68.1278	70.5806 (42a)
Hot water usage for baths												
	30.5919	30.1376	29.4978	28.3181	27.4348	26.4554	25.9263	26.5616	27.2534	28.3014	29.5054	30.4885 (42b)
Hot water usage for other uses												
	43.1127	41.5450	39.9772	38.4095	36.8418	35.2740	35.2740	36.8418	38.4095	39.9772	41.5450	43.1127 (42c)
Average daily hot water use (litres/day)												132.8802 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	144.5567	141.4699	137.7108	131.9947	127.3529	122.3625	120.4448	124.1876	128.1351	133.3741	139.1782	144.1818 (44)
Energy content (annual)	228.9425	201.4512	211.6563	180.6942	171.4414	150.4590	145.6675	153.7702	158.0034	180.9874	198.2849	225.7539 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 2207.1119
	34.3414	30.2177	31.7485	27.1041	25.7162	22.5688	21.8501	23.0655	23.7005	27.1481	29.7427	33.8631 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (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												
	275.5374	243.5370	258.2512	225.7860	218.0363	195.5508	192.2624	200.3651	203.0952	227.5823	243.3767	272.3488 (62)
WWHRS	-32.3906	-28.6465	-29.9970	-24.8387	-23.1488	-19.8086	-18.5674	-19.7445	-20.4947	-24.1610	-27.3715	-31.7908 (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	243.1468	214.8904	228.2543	200.9473	194.8876	175.7422	173.6950	180.6206	182.6005	203.4213	216.0052	240.5580 (64)
												Total per year (kWh/year) = Sum(64)m = 2454.7692 (64)
12Total per year (kWh/year)												2455
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												
	113.3993	100.6511	107.6517	96.1543	94.2802	86.1011	85.7104	88.4045	88.6096	97.4542	102.0032	112.3391 (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	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	143.3933	158.7569	143.3933	148.1731	143.3933	148.1731	143.3933	143.3933	148.1731	143.3933	148.1731	143.3933 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	264.1668	266.9081	260.0003	245.2944	226.7308	209.2837	197.6280	194.8868	201.7946	216.5004	235.0640	252.5111 (68)
Pumps, fans	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497 (71)
Total internal gains	152.4184	149.7784	144.6931	133.5476	126.7207	119.5848	115.2021	118.8233	123.0689	130.9869	141.6711	150.9934 (72)
	627.6972	643.1620	615.8053	594.7337	564.5634	541.7603	520.9420	521.8220	537.7551	558.5992	592.6268	614.6164 (73)

6. Solar gains												
[Jan]												
	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
North	5.1200	10.6334	0.6300	0.7000	0.7700	16.6385 (74)						
South	9.3700	46.7521	0.6300	0.7000	0.7700	133.8789 (78)						
Solar gains	150.5174	251.0562	333.3281	402.4540	445.8547	441.7202	426.1516	393.0804	356.7216	274.3418	179.2179	129.5544 (83)
Total gains	778.2146	894.2181	949.1334	997.1877	1010.4181	983.4804	947.0936	914.9023	894.4767	832.9410	771.8447	744.1708 (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, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	39.6287	39.8270	40.0233	40.9716	41.1541	42.0253	42.0253	42.1906	41.6854	41.1541	40.7866	40.4095
alpha	3.6419	3.6551	3.6682	3.7314	3.7436	3.8017	3.8017	3.8127	3.7790	3.7436	3.7191	3.6940
util living area	0.9607	0.9359	0.9020	0.8301	0.7177	0.5502	0.4083	0.4377	0.6322	0.8390	0.9342	0.9655 (86)
MIT	19.5022	19.7743	20.0890	20.4856	20.7708	20.9394	20.9848	20.9801	20.8934	20.5422	19.9874	19.4800 (87)
Th 2	20.1617	20.1655	20.1693	20.1870	20.1903	20.2058	20.2058	20.2087	20.1998	20.1903	20.1836	20.1766 (88)
util rest of house	0.9546	0.9263	0.8871	0.8047	0.6766	0.4914	0.3380	0.3669	0.5749	0.8100	0.9228	0.9601 (89)
MIT 2	18.4109	18.7537	19.1472	19.6411	19.9716	20.1593	20.1974	20.1971	20.1121	19.7185	19.0377	18.3932 (90)
Living area fraction	fLA = Living area / (4) = 0.2204 (91)											
MIT	18.6514	18.9786	19.3548	19.8272	20.1477	20.3312	20.3709	20.3697	20.2843	19.9000	19.2470	18.6327 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.6514	18.9786	19.3548	19.8272	20.1477	20.3312	20.3709	20.3697	20.2843	19.9000	19.2470	18.6327 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9402	0.9095	0.8700	0.7923	0.6743	0.5010	0.3529	0.3816	0.5813	0.7984	0.9067	0.9468 (94)
Useful gains	731.6975	813.3075	825.7574	790.0227	681.3022	492.7158	334.2009	349.0920	519.9216	664.9788	699.8404	704.5795 (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	1366.5385	1333.8849	1211.9631	1006.3792	774.5766	514.6031	338.5901	355.0372	559.8103	852.7221	1123.8007	1347.7266 (97)
Space heating kWh	472.3217	349.8280	287.3370	155.7767	69.3962	0.0000	0.0000	0.0000	0.0000	139.6810	305.2514	478.5014 (98a)
Space heating requirement - total per year (kWh/year)												2258.0935
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	472.3217	349.8280	287.3370	155.7767	69.3962	0.0000	0.0000	0.0000	0.0000	139.6810	305.2514	478.5014 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2258.0935
Space heating per m2										(98c) / (4) =		21.5057 (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	472.3217	349.8280	287.3370	155.7767	69.3962	0.0000	0.0000	0.0000	0.0000	139.6810	305.2514	478.5014 (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)	511.7245	379.0119	311.3077	168.7722	75.1854	0.0000	0.0000	0.0000	0.0000	151.3337	330.7166	518.4197 (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	243.1468	214.8904	228.2543	200.9473	194.8876	175.7422	173.6950	180.6206	182.6005	203.4213	216.0052	240.5580 (64)	
Efficiency of water heater												79.8000 (216)	
(217)m	85.5221	85.1458	84.5771	83.4954	81.9818	79.8000	79.8000	79.8000	79.8000	83.2344	84.8351	85.5713 (217)	
Fuel for water heating, kWh/month	284.3088	252.3793	269.8770	240.6687	237.7206	220.2284	217.6629	226.3416	228.8227	244.3958	254.6176	281.1199 (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	29.7943	23.9021	21.5212	15.7673	12.1791	9.9505	11.1102	14.4415	18.7581	24.6116	27.7987	30.6224 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-17.1041	-25.9181	-39.9986	-48.3792	-55.1987	-52.6230	-51.9706	-47.5401	-40.2990	-31.0769	-19.4299	-14.5840 (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	-4.8589	-10.5476	-21.5972	-33.4013	-45.1415	-45.7370	-45.2128	-37.8366	-27.1497	-15.4032	-6.5855	-3.8192 (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													2446.4718 (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													2958.1431 (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)													240.4570 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-741.4126 (233)
Wind generation													0.0000 (234)

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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	4989.6594 (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	2446.4718	0.2100	513.7591 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2958.1431	0.2100	621.2101 (264)
Space and water heating			1134.9691 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	240.4570	0.1443	34.7054 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-444.1222	0.1331	-59.1211
PV Unit electricity exported	-297.2904	0.1250	-37.1735
Total			-96.2946 (269)
Total CO2, kg/year			1085.3092 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.3400 (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	2446.4718	1.1300	2764.5132 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2958.1431	1.1300	3342.7017 (278)
Space and water heating			6107.2149 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	240.4570	1.5338	368.8210 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-444.1222	1.4919	-662.5866
PV Unit electricity exported	-297.2904	0.4589	-136.4396
Total			-799.0261 (283)
Total Primary energy kWh/year			5807.1106 (286)
Target Primary Energy Rate (TPER)			55.3100 (287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

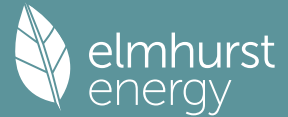
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	105.0000 (1b)	x 3.1500 (2b)	= 330.7500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 330.7500 (5)

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	4 * 10 = 40.0000 (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) = 40.0000 / (5) = 0.1209 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2709 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2709 (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	0.3454	0.3387	0.3319	0.2980	0.2913	0.2574	0.2574	0.2506	0.2709	0.2913	0.3048	0.3184 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5597	0.5573	0.5551	0.5444	0.5424	0.5331	0.5331	0.5314	0.5367	0.5424	0.5465	0.5507 (25)

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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								
Glazing			14.4900	0.7752	11.2326			(27)
External Wall North	21.2600	5.1200	16.1400	0.1400	2.2596	70.0000	1129.8000	(29a)
External Wall South	38.7100	9.3700	29.3400	0.1400	4.1076	70.0000	2053.8000	(29a)
Total net area of external elements Aum(A, m2)			59.9700					(31)
Fabric heat loss, W/K = Sum (A x U)					17.5998			(33)
Main dwelling								
Party Wall 1 East			32.4800	0.0000	0.0000	45.0000	1461.6000	(32)
Party Wall 2 West			35.0600	0.0000	0.0000	45.0000	1577.7000	(32)
Party Floor 1			105.0000			30.0000	3150.0000	(32d)
Party Ceiling 1			105.0000			30.0000	3150.0000	(32b)
Internal Wall 1			117.9400			9.0000	1061.4600	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13584.3600 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 129.3749 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450	
E18 Party wall between dwellings	12.6000	0.0300	0.3780	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				1.6230 (36)
Point Thermal Bridges				0.0000 (36a)
Total fabric heat loss				19.2228 (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	61.0862	60.8333	60.5854	59.4211	59.2033	58.1893	58.1893	58.0015	58.5798	59.2033	59.6440	60.1047	(38)
Average = Sum(39)m / 12 =	80.3089	80.0560	79.8082	78.6439	78.4261	77.4120	77.4120	77.2242	77.8026	78.4261	78.8667	79.3274	(39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.7648	0.7624	0.7601	0.7490	0.7469	0.7373	0.7373	0.7355	0.7410	0.7469	0.7511	0.7555	(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													2.7812 (42)
Hot water usage for mixer showers													
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	(42a)
Hot water usage for baths													
29.9100	29.4585	28.8161	27.8542	26.9873	25.7939	24.8886	25.9957	26.5767	27.7592	28.9886	29.8862	29.8862	(42b)
Hot water usage for other uses													
43.1127	41.5450	39.9772	38.4095	36.8418	35.2740	35.2740	36.8418	38.4095	39.9772	41.5450	43.1127	43.1127	(42c)
Average daily hot water use (litres/day)													66.9270 (43)
Daily hot water use													
73.0227	71.0034	68.7934	66.2637	63.8291	61.0680	60.1626	62.8374	64.9862	67.7364	70.5335	72.9989	72.9989	(44)
Energy conte	107.5020	93.9519	98.3043	86.5570	82.2502	70.6231	66.4814	73.9608	75.3808	87.2852	95.3284	107.2043	(45)
Distribution loss (46)m = 0.15 x (45)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	0.0000	(46)
Water storage 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	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	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	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													
91.3767	79.8591	83.5587	73.5734	69.9127	60.0296	56.5092	62.8667	64.0736	74.1924	81.0292	91.1237	91.1237	(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													
91.3767	79.8591	83.5587	73.5734	69.9127	60.0296	56.5092	62.8667	64.0736	74.1924	81.0292	91.1237	91.1237	(64)
12Total per year (kWh/year)													888 (64)
Electric shower(s)													
56.7407	50.5564	55.2057	52.6821	53.6707	51.1966	52.9032	53.6707	52.6821	55.2057	54.1676	56.7407	56.7407	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													645.4223 (64a)
Heat gains from water heating, kWh/month													
37.0294	32.6039	34.6911	31.5639	30.8958	27.8066	27.3531	29.1343	29.1889	32.3495	33.7992	36.9661	36.9661	(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	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
137.7833	152.5458	137.7833	142.3761	137.7833	142.3761	137.7833	137.7833	142.3761	137.7833	142.3761	137.7833	137.7833	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
264.1668	266.9081	260.0003	245.2944	226.7308	209.2837	197.6280	194.8868	201.7946	216.5004	235.0640	252.5111	252.5111	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	(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)													
-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	(71)
Water heating gains (Table 5)													
49.7706	48.5177	46.6278	43.8387	41.5267	38.6202	36.7649	39.1591	40.5402	43.4806	46.9433	49.6856	49.6856	(72)
Total internal gains													
516.4394	532.6902	509.1300	496.2279	470.7595	454.9987	436.8949	436.5478	449.4295	462.4830	489.1021	504.6987	504.6987	(73)

6. Solar gains

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[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	5.1200	10.6334	0.3500	0.8500	0.7700	11.2244 (74)
South	9.3700	46.7521	0.3500	0.8500	0.7700	90.3151 (78)

Solar gains	101.5395	169.3633	224.8642	271.4967	300.7750	297.9858	287.4832	265.1733	240.6455	185.0718	120.9010	87.3978 (83)
Total gains	617.9789	702.0535	733.9943	767.7246	771.5345	752.9845	724.3781	701.7211	690.0750	647.5548	610.0030	592.0965 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	46.9865	47.1349	47.2813	47.9813	48.1145	48.7448	48.7448	48.8633	48.5001	48.1145	47.8457	47.5678
alpha	4.1324	4.1423	4.1521	4.1988	4.2076	4.2497	4.2497	4.2576	4.2333	4.2076	4.1897	4.1712
util living area	0.9776	0.9616	0.9389	0.8834	0.7846	0.6152	0.4599	0.4921	0.6963	0.8884	0.9600	0.9809 (86)
MIT	19.6280	19.8564	20.1273	20.4883	20.7678	20.9395	20.9860	20.9813	20.8943	20.5499	20.0451	19.5958 (87)
Th 2	20.2839	20.2860	20.2881	20.2978	20.2996	20.3080	20.3080	20.3096	20.3048	20.2996	20.2959	20.2921 (88)
util rest of house	0.9741	0.9556	0.9292	0.8646	0.7501	0.5600	0.3915	0.4234	0.6448	0.8669	0.9529	0.9778 (89)
MIT 2	19.0149	19.2411	19.5080	19.8625	20.1204	20.2701	20.3016	20.3006	20.2339	19.9263	19.4367	18.9894 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.1500	19.3767	19.6445	20.0004	20.2630	20.4176	20.4524	20.4506	20.3794	20.0637	19.5708	19.1231 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.1500	19.3767	19.6445	20.0004	20.2630	20.4176	20.4524	20.4506	20.3794	20.0637	19.5708	19.1231 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9670	0.9465	0.9190	0.8557	0.7482	0.5691	0.4061	0.4377	0.6506	0.8588	0.9440	0.9714 (94)
Useful gains	597.6034	664.4984	674.5100	656.9550	577.2471	428.5136	294.1480	307.1645	448.9966	556.0944	575.8280	575.1764 (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	1192.5889	1158.9482	1049.0389	872.9787	671.5654	450.3557	298.2254	312.8045	488.5564	742.2043	983.5290	1183.8080 (97)
Space heating kWh	442.6692	332.2703	278.6495	155.5370	70.1728	0.0000	0.0000	0.0000	0.0000	138.4657	293.5447	452.8219 (98a)
Space heating requirement - total per year (kWh/year)	2164.1312											
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	442.6692	332.2703	278.6495	155.5370	70.1728	0.0000	0.0000	0.0000	0.0000	138.4657	293.5447	452.8219 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2164.1312											
Space heating per m2	(98c) / (4) = 20.6108 (99)											

8c. Space cooling requirement

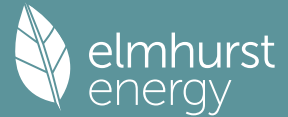
Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	727.6729	572.8489	586.9041	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8551	0.9142	0.9005	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	622.2501	523.7028	528.5063	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	821.4282	790.8713	767.0033	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	143.4082	198.7733	177.4418	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	35.8520	49.6933	44.3605	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	129.9058 (107)											
Energy for space heating	20.6108 (99)											
Energy for space cooling	1.2372 (108)											
Total	21.8480 (109)											
Fabric Energy Efficiency (DFEE)	21.8 (109)											

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	105.0000 (1b)	x	330.7500 (1b) - (3b)
Ground floor		3.1500 (2b)	=
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.0000		330.7500 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	330.7500 (5)

Full SAP Calculation Printout



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	4 * 10 =	40.0000	(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) =	40.0000 / (5) =	0.1209	(8)
Pressure test	Yes		
Pressure Test Method	Blower Door		
Measured/design AP50	5.0000 (17)		
Infiltration rate	0.3709 (18)		
Number of sides sheltered	0 (19)		
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3709	(21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
	0.4729	0.4637	0.4544	0.4080	0.3988	0.3524	0.3524	0.3431	0.3709	0.3988	0.4173	0.4359	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													0.0000 (23c)
Effective ac	0.6118	0.6075	0.6032	0.5832	0.5795	0.5621	0.5621	0.5589	0.5688	0.5795	0.5871	0.5950	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K						
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K						
TER Opening Type			14.4900	1.1450	16.5916			(27)					
External Wall North	21.2600	5.1200	16.1400	0.1800	2.9052			(29a)					
External Wall South	38.7100	9.3700	29.3400	0.1800	5.2812			(29a)					
Total net area of external elements Aum(A, m2)			59.9700					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.7780			(33)					
Main dwelling													
Party Wall 1 East			32.4800	0.0000	0.0000			(32)					
Party Wall 2 West			35.0600	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								129.3749 (35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
E7 Party floor between dwellings (in blocks of flats)				41.5000	0.0700	2.9050							
E18 Party wall between dwellings				12.6000	0.0600	0.7560							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								3.6610 (36)					
Point Thermal bridges						(36a) =		0.0000					
Total fabric heat loss						(33) + (36) + (36a) =		28.4390 (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	66.7806	66.3066	65.8420	63.6597	63.2514	61.3507	61.3507	60.9987	62.0828	63.2514	64.0774	64.9409	(38)
Average = Sum(39)m / 12 =	95.2196	94.7456	94.2810	92.0987	91.6904	89.7897	89.7897	89.4377	90.5218	91.6904	92.5164	93.3799	(39)
												92.0967	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9069	0.9023	0.8979	0.8771	0.8732	0.8551	0.8551	0.8518	0.8621	0.8732	0.8811	0.8893	(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													2.7812 (42)
Hot water usage for mixer showers													0.0000 (42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	30.5919	30.1376	29.4978	28.3181	27.4348	26.4554	25.9263	26.5616	27.2534	28.3014	29.5054	30.4885	(42c)
Average daily hot water use (litres/day)	43.1127	41.5450	39.9772	38.4095	36.8418	35.2740	35.2740	36.8418	38.4095	39.9772	41.5450	43.1127	(43)
													67.5569
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	73.7046	71.6826	69.4750	66.7276	64.2766	61.7294	61.2003	63.4034	65.6629	68.2787	71.0504	73.6012	(44)
Energy content (annual)	116.7301	102.0750	106.7806	91.3468	86.5286	75.9035	74.0165	78.5066	80.9689	92.6535	101.2243	115.2417	(45)
Distribution loss (46)m = 0.15 x (45)m													Total = Sum(45)m = 1121.9761
Water 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	(46)
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	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	99.2206	86.7638	90.7635	77.6448	73.5493	64.5180	62.9140	66.7306	68.8235	78.7555	86.0406	97.9555	(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	99.2206	86.7638	90.7635	77.6448	73.5493	64.5180	62.9140	66.7306	68.8235	78.7555	86.0406	97.9555	(64)
Total per year (kWh/year) = Sum(64)m =													953.6797 (64)
12Total per year (kWh/year)													954 (64)

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Electric shower(s)	56.7407	50.5564	55.2057	52.6821	53.6707	51.1966	52.9032	53.6707	52.6821	55.2057	54.1676	56.7407 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												645.4223 (64a)
Heat gains from water heating, kWh/month	38.9903	34.3301	36.4923	32.5817	31.8050	28.9286	28.9543	30.1003	30.3764	33.4903	35.0521	38.6740 (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	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	143.3933	158.7569	143.3933	148.1731	143.3933	148.1731	143.3933	143.3933	148.1731	143.3933	148.1731	143.3933	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	264.1668	266.9081	260.0003	245.2944	226.7308	209.2837	197.6280	194.8868	201.7946	216.5004	235.0640	252.5111	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	(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)	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	(71)
Water heating gains (Table 5)	52.4064	51.0864	49.0488	45.2524	42.7487	40.1787	38.9171	40.4574	42.1895	45.0138	48.6834	51.9812	(72)
Total internal gains	524.6851	541.4699	517.1610	503.4385	477.5914	462.3541	444.6570	443.4561	456.8757	469.6262	496.6391	512.6043	(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					5.1200	10.6334	0.6300	0.7000			0.7700			16.6385 (74)
South					9.3700	46.7521	0.6300	0.7000			0.7700			133.8789 (78)
Solar gains	150.5174	251.0562	333.3281	402.4540	445.8547	441.7202	426.1516	393.0804	356.7216	274.3418	179.2179			129.5544 (83)
Total gains	675.2025	792.5261	850.4891	905.8924	923.4461	904.0743	870.8085	836.5365	813.5973	743.9679	675.8570			642.1586 (84)

7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	21.0000 (85)
tau	39.6287	39.8270	40.0233	40.9716	41.1541	42.0253	42.0253	42.1906	41.6854	41.1541	40.7866	40.4095	
alpha	3.6419	3.6551	3.6682	3.7314	3.7436	3.8017	3.8017	3.8127	3.7790	3.7436	3.7191	3.6940	
util living area	0.9741	0.9539	0.9256	0.8617	0.7567	0.5890	0.4411	0.4745	0.6761	0.8746	0.9544	0.9779	(86)
MIT	19.3423	19.6303	19.9663	20.4010	20.7233	20.9238	20.9802	20.9739	20.8657	20.4557	19.8512	19.3181	(87)
Th 2	20.1617	20.1655	20.1693	20.1870	20.1903	20.2058	20.2058	20.2087	20.1998	20.1903	20.1836	20.1766	(88)
util rest of house	0.9698	0.9466	0.9135	0.8392	0.7172	0.5284	0.3663	0.3992	0.6189	0.8496	0.9460	0.9742	(89)
MIT 2	18.6408	18.9262	19.2568	19.6858	19.9816	20.1595	20.1972	20.1966	20.1121	19.7460	19.1600	18.6279	(90)
Living area fraction	18.7954	19.0814	19.4132	19.8434	20.1450	20.3279	20.3697	20.3679	20.2782	19.9024	19.3123	18.7800	(91)
MIT	18.7954	19.0814	19.4132	19.8434	20.1450	20.3279	20.3697	20.3679	20.2782	19.9024	19.3123	18.7800	(92)
Temperature adjustment	18.7954	19.0814	19.4132	19.8434	20.1450	20.3279	20.3697	20.3679	20.2782	19.9024	19.3123	18.7800	(93)
adjusted MIT	18.7954	19.0814	19.4132	19.8434	20.1450	20.3279	20.3697	20.3679	20.2782	19.9024	19.3123	18.7800	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9608	0.9349	0.9005	0.8285	0.7149	0.5381	0.3821	0.4148	0.6248	0.8395	0.9348	0.9661	(94)
Useful gains	648.7293	740.9005	765.8633	750.5641	660.1325	486.4840	332.7257	346.9829	508.3723	624.5467	631.7862	620.3861	(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	1380.2450	1343.6214	1217.4678	1007.8739	774.3299	514.3089	338.4842	354.8812	559.2605	852.9421	1129.8388	1361.4799	(97)
Space heating kWh	544.2476	405.0284	335.9937	185.2631	84.9628	0.0000	0.0000	0.0000	0.0000	169.9262	358.5979	551.3738	(98a)
Space heating requirement - total per year (kWh/year)												2635.3936	
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	544.2476	405.0284	335.9937	185.2631	84.9628	0.0000	0.0000	0.0000	0.0000	169.9262	358.5979	551.3738	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2635.3936	
Space heating per m ²										(98c) / (4) =		25.0990	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	844.0229	664.4435	679.7264	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8502	0.9073	0.8922	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	717.6244	602.8315	606.4437	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	991.4786	955.6338	918.4929	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	197.1751	262.4849	232.1646	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fc = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	49.2938	65.6212	58.0412	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												172.9561	(107)

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Energy for space heating	25.0990 (99)
Energy for space cooling	1.6472 (108)
Total	26.7462 (109)
Fabric Energy Efficiency (TFEE)	26.7 (109)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	105.0000 (1b)	3.1500 (2b)	330.7500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.0000		(3a) + (3b) + (3c) + (3d) + (3e) ... (3n) = 330.7500 (5)
Dwelling volume			

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	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (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	0.2862	0.2825	0.2787	0.2600	0.2562	0.2375	0.2375	0.2337	0.2450	0.2562	0.2637	0.2712 (25)

3. Heat losses and heat loss parameter

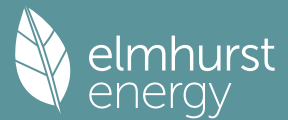
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Glazing			14.4900	0.7752	11.2326		(27)
External Wall North	21.2600	5.1200	16.1400	0.1400	2.2596	70.0000	1129.8000 (29a)
External Wall South	38.7100	9.3700	29.3400	0.1400	4.1076	70.0000	2053.8000 (29a)
Total net area of external elements Aum(A, m ²)			59.9700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.5998		(33)
Main dwelling							
Party Wall 1 East			32.4800	0.0000	0.0000	45.0000	1461.6000 (32)
Party Wall 2 West			35.0600	0.0000	0.0000	45.0000	1577.7000 (32)
Party Floor 1			105.0000			30.0000	3150.0000 (32a)
Party Ceiling 1			105.0000			30.0000	3150.0000 (32b)
Internal Wall 1			117.9400			9.0000	1061.4600 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13584.3600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		129.3749 (35)

List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450
E18 Party wall between dwellings	12.6000	0.0300	0.3780
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			1.6230 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 19.2228 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	31.2435	30.8342	30.4249	28.3784	27.9690	25.9225	25.9225	25.5132	26.7411	27.9690	28.7877	29.6063 (38)
Average = Sum(39)m / 12 =	50.4662	50.0569	49.6476	47.6011	47.1918	45.1453	45.1453	44.7360	45.9639	47.1918	48.0104	48.8290 (39)
												47.4988
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.4806	0.4767	0.4728	0.4533	0.4494	0.4300	0.4300	0.4261	0.4378	0.4494	0.4572	0.4650 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7812 (42)
Hot water usage for mixer showers												
77.6948	76.5053	74.7523	72.0555	69.6394	66.2591	63.5856	66.7111	68.2831	71.6311	75.1177	77.6247	(42a)
Hot water usage for baths												
29.9100	29.4585	28.8161	27.8542	26.9873	25.7939	24.8886	25.9957	26.5767	27.7592	28.9886	29.8862	(42b)
Hot water usage for other uses												
43.1127	41.5450	39.9772	38.4095	36.8418	35.2740	35.2740	36.8418	38.4095	39.9772	41.5450	43.1127	(42c)
Average daily hot water use (litres/day)												138.5556 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
150.7174	147.5087	143.5457	138.3193	133.4685	127.3271	123.7482	129.5486	133.2693	139.3675	145.6513	150.6237	(44)
Energy content (annual)	221.8821	195.1838	205.1238	180.6795	171.9876	147.2495	136.7454	152.4810	154.5858	179.5891	196.8525	221.2019 (45)
Distribution loss (46)m = 0.15 x (45)m												2163.5622
33.2823	29.2776	30.7686	27.1019	25.7981	22.0874	20.5118	22.8722	23.1879	26.9384	29.5279	33.1803	(46)
Water storage loss:												
Store volume												110.0000 (47)
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	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	(61)
Total heat required for water heating calculated for each month												
277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787	(62)
WWHRS	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	(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	(63c)
FGHRS	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	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787 (64)
Total per year (kWh/year) = Sum(64)m =												2814.4020 (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	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	117.9972	104.8406	112.4251	102.8709	101.4073	91.7554	89.6893	94.9214	94.1947	103.9348	108.2484	117.7711 (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	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.9192	25.6857	20.8891	15.8144	11.8214	9.9801	10.7839	14.0173	18.8140	23.8887	27.8816	29.7229 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	394.2789	398.3702	388.0601	366.1110	338.4042	312.3638	294.9671	290.8758	301.1859	323.1350	350.8418	376.8822 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687 (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)	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497 (71)
Water heating gains (Table 5)	158.5984	156.0128	151.1090	142.8762	136.3002	127.4381	120.5501	127.5825	130.8260	139.6974	150.3450	158.2944 (72)
Total internal gains	691.8900	690.1623	670.1517	634.8951	596.6193	559.8755	536.3947	542.5691	560.9194	596.8146	639.1620	674.9931 (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					5.1200	10.6334	0.3500		0.8500	0.7700		11.2244 (74)
South					9.3700	46.7521	0.3500		0.8500	0.7700		90.3151 (78)
Solar gains	101.5395	169.3633	224.8642	271.4967	300.7750	297.9858	287.4832	265.1733	240.6455	185.0718	120.9010	87.3978 (83)
Total gains	793.4295	859.5256	895.0159	906.3919	897.3943	857.8614	823.8779	807.7424	801.5650	781.8864	760.0629	762.3909 (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	74.7715	75.3828	76.0043	79.2720	79.9595	83.5842	83.5842	84.3489	82.0956	79.9595	78.5961	77.2785
alpha	5.9848	6.0255	6.0670	6.2848	6.3306	6.5723	6.5723	6.6233	6.4730	6.3306	6.2397	6.1519
util living area	0.8813	0.8286	0.7509	0.6215	0.4864	0.3366	0.2411	0.2547	0.3951	0.6150	0.8001	0.8896 (86)
MIT	20.7050	20.8071	20.9013	20.9738	20.9949	20.9997	21.0000	21.0000	20.9990	20.9794	20.8771	20.7062 (87)
Th 2	20.5386	20.5422	20.5458	20.5638	20.5674	20.5854	20.5854	20.5891	20.5782	20.5674	20.5602	20.5530 (88)
util rest of house	0.8703	0.8148	0.7334	0.6013	0.4643	0.3149	0.2184	0.2320	0.3711	0.5918	0.7833	0.8793 (89)
MIT 2	20.1984	20.3238	20.4376	20.5367	20.5626	20.5852	20.5854	20.5890	20.5774	20.5469	20.4248	20.2130 (90)
Living area fraction	fLA = Living area / (4) =											0.2204 (91)
MIT	20.3101	20.4303	20.5398	20.6330	20.6579	20.6765	20.6768	20.6796	20.6703	20.6422	20.5245	20.3217 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3101	20.4303	20.5398	20.6330	20.6579	20.6765	20.6768	20.6796	20.6703	20.6422	20.5245	20.3217 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8645	0.8112	0.7332	0.6046	0.4689	0.3197	0.2234	0.2370	0.3763	0.5958	0.7819	0.8736	(94)
Useful gains	685.9129	697.2721	656.2367	547.9736	420.8260	274.2234	184.0403	191.4417	301.6575	465.8606	594.2718	666.0001	(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	807.9671	777.3981	697.0433	558.5048	422.7388	274.3273	184.0478	191.4523	301.9970	473.9085	644.5147	787.2068	(97)
Space heating kWh	90.8084	53.8447	30.3601	7.5824	1.4231	0.0000	0.0000	0.0000	0.0000	5.9876	36.1749	90.1778	(98a)
Space heating requirement - total per year (kWh/year)												316.3590	
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	90.8084	53.8447	30.3601	7.5824	1.4231	0.0000	0.0000	0.0000	0.0000	5.9876	36.1749	90.1778	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												316.3590	
Space heating per m2										(98c) / (4) =		3.0129	(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												1.0000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	90.8084	53.8447	30.3601	7.5824	1.4231	0.0000	0.0000	0.0000	0.0000	5.9876	36.1749	90.1778	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													
307a	90.8084	53.8447	30.3601	7.5824	1.4231	0.0000	0.0000	0.0000	0.0000	5.9876	36.1749	90.1778	
Space heating requirement	90.8084	53.8447	30.3601	7.5824	1.4231	0.0000	0.0000	0.0000	0.0000	5.9876	36.1749	90.1778	(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	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310a	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787	
Water heating fuel	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787	(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	25.4292	22.9683	25.4292	24.6089	25.4292	24.6089	25.4292	25.4292	24.6089	25.4292	24.6089	25.4292	(331)
Lighting	25.3128	20.3068	18.2841	13.3957	10.3472	8.4538	9.4391	12.2693	15.9366	20.9096	23.6174	26.0163	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												316.3590	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2814.4020	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												3.1636	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7420)													
mechanical ventilation fans (SFP = 0.7420)												299.4081	(330a)
Total electricity for the above, kWh/year												299.4081	(331)
Electricity for lighting (calculated in Appendix L)												204.2886	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3634.4577	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	316.3590	4.4400	14.0463	(340a)
Space heating total			14.0463	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2814.4020	4.4400	124.9594	(342a)
Water heating total			124.9594	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	299.4081	16.4900	49.3724	(349)
Energy for lighting	204.2886	16.4900	33.6872	(350)
Additional standing charges			92.0000	(351)
Total energy cost			314.0654	(355)

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11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.7538 (357)
SAP value		87.7816
SAP rating (Section 12)		88 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Efficiency of heat source Heat pump			262.0000 (367)
Space and Water heating from Heat pump	1194.9469	0.1590	19.2022 (367)
Electrical energy for heat distribution (space & water)	3.1636	0.0000	4.4690 (372)
Overall CO ₂ factor for heat network			0.0559 (386)
Total CO ₂ associated with community systems			175.0414 (373)
Space and water heating			175.0414 (376)
Pumps, fans and electric keep-hot	299.4081	0.1387	41.5316 (378)
Energy for lighting	204.2886	0.1443	29.4852 (379)
Total CO ₂ , kg/year			246.0582 (383)
CO ₂ emissions per m ²			2.3400 (384)
EI value			97.8019 (384a)
EI rating			98 (385)
EI band			A

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	105.0000 (1b)	x 3.1500 (2b)	= 330.7500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	330.7500 (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	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.8000	4.5000	4.4000	3.9000	3.9000	3.6000	3.7000	3.5000	3.7000	4.0000	4.1000	4.4000 (22)
Wind factor	1.2000	1.1250	1.1000	0.9750	0.9750	0.9000	0.9250	0.8750	0.9250	1.0000	1.0250	1.1000 (22a)
Adj infilt rate	0.1800	0.1687	0.1650	0.1462	0.1462	0.1350	0.1388	0.1313	0.1388	0.1500	0.1537	0.1650 (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	0.2750	0.2637	0.2600	0.2412	0.2412	0.2300	0.2337	0.2262	0.2337	0.2450	0.2487	0.2600 (25)

3. Heat losses and heat loss parameter

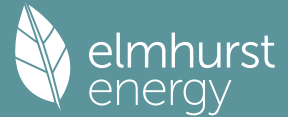
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Glazing			14.4900	0.7752	11.2326		(27)
External Wall North	21.2600	5.1200	16.1400	0.1400	2.2596	70.0000	1129.8000 (29a)
External Wall South	38.7100	9.3700	29.3400	0.1400	4.1076	70.0000	2053.8000 (29a)
Total net area of external elements Aum(A, m ²)			59.9700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.5998		(33)
Main dwelling							

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	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.9192	25.6857	20.8891	15.8144	11.8214	9.9801	10.7839	14.0173	18.8140	23.8887	27.8816	29.7229	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	394.2789	398.3702	388.0601	366.1110	338.4042	312.3638	294.9671	290.8758	301.1859	323.1350	350.8418	376.8822	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	(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)	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	(71)
Water heating gains (Table 5)	158.5984	156.0128	151.1090	142.8762	136.3002	127.4381	120.5501	127.5825	130.8260	139.6974	150.3450	158.2944	(72)
Total internal gains	691.8900	690.1623	670.1517	634.8951	596.6193	559.8755	536.3947	542.5691	560.9194	596.8146	639.1620	674.9931	(73)

[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	5.1200	12.7054	0.3500	0.8500	0.7700	13.4115 (74)
South	9.3700	53.5774	0.3500	0.8500	0.7700	103.5002 (78)

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Solar gains	116.9117	173.2516	229.6937	294.5274	316.3836	336.3619	320.1972	296.0583	263.8129	202.5115	140.5118	97.3638 (83)
Total gains	808.8017	863.4139	899.8454	929.4226	913.0030	896.2374	856.5919	838.6274	824.7323	799.3261	779.6737	772.3569 (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	76.6361	78.5961	79.2720	82.8332	82.8332	85.1278	84.3489	85.9212	84.3489	82.0956	81.3710	79.2720
alpha	6.1091	6.2397	6.2848	6.5222	6.5222	6.6752	6.6233	6.7281	6.6233	6.4730	6.4247	6.2848
util living area	0.8478	0.7938	0.7038	0.5577	0.4183	0.2769	0.1880	0.1833	0.3253	0.5304	0.7294	0.8510 (86)
MIT	20.7892	20.8681	20.9411	20.9885	20.9984	20.9999	21.0000	21.0000	20.9998	20.9927	20.9385	20.8031 (87)
Th 2	20.5494	20.5602	20.5638	20.5818	20.5818	20.5927	20.5891	20.5963	20.5891	20.5782	20.5746	20.5638 (88)
util rest of house	0.8347	0.7787	0.6857	0.5385	0.3977	0.2568	0.1665	0.1621	0.3031	0.5073	0.7104	0.8381 (89)
MIT 2	20.3096	20.4126	20.5002	20.5702	20.5804	20.5926	20.5891	20.5963	20.5889	20.5713	20.5087	20.3399 (90)
Living area fraction	20.4153	20.5130	20.5973	20.6623	20.6725	20.6824	20.6796	20.6853	20.6794	20.6642	20.6034	0.2204 (91)
MIT	20.4153	20.5130	20.5973	20.6623	20.6725	20.6824	20.6796	20.6853	20.6794	20.6642	20.6034	20.4420 (92)
Temperature adjustment												0.0000
adjusted MIT	20.4153	20.5130	20.5973	20.6623	20.6725	20.6824	20.6796	20.6853	20.6794	20.6642	20.6034	20.4420 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8306	0.7771	0.6871	0.5422	0.4021	0.2612	0.1713	0.1668	0.3080	0.5120	0.7117	0.8343 (94)
Useful gains	671.8131	670.9375	618.2906	503.9398	367.1558	234.1290	146.7164	139.8885	254.0035	409.2705	554.8878	644.3987 (95)
Ext temp.	5.0000	5.4000	7.1000	9.5000	12.6000	15.4000	17.4000	17.5000	15.0000	11.7000	8.1000	5.2000 (96)
Heat loss rate W	759.0228	725.5806	642.4886	508.4962	367.7397	234.1512	146.7174	139.8891	254.0757	412.0273	579.8236	725.5353 (97)
Space heating kWh	64.8840	36.7201	18.0033	3.2806	0.4344	0.0000	0.0000	0.0000	0.0000	2.0510	17.9537	60.3656 (98a)
Space heating requirement - total per year (kWh/year)												203.6928
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	64.8840	36.7201	18.0033	3.2806	0.4344	0.0000	0.0000	0.0000	0.0000	2.0510	17.9537	60.3656 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												203.6928
Space heating per m2										(98c) / (4) =		1.9399 (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												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	64.8840	36.7201	18.0033	3.2806	0.4344	0.0000	0.0000	0.0000	0.0000	2.0510	17.9537	60.3656 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	64.8840	36.7201	18.0033	3.2806	0.4344	0.0000	0.0000	0.0000	0.0000	2.0510	17.9537	60.3656
Space heating requirement	64.8840	36.7201	18.0033	3.2806	0.4344	0.0000	0.0000	0.0000	0.0000	2.0510	17.9537	60.3656 (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												
	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00												
310a	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787
Water heating fuel	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787 (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	25.4292	22.9683	25.4292	24.6089	25.4292	24.6089	25.4292	25.4292	24.6089	25.4292	24.6089	25.4292 (331)
Lighting	25.3128	20.3068	18.2841	13.3957	10.3472	8.4538	9.4391	12.2693	15.9366	20.9096	23.6174	26.0163 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												203.6928 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2814.4020 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												2.0369 (313)
Space cooling fuel												0.0000 (321)

Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7420)												
mechanical ventilation fans (SFP = 0.7420)												
Total electricity for the above, kWh/year												299.4081 (330a)
Electricity for lighting (calculated in Appendix L)												299.4081 (331)
												204.2886 (332)

Energy saving/generation technologies (Appendices M ,N and Q)

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PV generation	0.0000 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	3521.7915 (338)

10b. Fuel costs - using BEDF prices (568)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating from Heat pump	203.6928	5.6000	11.4068 (340a)
Space heating total			11.4068 (340)
Total CO2 associated with community systems			0.0000 (473)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Heat pump	2814.4020	5.6000	157.6065 (342a)
Water heating total			157.6065 (342)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (347a)
Pumps, fans and electric keep-hot	299.4081	26.0600	78.0258 (349)
Energy for lighting	204.2886	26.0600	53.2376 (350)
Additional standing charges			99.0000 (351)
Total energy cost			399.2767 (355)

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			262.0000 (367)
Space and Water heating from Heat pump	1151.9446	0.1599	12.4282 (367)
Electrical energy for heat distribution (space & water)	2.0369	0.0000	4.2915 (372)
Overall CO2 factor for heat network			0.0557 (386)
Total CO2 associated with community systems			168.0899 (373)
Space and water heating			168.0899 (376)
Pumps, fans and electric keep-hot	299.4081	0.1387	41.5316 (378)
Energy for lighting	204.2886	0.1443	29.4852 (379)
Total CO2, kg/year			239.1067 (383)

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			262.0000 (467a)
Space and Water heating from Heat pump	1151.9446	1.5917	123.7469 (467)
Electrical energy for heat distribution (space & water)	2.0369	0.0000	46.0506 (472)
Overall CO2 factor for heat network			0.5976 (486)
Total CO2 associated with community systems			1803.7086 (473)
Space and water heating			1803.7086 (476)
Pumps, fans and electric keep-hot	299.4081	1.5128	452.9446 (478)
Energy for lighting	204.2886	1.5338	313.3447 (479)
Total Primary energy kWh/year			2569.9979 (483)

SAP 10 EPC IMPROVEMENTS

0306_3B6P_BL

Current energy efficiency rating:	B 88
Current environmental impact rating:	A 98

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures: (none)	SAP change	Cost change	CO2 change
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Recommended measures (none)	Typical annual savings	Energy efficiency	Environmental impact
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Total Savings £0 0.00 kg/m²

Potential energy efficiency rating:	B 88
Potential environmental impact rating:	A 98

Fuel prices for cost data on this page from database revision number 568 TEST (31 Mar 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, South East England):

	Current	Potential	Saving
Electricity	£131	£131	£0
Community scheme	£268	£268	£0
Space heating	£188	£188	£0
Water heating	£158	£158	£0
Lighting	£53	£53	£0
Total cost of fuels	£399	£399	£0
Total cost of uses	£399	£399	£0
Delivered energy	34 kWh/m²	34 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	2 kg/m²	2 kg/m²	0 kg/m²
Primary energy	24 kWh/m²	24 kWh/m²	0 kWh/m²

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SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	105.0000 (1b)	x 3.1500 (2b)	= 330.7500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.0000		(4)
Dwelling volume		(3a) + (3b) + (3c) + (3d) + (3e) ... (3n) =	330.7500 (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		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.1500 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000
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
Adj infilt rate	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762
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	0.2862	0.2825	0.2787	0.2600	0.2562	0.2375	0.2375	0.2337	0.2450	0.2562	0.2637	0.2712 (25)

3. Heat losses and heat loss parameter

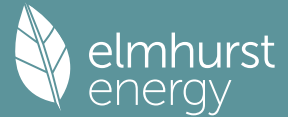
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Glazing			14.4900	0.7752	11.2326		(27)
External Wall North	21.2600	5.1200	16.1400	0.1400	2.2596	70.0000	1129.8000 (29a)
External Wall South	38.7100	9.3700	29.3400	0.1400	4.1076	70.0000	2053.8000 (29a)
Total net area of external elements Aum(A, m ²)			59.9700				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	17.5998	(33)
Main dwelling							
Party Wall 1 East			32.4800	0.0000	0.0000	45.0000	1461.6000 (32)
Party Wall 2 West			35.0600	0.0000	0.0000	45.0000	1577.7000 (32)
Party Floor 1			105.0000			30.0000	3150.0000 (32d)
Party Ceiling 1			105.0000			30.0000	3150.0000 (32b)
Internal Wall 1			117.9400			9.0000	1061.4600 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13584.3600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		129.3749 (35)

List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450
E18 Party wall between dwellings	12.6000	0.0300	0.3780
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			1.6230 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 19.2228 (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
	31.2435	30.8342	30.4249	28.3784	27.9690	25.9225	25.9225	25.5132	26.7411	27.9690	28.7877	29.6063 (38)
Heat transfer coeff	50.4662	50.0569	49.6476	47.6011	47.1918	45.1453	45.1453	44.7360	45.9639	47.1918	48.0104	48.8290 (39)
Average = Sum(39)m / 12 =												47.4988
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.4806	0.4767	0.4728	0.4533	0.4494	0.4300	0.4300	0.4261	0.4378	0.4494	0.4572	0.4650 (40)
HLP (average)												0.4524
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7812 (42)
Hot water usage for mixer showers												77.6247 (42a)
Hot water usage for baths												29.8862 (42b)
Hot water usage for other uses												43.1127 (42c)
Average daily hot water use (litres/day)												138.5556 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	150.7174	147.5087	143.5457	138.3193	133.4685	127.3271	123.7482	129.5486	133.2693	139.3675	145.6513	150.6237 (44)
Distribution loss (46)m = 0.15 x (45)m	221.8821	195.1838	205.1238	180.6795	171.9876	147.2495	136.7454	152.4810	154.5858	179.5891	196.8525	221.2019 (45)
Water storage loss:												
Store volume												110.0000 (47)
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	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787 (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	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787 (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	117.9972	104.8406	112.4251	102.8709	101.4073	91.7554	89.6893	94.9214	94.1947	103.9348	108.2484	117.7711 (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	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.9192	25.6857	20.8891	15.8144	11.8214	9.9801	10.7839	14.0173	18.8140	23.8887	27.8816	29.7229 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	394.2789	398.3702	388.0601	366.1110	338.4042	312.3638	294.9671	290.8758	301.1859	323.1350	350.8418	376.8822 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687 (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)	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497 (71)
Water heating gains (Table 5)	158.5984	156.0128	151.1090	142.8762	136.3002	127.4381	120.5501	127.5825	130.8260	139.6974	150.3450	158.2944 (72)
Total internal gains	691.8900	690.1623	670.1517	634.8951	596.6193	559.8755	536.3947	542.5691	560.9194	596.8146	639.1620	674.9931 (73)

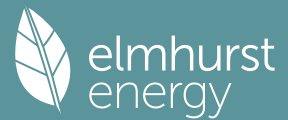
6. Solar gains

[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					5.1200	10.6334	0.3500	0.8500	0.7700		11.2244 (74)	
South					9.3700	46.7521	0.3500	0.8500	0.7700		90.3151 (78)	
Solar gains	101.5395	169.3633	224.8642	271.4967	300.7750	297.9858	287.4832	265.1733	240.6455	185.0718	120.9010	87.3978 (83)
Total gains	793.4295	859.5256	895.0159	906.3919	897.3943	857.8614	823.8779	807.7424	801.5650	781.8864	760.0629	762.3909 (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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	74.7715	75.3828	76.0043	79.2720	79.9595	83.5842	83.5842	84.3489	82.0956	79.9595	78.5961	77.2785
util living area	5.9848	6.0255	6.0670	6.2848	6.3306	6.5723	6.5723	6.6233	6.4730	6.3306	6.2397	6.1519
	0.8813	0.8286	0.7509	0.6215	0.4864	0.3366	0.2411	0.2547	0.3951	0.6150	0.8001	0.8896 (86)
MIT	20.7050	20.8071	20.9013	20.9738	20.9949	20.9997	21.0000	21.0000	20.9990	20.9794	20.8771	20.7062 (87)
Th 2	20.5386	20.5422	20.5458	20.5638	20.5674	20.5854	20.5854	20.5891	20.5782	20.5674	20.5602	20.5530 (88)
util rest of house	0.8703	0.8148	0.7334	0.6013	0.4643	0.3149	0.2184	0.2320	0.3711	0.5918	0.7833	0.8793 (89)
MIT 2	20.1984	20.3238	20.4376	20.5367	20.5626	20.5852	20.5854	20.5890	20.5774	20.5469	20.4248	20.2130 (90)
Living area fraction	20.3101	20.4303	20.5398	20.6330	20.6579	20.6765	20.6768	20.6796	20.6703	20.6422	20.5245	0.2204 (91)
MIT	20.3101	20.4303	20.5398	20.6330	20.6579	20.6765	20.6768	20.6796	20.6703	20.6422	20.5245	20.3217 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3101	20.4303	20.5398	20.6330	20.6579	20.6765	20.6768	20.6796	20.6703	20.6422	20.5245	20.3217 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8645	0.8112	0.7332	0.6046	0.4689	0.3197	0.2234	0.2370	0.3763	0.5958	0.7819	0.8736	(94)
Useful gains	685.9129	697.2721	656.2367	547.9736	420.8260	274.2234	184.0403	191.4417	301.6575	465.8606	594.2718	666.0001	(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													
	807.9671	777.3981	697.0433	558.5048	422.7388	274.3273	184.0478	191.4523	301.9970	473.9085	644.5147	787.2068	(97)
Space heating kWh													
	90.8084	53.8447	30.3601	7.5824	1.4231	0.0000	0.0000	0.0000	0.0000	5.9876	36.1749	90.1778	(98a)
Space heating requirement - total per year (kWh/year)												316.3590	
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													
	90.8084	53.8447	30.3601	7.5824	1.4231	0.0000	0.0000	0.0000	0.0000	5.9876	36.1749	90.1778	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												316.3590	
Space heating per m2										(98c) / (4) =		3.0129	(99)

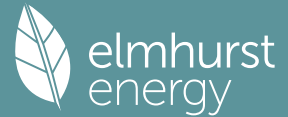
9b. Energy requirements

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													1.0000	(306)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating:														
Space heating requirement														
90.8084	53.8447	30.3601	7.5824	1.4231	0.0000	0.0000	0.0000	0.0000	0.0000	5.9876	36.1749	90.1778	(98)	
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00														
307a	90.8084	53.8447	30.3601	7.5824	1.4231	0.0000	0.0000	0.0000	0.0000	5.9876	36.1749	90.1778		
Space heating requirement														
90.8084	53.8447	30.3601	7.5824	1.4231	0.0000	0.0000	0.0000	0.0000	0.0000	5.9876	36.1749	90.1778	(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	0.0000	(309)	
Water heating														
Annual water heating requirement														
277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787	(64)		
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00														
310a	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787		
Water heating fuel														
277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787	(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	0.0000	(315)
Pumps and Fa	25.4292	22.9683	25.4292	24.6089	25.4292	24.6089	25.4292	25.4292	24.6089	25.4292	24.6089	25.4292	(331)	
Lighting	25.3128	20.3068	18.2841	13.3957	10.3472	8.4538	9.4391	12.2693	15.9366	20.9096	23.6174	26.0163	(332)	
Electricity generated by PVs (Appendix M) (negative quantity)														
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)														
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)	
Electricity generated by PVs (Appendix M) (negative quantity)														
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)														
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)	
Annual totals kWh/year														
Space heating fuel - community heating													316.3590	(307)
Space heating fuel - secondary													0.0000	(309)
Water heating fuel - community heating													2814.4020	(310)
Efficiency of water heater													0.0000	(311)
Electricity used for heat distribution													3.1636	(313)
Space cooling fuel													0.0000	(321)
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7420)														
mechanical ventilation fans (SFP = 0.7420)													299.4081	(330a)
Total electricity for the above, kWh/year													299.4081	(331)
Electricity for lighting (calculated in Appendix L)													204.2886	(332)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													0.0000	(333)
Wind generation													0.0000	(334)
Hydro-electric generation (Appendix N)													0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)													0.0000	(335)
Appendix Q - special features														
Energy saved or generated													-0.0000	(336)
Energy used													0.0000	(337)
Total delivered energy for all uses													3634.4577	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	316.3590	4.4400	14.0463	(340a)
Space heating total			14.0463	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2814.4020	4.4400	124.9594	(342a)
Water heating total			124.9594	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	299.4081	16.4900	49.3724	(349)
Energy for lighting	204.2886	16.4900	33.6872	(350)
Additional standing charges			92.0000	(351)
Total energy cost			314.0654	(355)

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11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.7538 (357)
SAP value		87.7816
SAP rating (Section 12)		88 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Efficiency of heat source Heat pump			262.0000 (367)
Space and Water heating from Heat pump	1194.9469	0.1590	19.2022 (367)
Electrical energy for heat distribution (space & water)	3.1636	0.0000	4.4690 (372)
Overall CO ₂ factor for heat network			0.0559 (386)
Total CO ₂ associated with community systems			175.0414 (373)
Space and water heating			175.0414 (376)
Pumps, fans and electric keep-hot	299.4081	0.1387	41.5316 (378)
Energy for lighting	204.2886	0.1443	29.4852 (379)
Total CO ₂ , kg/year			246.0582 (383)
CO ₂ emissions per m ²			2.3400 (384)
EI value			97.8019 (384a)
EI rating			98 (385)
EI band			A

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	105.0000 (1b)	x 3.1500 (2b)	= 330.7500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	330.7500 (5)

2. Ventilation rate

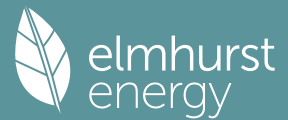
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.8000	4.5000	4.4000	3.9000	3.9000	3.6000	3.7000	3.5000	3.7000	4.0000	4.1000	4.4000 (22)
Wind factor	1.2000	1.1250	1.1000	0.9750	0.9750	0.9000	0.9250	0.8750	0.9250	1.0000	1.0250	1.1000 (22a)
Adj infilt rate	0.1800	0.1687	0.1650	0.1462	0.1462	0.1350	0.1388	0.1313	0.1388	0.1500	0.1537	0.1650 (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	0.2750	0.2637	0.2600	0.2412	0.2412	0.2300	0.2337	0.2262	0.2337	0.2450	0.2487	0.2600 (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							
Glazing			14.4900	0.7752	11.2326		(27)
External Wall North	21.2600	5.1200	16.1400	0.1400	2.2596	70.0000	1129.8000 (29a)
External Wall South	38.7100	9.3700	29.3400	0.1400	4.1076	70.0000	2053.8000 (29a)
Total net area of external elements Aum(A, m ²)			59.9700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.5998		(33)
Main dwelling							
Party Wall 1 East			32.4800	0.0000	0.0000	45.0000	1461.6000 (32)
Party Wall 2 West			35.0600	0.0000	0.0000	45.0000	1577.7000 (32)
Party Floor 1			105.0000			30.0000	3150.0000 (32d)

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Party Ceiling 1	105.0000										30.0000	3150.0000	(32b)		
Internal Wall 1	117.9400										9.0000	1061.4600	(32c)		
Heat capacity Cm = Sum(A x k)										(28)...(30) + (32) + (32a)...(32e) = 13584.3600				(34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K										129.3749				(35)	
List of Thermal Bridges															
K1 Element											Length	Psi-value	Total		
E7 Party floor between dwellings (in blocks of flats)											41.5000	0.0300	1.2450		
E18 Party wall between dwellings											12.6000	0.0300	0.3780		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)														1.6230	(36)
Point Thermal bridges										(36a) =				0.0000	
Total fabric heat loss										(33) + (36) + (36a) =				19.2228	(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	30.0156	28.7877	28.3784	26.3318	26.3318	25.1039	25.5132	24.6946	25.5132	26.7411	27.1504	28.3784	(38)		
Average = Sum(39)m / 12 =	49.2383	48.0104	47.6011	45.5546	45.5546	44.3267	44.7360	43.9174	44.7360	45.9639	46.3732	47.6011	(39)		
												46.1344			
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
HLP (average)	0.4689	0.4572	0.4533	0.4339	0.4339	0.4222	0.4261	0.4183	0.4261	0.4378	0.4416	0.4533	(40)		
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31			
												0.4394			
												31			

4. Water heating energy requirements (kWh/year)															

Assumed occupancy													2.7812	(42)	
Hot water usage for mixer showers															
	77.6948	76.5053	74.7523	72.0555	69.6394	66.2591	63.5856	66.7111	68.2831	71.6311	75.1177	77.6247	(42a)		
Hot water usage for baths	29.9100	29.4585	28.8161	27.8542	26.9873	25.7939	24.8886	25.9957	26.5767	27.7592	28.9886	29.8862	(42b)		
Hot water usage for other uses	43.1127	41.5450	39.9772	38.4095	36.8418	35.2740	35.2740	36.8418	38.4095	39.9772	41.5450	43.1127	(42c)		
Average daily hot water use (litres/day)												138.5556	(43)		
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Energy conte	150.7174	147.5087	143.5457	138.3193	133.4685	127.3271	123.7482	129.5486	133.2693	139.3675	145.6513	150.6237	(44)		
Energy content (annual)	221.8821	195.1838	205.1238	180.6795	171.9876	147.2495	136.7454	152.4810	154.5858	179.5891	196.8525	221.2019	(45)		
Distribution loss (46)m = 0.15 x (45)m	33.2823	29.2776	30.7686	27.1019	25.7981	22.0874	20.5118	22.8722	23.1879	26.9384	29.5279	33.1803	(46)		
Water storage loss:															
Store volume												110.0000	(47)		
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															
	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787	(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	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787	(64)		
												2814.4020	(64)		
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)		
												0.0000	(64a)		
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =															
Heat gains from water heating, kWh/month	117.9972	104.8406	112.4251	102.8709	101.4073	91.7554	89.6893	94.9214	94.1947	103.9348	108.2484	117.7711	(65)		

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

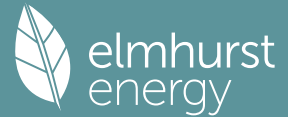
Metabolic gains (Table 5), Watts															
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	(66)		
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	28.9192	25.6857	20.8891	15.8144	11.8214	9.9801	10.7839	14.0173	18.8140	23.8887	27.8816	29.7229	(67)		
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	394.2789	398.3702	388.0601	366.1110	338.4042	312.3638	294.9671	290.8758	301.1859	323.1350	350.8418	376.8822	(68)		
Pumps, fans	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	(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)	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	(71)		
Total internal gains	158.5984	156.0128	151.1090	142.8762	136.3002	127.4381	120.5501	127.5825	130.8260	139.6974	150.3450	158.2944	(72)		
	691.8900	690.1623	670.1517	634.8951	596.6193	559.8755	536.3947	542.5691	560.9194	596.8146	639.1620	674.9931	(73)		

6. Solar gains															

[Jan]				Area	Solar flux		g		FF		Access	Gains			
				m2	Table 6a		W/m2				factor	W			
North				5.1200	12.7054		0.3500		0.8500		0.7700	13.4115	(74)		
South				9.3700	53.5774		0.3500		0.8500		0.7700	103.5002	(78)		

Solar gains	116.9117	173.2516	229.6937	294.5274	316.3836	336.3619	320.1972	296.0583	263.8129	202.5115	140.5118	97.3638	(83)		

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Total gains 808.8017 863.4139 899.8454 929.4226 913.0030 896.2374 856.5919 838.6274 824.7323 799.3261 779.6737 772.3569 (84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.6361	78.5961	79.2720	82.8332	82.8332	85.1278	84.3489	85.9212	84.3489	82.0956	81.3710	79.2720	21.0000 (85)
alpha	6.1091	6.2397	6.2848	6.5222	6.5222	6.6752	6.6233	6.7281	6.6233	6.4730	6.4247	6.2848	
util living area	0.8478	0.7938	0.7038	0.5577	0.4183	0.2769	0.1880	0.1833	0.3253	0.5304	0.7294	0.8510	(86)
MIT	20.7892	20.8681	20.9411	20.9885	20.9984	20.9999	21.0000	21.0000	20.9998	20.9927	20.9385	20.8031	(87)
Th 2	20.5494	20.5602	20.5638	20.5818	20.5818	20.5927	20.5891	20.5963	20.5891	20.5782	20.5746	20.5638	(88)
util rest of house	0.8347	0.7787	0.6857	0.5385	0.3977	0.2568	0.1665	0.1621	0.3031	0.5073	0.7104	0.8381	(89)
MIT 2	20.3096	20.4126	20.5002	20.5702	20.5804	20.5926	20.5891	20.5963	20.5889	20.5713	20.5087	20.3399	(90)
Living area fraction									fLA = Living area / (4) =				0.2204 (91)
MIT	20.4153	20.5130	20.5973	20.6623	20.6725	20.6824	20.6796	20.6853	20.6794	20.6642	20.6034	20.4420	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.4153	20.5130	20.5973	20.6623	20.6725	20.6824	20.6796	20.6853	20.6794	20.6642	20.6034	20.4420	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8306	0.7771	0.6871	0.5422	0.4021	0.2612	0.1713	0.1668	0.3080	0.5120	0.7117	0.8343	(94)
Useful gains	671.8131	670.9375	618.2906	503.9398	367.1558	234.1290	146.7164	139.8885	254.0035	409.2705	554.8878	644.3987	(95)
Ext temp.	5.0000	5.4000	7.1000	9.5000	12.6000	15.4000	17.4000	17.5000	15.0000	11.7000	8.1000	5.2000	(96)
Heat loss rate W	759.0228	725.5806	642.4886	508.4962	367.7397	234.1512	146.7174	139.8891	254.0757	412.0273	579.8236	725.5353	(97)
Space heating kWh	64.8840	36.7201	18.0033	3.2806	0.4344	0.0000	0.0000	0.0000	0.0000	2.0510	17.9537	60.3656	(98a)
Space heating requirement - total per year (kWh/year)												203.6928	
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	64.8840	36.7201	18.0033	3.2806	0.4344	0.0000	0.0000	0.0000	0.0000	2.0510	17.9537	60.3656	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												203.6928	
Space heating per m2										(98c) / (4) =		1.9399	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)
 Fraction of space heat from community system
 Fraction of heat from community Heat pump-Space and Water
 Factor for control and charging method (Table 4c(3)) for space heating
 Factor for charging method (Table 4c(3)) for water heating
 Distribution loss factor (Table 12c) for community heating system
 Efficiency of secondary/supplementary heating system, %

Space heating:													0.0000 (301)
Space heating requirement													1.0000 (302)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													1.0000 (303a)
307a	64.8840	36.7201	18.0033	3.2806	0.4344	0.0000	0.0000	0.0000	0.0000	2.0510	17.9537	60.3656	1.0000 (305)
Space heating requirement	64.8840	36.7201	18.0033	3.2806	0.4344	0.0000	0.0000	0.0000	0.0000	2.0510	17.9537	60.3656	1.0000 (305a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)													1.0000 (306)
Space heating fuel for secondary/supplementary system													0.0000 (208)
	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	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310a	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787	
Water heating fuel	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787	(310)
Cooling System Energy Efficiency Ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(314)
Space coolin	25.4292	22.9683	25.4292	24.6089	25.4292	24.6089	25.4292	25.4292	24.6089	25.4292	24.6089	25.4292	(315)
Pumps and Fa	25.3128	20.3068	18.2841	13.3957	10.3472	8.4538	9.4391	12.2693	15.9366	20.9096	23.6174	26.0163	(332)
Lighting	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(307)
Annual totals kWh/year													(308)
Space heating fuel - community heating													203.6928 (309)
Space heating fuel - secondary													2814.4020 (310)
Water heating fuel - community heating													0.0000 (311)
Efficiency of water heater													2.0369 (313)
Electricity used for heat distribution													0.0000 (321)
Space cooling fuel													

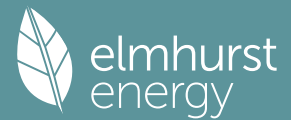
Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7420)													
mechanical ventilation fans (SFP = 0.7420)													299.4081 (330a)
Total electricity for the above, kWh/year													299.4081 (331)
Electricity for lighting (calculated in Appendix L)													204.2886 (332)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation													0.0000 (333)
Wind generation													0.0000 (334)
Hydro-electric generation (Appendix N)													0.0000 (335a)

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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	3521.7915 (338)

10b. Fuel costs - using BEDF prices (568)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating from Heat pump	203.6928	5.6000	11.4068 (340a)
Space heating total			11.4068 (340)
Total CO2 associated with community systems			0.0000 (473)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Heat pump	2814.4020	5.6000	157.6065 (342a)
Water heating total			157.6065 (342)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (347a)
Pumps, fans and electric keep-hot	299.4081	26.0600	78.0258 (349)
Energy for lighting	204.2886	26.0600	53.2376 (350)
Additional standing charges			99.0000 (351)
Total energy cost			399.2767 (355)

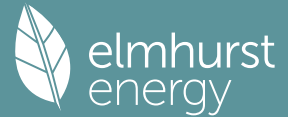
12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			262.0000 (367)
Space and Water heating from Heat pump	1151.9446	0.1599	12.4282 (367)
Electrical energy for heat distribution (space & water)	2.0369	0.0000	4.2915 (372)
Overall CO2 factor for heat network			0.0557 (386)
Total CO2 associated with community systems			168.0899 (373)
Space and water heating			168.0899 (376)
Pumps, fans and electric keep-hot	299.4081	0.1387	41.5316 (378)
Energy for lighting	204.2886	0.1443	29.4852 (379)
Total CO2, kg/year			239.1067 (383)

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			262.0000 (467a)
Space and Water heating from Heat pump	1151.9446	1.5917	123.7469 (467)
Electrical energy for heat distribution (space & water)	2.0369	0.0000	46.0506 (472)
Overall CO2 factor for heat network			0.5976 (486)
Total CO2 associated with community systems			1803.7086 (473)
Space and water heating			1803.7086 (476)
Pumps, fans and electric keep-hot	299.4081	1.5128	452.9446 (478)
Energy for lighting	204.2886	1.5338	313.3447 (479)
Total Primary energy kWh/year			2569.9979 (483)

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Property Reference	Be Lean				Issued on Date	08/04/2025
Assessment Reference	0307_2B3P_BL		Prop Type Ref			
Property						
SAP Rating	87 B	DER	2.86	TER	12.76	
Environmental	98 A	% DER < TER				77.59
CO ₂ Emissions (t/year)	0.23	DFEE	26.95	TFEE	34.35	
Compliance Check	See BREL	% DFEE < TFEE				21.56
% DPER < TPER	55.33	DPER	30.55	TPER	68.38	
Assessor Details	Alfie Gamble-Thornton				Assessor ID	CM02-0001
Client	Fifth State, Fifth State					

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	86.0000 (1b)	x 3.1500 (2b)	= 270.9000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 270.9000 (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	0	(19)

Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1500 (21)

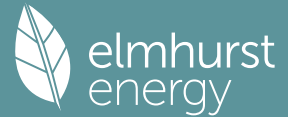
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (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	0.2862	0.2825	0.2787	0.2600	0.2562	0.2375	0.2375	0.2337	0.2450	0.2562	0.2637	0.2712 (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							
Glazing			22.2000	0.7752	17.2093		(27)
External Wall North	21.7700	14.8000	6.9700	0.1400	0.9758	70.0000	487.9000 (29a)
External Wall East	39.9100		39.9100	0.1400	5.5874	70.0000	2793.7000 (29a)
External Wall South	21.5800	7.4000	14.1800	0.1400	1.9852	70.0000	992.6000 (29a)
Total net area of external elements Aum(A, m ²)			83.2600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	25.7577	(33)
Main dwelling							
Party Wall 1 West			39.3100	0.0000	0.0000	45.0000	1768.9500 (32)
Party Floor 1			82.0000			30.0000	2460.0000 (32d)
Party Ceiling 1			82.0000			20.0000	1640.0000 (32b)
Internal Wall 1			89.5900			9.0000	806.3100 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10949.4600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		127.3193 (35)
List of Thermal Bridges		

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K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450
E18 Party wall between dwellings	12.6000	0.0300	0.3780
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			1.6230 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	27.3807 (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	25.5899	25.2547	24.9194	23.2432	22.9080	21.2318	21.2318	20.8965	21.9023	22.9080	23.5785	24.2489
Heat transfer coeff	52.9706	52.6354	52.3001	50.6239	50.2887	48.6125	48.6125	48.2773	49.2830	50.2887	50.9592	51.6296
Average = Sum(39)m / 12 =												50.5401
HLP	0.6159	0.6120	0.6081	0.5887	0.5848	0.5653	0.5653	0.5614	0.5731	0.5848	0.5925	0.6003
HLP (average)												0.5877
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5669 (42)
Hot water usage for mixer showers	73.7542	72.6250	70.9609	68.4009	66.1073	62.8985	60.3606	63.3276	64.8199	67.9980	71.3078	73.6877	(42a)
Hot water usage for baths	28.3991	27.9704	27.3605	26.4472	25.6241	24.4910	23.6313	24.6825	25.2342	26.3569	27.5242	28.3765	(42b)
Hot water usage for other uses	40.9178	39.4299	37.9420	36.4541	34.9661	33.4782	33.4782	34.9661	36.4541	37.9420	39.4299	40.9178	(42c)
Average daily hot water use (litres/day)													131.5263 (43)
Daily hot water use	143.0710	140.0253	136.2634	131.3022	126.6975	120.8677	117.4701	122.9762	126.5081	132.2969	138.2619	142.9820	(44)
Energy conte	210.6253	185.2817	194.7176	171.5135	163.2626	139.7795	129.8079	144.7453	146.7431	170.4780	186.8656	209.9796	(45)
Energy content (annual)										Total = Sum(45)m =		2053.7995	
Distribution loss (46)m = 0.15 x (45)m	31.5938	27.7923	29.2076	25.7270	24.4894	20.9669	19.4712	21.7118	22.0115	25.5717	28.0298	31.4969	(46)
Water storage loss:													110.0000 (47)
Store volume													
b) If manufacturer declared loss factor is not known :													0.0152 (51)
Hot water storage loss factor from Table 2 (kWh/litre/day)													1.0294 (52)
Volume factor from Table 2a													0.6000 (53)
Temperature factor from Table 2b													1.0327 (55)
Enter (49) or (54) in (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	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564	(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	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2704.6393	(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	114.2544	101.5481	108.9650	99.8232	98.5062	89.2716	87.3826	92.3492	91.5870	100.9054	104.9278	114.0396	(65)

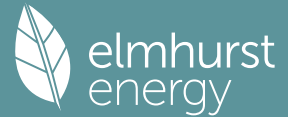
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	116.7770	129.2888	116.7770	120.6695	116.7770	120.6695	116.7770	116.7770	120.6695	116.7770	120.6695	116.7770 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	231.5234	233.9259	227.8717	214.9831	198.7134	183.4223	173.2069	170.8044	176.8586	189.7472	206.0168	221.3080 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346 (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)	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768 (71)
Water heating gains (Table 5)	153.5677	151.1133	146.4584	138.6433	132.4009	123.9884	117.4497	124.1253	127.2042	135.6255	145.7330	153.2791 (72)
Total internal gains	563.3719	575.8318	552.6108	535.7997	509.3951	489.5840	468.9373	473.2105	486.2361	503.6535	533.9232	552.8678 (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				14.8000	10.6334	0.3500	0.8500	0.7700	32.4454 (74)				
South				7.4000	46.7521	0.3500	0.8500	0.7700	71.3268 (78)				
Solar gains	103.7722	178.8198	254.1630	337.4156	403.2304	412.7138	392.6463	340.8084	282.1194	199.8046	124.5722	88.6810	(83)
Total gains	667.1441	754.6516	806.7738	873.2152	912.6254	902.2978	861.5837	814.0188	768.3555	703.4581	658.4954	641.5489	(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, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	57.4190	57.7847	58.1551	60.0806	60.4811	62.5666	62.5666	63.0010	61.7154	60.4811	59.6854	58.9103
alpha	4.8279	4.8523	4.8770	5.0054	5.0321	5.1711	5.1711	5.2001	5.1144	5.0321	4.9790	4.9274
util living area	0.9220	0.8734	0.8032	0.6612	0.5037	0.3439	0.2481	0.2726	0.4387	0.6919	0.8616	0.9292 (86)
MIT	20.3474	20.5434	20.7320	20.9140	20.9803	20.9980	20.9997	20.9995	20.9927	20.9112	20.6558	20.3396 (87)
Th 2	20.4157	20.4192	20.4227	20.4402	20.4437	20.4614	20.4614	20.4649	20.4543	20.4437	20.4367	20.4297 (88)
util rest of house	0.9128	0.8602	0.7847	0.6365	0.4754	0.3152	0.2178	0.2410	0.4051	0.6633	0.8456	0.9209 (89)
MIT 2	19.6555	19.8974	20.1264	20.3511	20.4254	20.4598	20.4612	20.4646	20.4483	20.3544	20.0520	19.6576 (90)
Living area fraction	19.9225	20.1467	20.3601	20.5683	20.6395	20.6675	20.6690	20.6711	20.6584	20.5693	20.2850	19.9208 (92)
MIT	19.9225	20.1467	20.3601	20.5683	20.6395	20.6675	20.6690	20.6711	20.6584	20.5693	20.2850	19.9208 (93)
Temperature adjustment												0.0000
adjusted MIT	19.9225	20.1467	20.3601	20.5683	20.6395	20.6675	20.6690	20.6711	20.6584	20.5693	20.2850	19.9208 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9042	0.8536	0.7826	0.6423	0.4854	0.3262	0.2295	0.2532	0.4177	0.6699	0.8410	0.9125 (94)
Useful gains	603.2416	644.1550	631.3807	560.8265	442.9988	294.3424	197.7296	206.0727	320.9742	471.2438	553.8110	585.4306 (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	827.5335	802.5171	724.8869	590.6971	449.5579	294.9550	197.8051	206.1947	323.2195	501.3426	671.8983	811.6591 (97)
Space heating kWh	166.8732	106.4193	69.5686	21.5068	4.8800	0.0000	0.0000	0.0000	0.0000	22.3935	85.0229	168.3140 (98a)
Space heating requirement - total per year (kWh/year)												644.9782
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	166.8732	106.4193	69.5686	21.5068	4.8800	0.0000	0.0000	0.0000	0.0000	22.3935	85.0229	168.3140 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												644.9782
Space heating per m2										(98c) / (4) =		7.4997 (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												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	166.8732	106.4193	69.5686	21.5068	4.8800	0.0000	0.0000	0.0000	0.0000	22.3935	85.0229	168.3140 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	166.8732	106.4193	69.5686	21.5068	4.8800	0.0000	0.0000	0.0000	0.0000	22.3935	85.0229	168.3140
Space heating requirement	166.8732	106.4193	69.5686	21.5068	4.8800	0.0000	0.0000	0.0000	0.0000	22.3935	85.0229	168.3140 (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	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00												
310a	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564
Water heating fuel	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564 (310)
Cooling System Energy Efficiency Ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	19.6488	17.7473	19.6488	19.0150	19.6488	19.0150	19.6488	19.6488	19.0150	19.6488	19.0150	19.6488 (331)
Lighting	21.4536	17.2109	15.4965	11.3534	8.7697	7.1649	8.0000	10.3987	13.5069	17.7218	20.0167	22.0499 (332)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												644.9782 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2704.6393 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												6.4498 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)												
mechanical ventilation fans (SFP = 0.7000)												231.3486 (330a)
Total electricity for the above, kWh/year												231.3486 (331)
Electricity for lighting (calculated in Appendix L)												173.1429 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (333)
Wind generation												0.0000 (334)
Hydro-electric generation (Appendix N)												0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (335)
Appendix Q - special features												
Energy saved or generated												-0.0000 (336)
Energy used												0.0000 (337)
Total delivered energy for all uses												3754.1090 (338)

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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			262.0000 (367)
Space and Water heating from Heat pump	1278.4800	0.1580	38.8970 (367)
Electrical energy for heat distribution (space & water)	6.4498	0.0000	4.8296 (372)
Overall CO2 factor for heat network			0.0565 (386)
Total CO2 associated with community systems			189.1656 (373)
Space and water heating			189.1656 (376)
Pumps, fans and electric keep-hot	231.3486	0.1387	32.0909 (378)
Energy for lighting	173.1429	0.1443	24.9899 (379)
Total CO2, kg/year			246.2464 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.8600 (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			262.0000 (467a)
Space and Water heating from Heat pump	1278.4800	1.5849	390.1616 (467)
Electrical energy for heat distribution (space & water)	6.4498	0.0000	51.3584 (472)
Overall CO2 factor for heat network			0.6005 (486)
Total CO2 associated with community systems			2011.6040 (473)
Space and water heating			2011.6040 (476)
Pumps, fans and electric keep-hot	231.3486	1.5128	349.9842 (478)
Energy for lighting	173.1429	1.5338	265.5723 (479)
Total Primary energy kWh/year			2627.1605 (483)
Dwelling Primary energy Rate (DPER)			30.5500 (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	86.0000 (1b)	x 3.1500 (2b)	= 270.9000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0000		(4)
Dwelling volume		(3a) + (3b) + (3c) + (3d) + (3e) ... (3n) =	270.9000 (5)

2. Ventilation rate

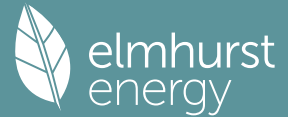
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	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) = 0.1107 (8)
Pressure Test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3607 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3607 (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	0.4599	0.4509	0.4419	0.3968	0.3878	0.3427	0.3427	0.3337	0.3607	0.3878	0.4058	0.4239 (22b)
Effective ac	0.6058	0.6017	0.5976	0.5787	0.5752	0.5587	0.5587	0.5557	0.5651	0.5752	0.5824	0.5898 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opening Type			21.5100	1.1450	24.6298		(27)
External Wall North	21.7700	14.3400	7.4300	0.1800	1.3374		(29a)
External Wall East	39.9100		39.9100	0.1800	7.1838		(29a)
External Wall South	21.5800	7.1700	14.4100	0.1800	2.5938		(29a)
Total net area of external elements Aum(A, m2)			83.2600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		35.7448		(33)
Main dwelling							

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Party Wall 1 West						39.3100	0.0000	0.0000					(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K													136.8542 (35)
List of Thermal Bridges													
K1 Element							Length	Psi-value	Total				
E7 Party floor between dwellings (in blocks of flats)						41.5000	0.0700	2.9050					
E18 Party wall between dwellings						12.6000	0.0600	0.7560					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)													3.6610 (36)
Point Thermal bridges													0.0000
Total fabric heat loss													(33) + (36) + (36a) = 39.4058 (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	54.1545	53.7873	53.4274	51.7369	51.4206	49.9482	49.9482	49.6755	50.5153	51.4206	52.0604	52.7294	(38)
Heat transfer coeff	93.5603	93.1931	92.8332	91.1426	90.8263	89.3540	89.3540	89.0813	89.9211	90.8263	91.4662	92.1351	(39)
Average = Sum(39)m / 12 =													91.1411
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0879	1.0836	1.0795	1.0598	1.0561	1.0390	1.0390	1.0358	1.0456	1.0561	1.0636	1.0713	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
													1.0598
													31

4. Water heating energy requirements (kWh/year)													

Assumed occupancy													2.5669 (42)
Hot water usage for mixer showers													
	67.2585	66.2478	64.7749	61.9568	59.8771	57.5579	56.2396	57.7013	59.3037	61.7938	64.6725	67.0008	(42a)
Hot water usage for baths													
	29.0466	28.6152	28.0077	26.8877	26.0490	25.1190	24.6166	25.2199	25.8767	26.8718	28.0149	28.9484	(42b)
Hot water usage for other uses													
	40.9178	39.4299	37.9420	36.4541	34.9661	33.4782	33.4782	34.9661	36.4541	37.9420	39.4299	40.9178	(42c)
Average daily hot water use (litres/day)													126.1389 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.2229	134.2929	130.7246	125.2985	120.8922	116.1550	114.3344	117.8873	121.6344	126.6076	132.1173	136.8670	(44)
Energy conte	217.3276	191.2313	200.9188	171.5274	162.7441	142.8262	138.2776	145.9691	149.9874	171.8053	188.2253	214.3007	(45)
Energy content (annual)													Total = Sum(45)m = 2095.1407
Distribution loss (46)m = 0.15 x (45)m													
	32.5991	28.6847	30.1378	25.7291	24.4116	21.4239	20.7416	21.8954	22.4981	25.7708	28.2338	32.1451	(46)
Water storage loss:													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													
Temperature factor from Table 2b													1.3938 (48)
Enter (49) or (54) in (55)													0.5400 (49)
Total storage loss													0.7527 (55)
	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													
	263.9225	233.3170	247.5137	216.6192	209.3390	187.9180	184.8725	192.5640	195.0792	218.4002	233.3171	260.8956	(62)
WWHRS	-30.7478	-27.1936	-28.4756	-23.5789	-21.9747	-18.8039	-17.6257	-18.7431	-19.4552	-22.9356	-25.9832	-30.1784	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	233.1747	206.1234	219.0382	193.0403	187.3643	169.1141	167.2469	173.8209	175.6240	195.4646	207.3339	230.7172	(64)
								Total per year (kWh/year) = Sum(64)m = 2358.0625 (64)					
12Total per year (kWh/year)													2358
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													
	109.5373	97.2530	104.0814	93.1063	91.3883	83.5632	83.2532	85.8107	85.9443	94.4012	98.6584	108.5309	(65)

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

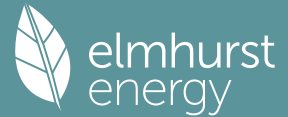
Metabolic gains (Table 5), Watts													
(66)m	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	116.7770	129.2888	116.7770	120.6695	116.7770	120.6695	116.7770	116.7770	120.6695	116.7770	120.6695	116.7770	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	231.5234	233.9259	227.8717	214.9831	198.7134	183.4223	173.2069	170.8044	176.8586	189.7472	206.0168	221.3080	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	(71)
Water heating gains (Table 5)													
	147.2276	144.7217	139.8944	129.3143	122.8338	116.0600	111.8995	115.3369	119.3670	126.8833	137.0255	145.8749	(72)
Total internal gains													
	560.0318	572.4402	549.0469	529.4707	502.8280	481.6556	463.3871	464.4220	478.3989	497.9113	528.2157	548.4636	(73)

6. Solar gains													

[Jan]													
	Area												
	m2												
	Solar flux												
	Table 6a												
	W/m2												
	Specific data												
	or Table 6b												
	g												
	Specific data												
	or Table 6c												
	FF												
	Access												
	factor												
	Table 6d												
	Gains												
	W												
North	14.3400												46.6007 (74)
South	7.1700												102.4452 (78)

Solar gains	149.0460	256.8353	365.0491	484.6231	579.1516	592.7725	563.9500	489.4962	405.2024	286.9753	178.9206	127.3708	(83)
Total gains	709.0778	829.2755	914.0960	1014.0939	1081.9796	1074.4281	1027.3371	953.9182	883.6013	784.8866	707.1362	675.8344	(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, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	34.9432	35.0809	35.2169	35.8701	35.9950	36.5881	36.5881	36.7001	36.3574	35.9950	35.7432	35.4837	
alpha	3.3295	3.3387	3.3478	3.3913	3.3997	3.4392	3.4392	3.4467	3.4238	3.3997	3.3829	3.3656	
util living area	0.9593	0.9331	0.8921	0.8035	0.6695	0.5020	0.3739	0.4159	0.6234	0.8384	0.9340	0.9644 (86)	
MIT	19.2570	19.5627	19.9491	20.4264	20.7601	20.9348	20.9819	20.9739	20.8607	20.4286	19.7844	19.2211 (87)	
Th 2	20.0107	20.0142	20.0176	20.0338	20.0368	20.0510	20.0510	20.0536	20.0455	20.0368	20.0307	20.0243 (88)	
util rest of house	0.9523	0.9220	0.8743	0.7725	0.6210	0.4365	0.2968	0.3356	0.5571	0.8055	0.9211	0.9582 (89)	
MIT 2	17.9961	18.3797	18.8595	19.4425	19.8186	20.0045	20.0421	20.0399	19.9367	19.4613	18.6741	17.9600 (90)	
Living area fraction									fLA = Living area / (4) =				0.3859 (91)
MIT	18.4827	18.8363	19.2800	19.8222	20.1820	20.3635	20.4048	20.4004	20.2933	19.8346	19.1026	18.4467 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.4827	18.8363	19.2800	19.8222	20.1820	20.3635	20.4048	20.4004	20.2933	19.8346	19.1026	18.4467 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9381	0.9057	0.8586	0.7651	0.6287	0.4586	0.3260	0.3656	0.5751	0.7976	0.9060	0.9450 (94)
Useful gains	665.1864	751.0741	784.8605	775.8561	680.2392	492.7658	334.8615	348.7659	508.1955	626.0579	640.6351	638.6781 (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	1326.9388	1298.7644	1186.4103	995.4797	770.3848	514.9935	339.9711	356.3579	556.9087	838.7469	1097.8325	1312.6181 (97)
Space heating kWh	492.3438	368.0479	298.7531	158.1290	67.0683	0.0000	0.0000	0.0000	0.0000	158.2406	329.1821	501.4114 (98a)
Space heating requirement - total per year (kWh/year)												2373.1762
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	492.3438	368.0479	298.7531	158.1290	67.0683	0.0000	0.0000	0.0000	0.0000	158.2406	329.1821	501.4114 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2373.1762
Space heating per m2										(98c) / (4) =		27.5951 (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	492.3438	368.0479	298.7531	158.1290	67.0683	0.0000	0.0000	0.0000	0.0000	158.2406	329.1821	501.4114	(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)	533.4168	398.7518	323.6762	171.3207	72.6634	0.0000	0.0000	0.0000	0.0000	171.4416	356.6437	543.2409	(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	233.1747	206.1234	219.0382	193.0403	187.3643	169.1141	167.2469	173.8209	175.6240	195.4646	207.3339	230.7172	(64)
Efficiency of water heater													(216)
(217)m	85.6939	85.3446	84.7563	83.6161	81.9905	79.8000	79.8000	79.8000	79.8000	83.5902	85.0914	85.7523	(217)
Fuel for water heating, kWh/month	272.1020	241.5190	258.4328	230.8651	228.5196	211.9225	209.5825	217.8207	220.0802	233.8368	243.6603	269.0509	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.2639	19.4654	17.5265	12.8406	9.9185	8.1035	9.0480	11.7609	15.2762	20.0433	22.6388	24.9383	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.1333	-21.4881	-33.2771	-40.4010	-46.2402	-44.1436	-43.5994	-39.8103	-33.6426	-25.8271	-16.0801	-12.0434	(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	-3.8554	-8.3790	-17.1728	-26.5811	-35.9431	-36.4179	-35.9984	-30.1173	-21.6012	-12.2424	-5.2277	-3.0297	(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													2571.1551 (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													2837.3925 (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)													195.8240 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-607.2522 (233)
Wind generation													0.0000 (234)

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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	5083.1194 (238)

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

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	2571.1551	0.2100	539.9426 (261)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating (other fuel)	2837.3925	0.2100	595.8524 (264)
Space and water heating			1135.7950 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	195.8240	0.1443	28.2635 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-370.6862	0.1330	-49.3178
PV Unit electricity exported	-236.5660	0.1250	-29.5755
Total			-78.8933 (269)
Total CO ₂ , kg/year			1097.0944 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.7600 (273)

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

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	2571.1551	1.1300	2905.4053 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	2837.3925	1.1300	3206.2535 (278)
Space and water heating			6111.6588 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	195.8240	1.5338	300.3613 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-370.6862	1.4916	-552.9238
PV Unit electricity exported	-236.5660	0.4589	-108.5520
Total			-661.4758 (283)
Total Primary energy kWh/year			5880.6451 (286)
Target Primary Energy Rate (TPER)			68.3800 (287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF FABRIC ENERGY EFFICIENCY

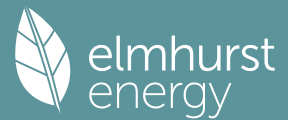
1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	86.0000 (1b)	x 3.1500 (2b)	= 270.9000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 270.9000 (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	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) = 0.1107 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2607 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2607 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000 (22)
Wind factor	1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1250 1.1750 (22a)
Adj infilt rate	0.3324 0.3259 0.3194 0.2868 0.2803 0.2477 0.2477 0.2412 0.2607 0.2803 0.2933 0.3064 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	
Effective ac	0.5553 0.5531 0.5510 0.5411 0.5393 0.5307 0.5307 0.5291 0.5340 0.5393 0.5430 0.5469 (25)

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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								
Glazing			22.2000	0.7752	17.2093			(27)
External Wall North	21.7700	14.8000	6.9700	0.1400	0.9758	70.0000	487.9000	(29a)
External Wall East	39.9100		39.9100	0.1400	5.5874	70.0000	2793.7000	(29a)
External Wall South	21.5800	7.4000	14.1800	0.1400	1.9852	70.0000	992.6000	(29a)
Total net area of external elements Aum(A, m2)			83.2600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		25.7577			(33)
Main dwelling								
Party Wall 1 West			39.3100	0.0000	0.0000	45.0000	1768.9500	(32)
Party Floor 1			82.0000			30.0000	2460.0000	(32d)
Party Ceiling 1			82.0000			30.0000	2460.0000	(32b)
Internal Wall 1			89.5900			9.0000	806.3100	(32c)

Heat capacity Cm = Sum(A x k) (28) ... (30) + (32) + (32a) ... (32e) = 11769.4600 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 136.8542 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450	
E18 Party wall between dwellings	12.6000	0.0300	0.3780	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				1.6230 (36)
Point Thermal bridges				(36a) = 0.0000
Total fabric heat loss				(33) + (36) + (36a) = 27.3807 (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	49.6386	49.4468	49.2587	48.3756	48.2103	47.4411	47.4411	47.2986	47.7374	48.2103	48.5446	48.8941	(38)
Average = Sum(39)m / 12 =	77.0193	76.8275	76.6394	75.7563	75.5910	74.8218	74.8218	74.6794	75.1181	75.5910	75.9253	76.2748	(39)
												75.7555	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8956	0.8933	0.8912	0.8809	0.8790	0.8700	0.8700	0.8684	0.8735	0.8790	0.8829	0.8869	(40)
HLP (average)												0.8809	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

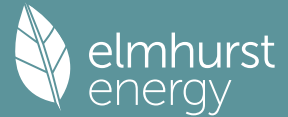
Assumed occupancy													2.5669 (42)
Hot water usage for mixer showers													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
28.3991	27.9704	27.3605	26.4472	25.6241	24.4910	23.6313	24.6825	25.2342	26.3569	27.5242	28.3765	28.3765	(42b)
Hot water usage for other uses													
40.9178	39.4299	37.9420	36.4541	34.9661	33.4782	33.4782	34.9661	36.4541	37.9420	39.4299	40.9178	40.9178	(42c)
Average daily hot water use (litres/day)												63.5307	(43)
Daily hot water use													
69.3169	67.4003	65.3025	62.9012	60.5902	57.9692	57.1095	59.6486	61.6883	64.2989	66.9541	69.2944	69.2944	(44)
Energy conte	102.0464	89.1842	93.3159	82.1647	78.0766	67.0394	63.1077	70.2076	71.5553	82.8556	90.4907	101.7638	(45)
Energy content (annual)												991.8080	
Distribution loss (46)m = 0.15 x (45)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	0.0000	(46)
Water storage 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	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	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	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													
86.7395	75.8066	79.3185	69.8400	66.3651	56.9835	53.6416	59.6764	60.8220	70.4273	76.9171	86.4993	86.4993	(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													
86.7395	75.8066	79.3185	69.8400	66.3651	56.9835	53.6416	59.6764	60.8220	70.4273	76.9171	86.4993	86.4993	(64)
12Total per year (kWh/year)												843.0368	(64)
Electric shower(s)												843	(64)
53.8629	47.9923	52.4057	50.0101	50.9486	48.6000	50.2200	50.9486	50.0101	52.4057	51.4203	53.8629	53.8629	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												612.6870	(64a)
Heat gains from water heating, kWh/month													
35.1506	30.9497	32.9311	29.9625	29.3284	26.3959	25.9654	27.6562	27.7080	30.7082	32.0843	35.0905	35.0905	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
116.7770	129.2888	116.7770	120.6695	116.7770	120.6695	116.7770	116.7770	120.6695	116.7770	120.6695	116.7770	116.7770	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
231.5234	233.9259	227.8717	214.9831	198.7134	183.4223	173.2069	170.8044	176.8586	189.7472	206.0168	221.3080	221.3080	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	(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)													
-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	(71)
Water heating gains (Table 5)													
47.2454	46.0561	44.2622	41.6146	39.4199	36.6609	34.8997	37.1724	38.4834	41.2745	44.5616	47.1647	47.1647	(72)
Total internal gains													
457.0496	470.7746	450.4146	438.7710	416.4141	402.2565	386.3873	386.2575	397.5153	409.3025	432.7518	446.7534	446.7534	(73)

6. Solar gains

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[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	14.8000	10.6334	0.3500	0.8500	0.7700	32.4454 (74)
South	7.4000	46.7521	0.3500	0.8500	0.7700	71.3268 (78)

Solar gains	103.7722	178.8198	254.1630	337.4156	403.2304	412.7138	392.6463	340.8084	282.1194	199.8046	124.5722	88.6810 (83)
Total gains	560.8218	649.5944	704.5776	776.1866	819.6445	814.9703	779.0337	727.0659	679.6346	609.1071	557.3240	535.4345 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	42.4477	42.5537	42.6581	43.1554	43.2498	43.6944	43.6944	43.7778	43.5221	43.2498	43.0594	42.8621
alpha	3.8298	3.8369	3.8439	3.8770	3.8833	3.9130	3.9130	3.9185	3.9015	3.8833	3.8706	3.8575
util living area	0.9761	0.9580	0.9287	0.8553	0.7302	0.5549	0.4141	0.4589	0.6771	0.8826	0.9583	0.9796 (86)
MIT	19.4545	19.7135	20.0428	20.4688	20.7803	20.9439	20.9860	20.9792	20.8775	20.4775	19.9053	19.4125 (87)
Th 2	20.1713	20.1732	20.1750	20.1838	20.1854	20.1931	20.1931	20.1945	20.1901	20.1854	20.1821	20.1786 (88)
util rest of house	0.9720	0.9510	0.9166	0.8314	0.6885	0.4944	0.3416	0.3838	0.6183	0.8579	0.9501	0.9761 (89)
MIT 2	18.7545	19.0101	19.3325	19.7436	20.0233	20.1602	20.1873	20.1853	20.1116	19.7607	19.2083	18.7185 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.0246	19.2816	19.6066	20.0235	20.3154	20.4626	20.4955	20.4917	20.4072	20.0373	19.4773	18.9864 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.0246	19.2816	19.6066	20.0235	20.3154	20.4626	20.4955	20.4917	20.4072	20.0373	19.4773	18.9864 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9647	0.9419	0.9069	0.8263	0.6955	0.5151	0.3691	0.4120	0.6348	0.8528	0.9416	0.9695 (94)
Useful gains	541.0514	611.8258	638.9838	641.3412	570.0655	419.8136	287.5446	299.5498	431.4447	519.4752	524.7489	519.1096 (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	1134.0818	1104.8982	1004.4830	842.6751	651.2499	438.6538	291.4698	305.5655	473.7846	713.3763	939.7471	1127.8261 (97)
Space heating kWh	441.2146	331.3447	271.9314	144.9604	60.4012	0.0000	0.0000	0.0000	0.0000	144.2624	298.7987	452.8850 (98a)
Space heating requirement - total per year (kWh/year)	2145.7985											
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	441.2146	331.3447	271.9314	144.9604	60.4012	0.0000	0.0000	0.0000	0.0000	144.2624	298.7987	452.8850 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2145.7985											
Space heating per m2	(98c) / (4) = 24.9511 (99)											

8c. Space cooling requirement

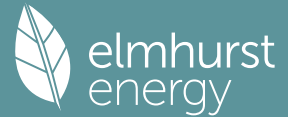
Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	703.3249	553.6813	567.5631	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8837	0.9299	0.9098	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	621.5547	514.8661	516.3911	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	907.3426	867.7019	809.1092	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	205.7673	262.5098	217.7823	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	51.4418	65.6274	54.4456	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	171.5149 (107)											
Energy for space heating	24.9511 (99)											
Energy for space cooling	1.9944 (108)											
Total	26.9455 (109)											
Fabric Energy Efficiency (DFEE)	26.9 (109)											

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	86.0000 (1b)	x	270.9000 (1b) - (3b)
Ground floor		3.1500 (2b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	270.9000 (5)

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2. Ventilation rate

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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)
	0.4599	0.4509	0.4419	0.3968	0.3878	0.3427	0.3427	0.3337	0.3607	0.3878	0.4058	0.4239	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													(23c)
Effective ac	0.6058	0.6017	0.5976	0.5787	0.5752	0.5587	0.5587	0.5557	0.5651	0.5752	0.5824	0.5898	(25)

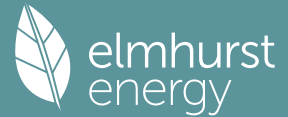
3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K						
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K						
TER Opening Type			21.5100	1.1450	24.6298			(27)					
External Wall North	21.7700	14.3400	7.4300	0.1800	1.3374			(29a)					
External Wall East	39.9100		39.9100	0.1800	7.1838			(29a)					
External Wall South	21.5800	7.1700	14.4100	0.1800	2.5938			(29a)					
Total net area of external elements Aum(A, m2)			83.2600					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		35.7448			(33)					
Main dwelling													
Party Wall 1 West			39.3100	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								136.8542 (35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
E7 Party floor between dwellings (in blocks of flats)				41.5000	0.0700	2.9050							
E18 Party wall between dwellings				12.6000	0.0600	0.7560							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.6610	(36)					
Point Thermal bridges							(36a) =	0.0000					
Total fabric heat loss							(33) + (36) + (36a) =	39.4058 (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	54.1545	53.7873	53.4274	51.7369	51.4206	49.9482	49.9482	49.6755	50.5153	51.4206	52.0604	52.7294	(38)
Average = Sum(39)m / 12 =	93.5603	93.1931	92.8332	91.1426	90.8263	89.3540	89.3540	89.0813	89.9211	90.8263	91.4662	92.1351	(39)
	91.1411												
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0879	1.0836	1.0795	1.0598	1.0561	1.0390	1.0390	1.0358	1.0456	1.0561	1.0636	1.0713	(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													2.5669 (42)
Hot water usage for mixer showers													
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	(42a)
Hot water usage for baths													
29.0466	28.6152	28.0077	26.8877	26.0490	25.1190	24.6166	25.2199	25.8767	26.8718	28.0149	28.9484	28.9484	(42b)
Hot water usage for other uses													
40.9178	39.4299	37.9420	36.4541	34.9661	33.4782	33.4782	34.9661	36.4541	37.9420	39.4299	40.9178	40.9178	(42c)
Average daily hot water use (litres/day)													64.1288 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
69.9644	68.0451	65.9497	63.3417	61.0151	58.5972	58.0948	60.1860	62.3307	64.8138	67.4448	69.8662	69.8662	(44)
Energy conte	110.8065	96.8953	101.3622	86.7116	82.1380	72.0521	70.2607	74.5228	76.8600	87.9517	96.0875	109.3936	(45)
Energy content (annual)													Total = Sum(45)m = 1065.0421
Distribution loss (46)m = 0.15 x (45)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	0.0000	(46)
Water storage 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	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	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													
94.1855	82.3610	86.1579	73.7049	69.8173	61.2443	59.7216	63.3444	65.3310	74.7589	81.6744	92.9846	92.9846	(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	94.1855	82.3610	86.1579	73.7049	69.8173	61.2443	59.7216	63.3444	65.3310	74.7589	81.6744	92.9846	(64)
12Total per year (kWh/year)													Total per year (kWh/year) = Sum(64)m = 905.2858 (64)
													905 (64)

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Electric shower(s)	53.8629	47.9923	52.4057	50.0101	50.9486	48.6000	50.2200	50.9486	50.0101	52.4057	51.4203	53.8629 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												612.6870 (64a)
Heat gains from water heating, kWh/month	37.0121	32.5883	34.6409	30.9288	30.1915	27.4611	27.4854	28.5732	28.8353	31.7912	33.2737	36.7119 (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	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	116.7770	129.2888	116.7770	120.6695	116.7770	120.6695	116.7770	116.7770	120.6695	116.7770	120.6695	116.7770	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	231.5234	233.9259	227.8717	214.9831	198.7134	183.4223	173.2069	170.8044	176.8586	189.7472	206.0168	221.3080	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	(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)	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	(71)
Water heating gains (Table 5)	49.7475	48.4945	46.5604	42.9566	40.5799	38.1404	36.9427	38.4049	40.0490	42.7300	46.2134	49.3439	(72)
Total internal gains	459.5516	473.2130	452.7128	440.1130	417.5741	403.7360	388.4303	387.4900	399.0809	410.7580	434.4036	448.9326	(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					14.3400	10.6334	0.6300	0.7000	0.7700					46.6007 (74)
South					7.1700	46.7521	0.6300	0.7000	0.7700					102.4452 (78)
Solar gains	149.0460	256.8353	365.0491	484.6231	579.1516	592.7725	563.9500	489.4962	405.2024	286.9753	178.9206			127.3708 (83)
Total gains	608.5976	730.0483	817.7620	924.7361	996.7257	996.5085	952.3803	876.9862	804.2832	697.7333	613.3241			576.3034 (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	34.9432	35.0809	35.2169	35.8701	35.9950	36.5881	36.5881	36.7001	36.3574	35.9950	35.7432	35.4837	
alpha	3.3295	3.3387	3.3478	3.3913	3.3997	3.4392	3.4392	3.4467	3.4238	3.3997	3.3829	3.3656	
util living area	0.9731	0.9515	0.9164	0.8350	0.7051	0.5343	0.4010	0.4485	0.6652	0.8733	0.9542	0.9771	(86)
MIT	19.0831	19.4061	19.8183	20.3413	20.7170	20.9210	20.9775	20.9671	20.8291	20.3314	19.6347	19.0451	(87)
Th 2	20.0107	20.0142	20.0176	20.0338	20.0368	20.0510	20.0510	20.0536	20.0455	20.0368	20.0307	20.0243	(88)
util rest of house	0.9682	0.9430	0.9017	0.8067	0.6575	0.4665	0.3192	0.3634	0.5989	0.8449	0.9447	0.9729	(89)
MIT 2	18.2708	18.5898	18.9926	19.4985	19.8337	20.0066	20.0423	20.0399	19.9395	19.5032	18.8303	18.2431	(90)
Living area fraction									FLA = Living area / (4) =				(91)
MIT	18.5843	18.9048	19.3113	19.8238	20.1746	20.3595	20.4032	20.3978	20.2829	19.8228	19.1407	18.5526	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5843	18.9048	19.3113	19.8238	20.1746	20.3595	20.4032	20.3978	20.2829	19.8228	19.1407	18.5526	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9590	0.9311	0.8891	0.7999	0.6647	0.4893	0.3501	0.3951	0.6164	0.8376	0.9337	0.9646	(94)
Useful gains	583.6152	679.7623	727.0570	739.7131	662.5217	487.5475	333.4494	346.4799	495.7211	584.4178	572.6871	555.8945	(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	1336.4437	1305.1542	1189.3122	995.6224	769.7151	514.6305	339.8303	356.1249	555.9698	837.6751	1101.3210	1322.3765	(97)
Space heating kWh	560.1044	420.2634	343.9179	184.2547	79.7519	0.0000	0.0000	0.0000	0.0000	188.4234	380.6164	570.2626	(98a)
Space heating requirement - total per year (kWh/year)												2727.5948	
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	560.1044	420.2634	343.9179	184.2547	79.7519	0.0000	0.0000	0.0000	0.0000	188.4234	380.6164	570.2626	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2727.5948	
Space heating per m ²										(98c) / (4) =		31.7162	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	839.9272	661.2193	677.0178	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8710	0.9173	0.8939	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	731.5379	606.5042	605.2099	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1119.2803	1069.9700	984.1327	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	279.1745	344.8185	281.9186	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fc = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	69.7936	86.2046	70.4796	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												226.4779	(107)

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Energy for space heating	31.7162 (99)
Energy for space cooling	2.6335 (108)
Total	34.3497 (109)
Fabric Energy Efficiency (TFEE)	34.3 (109)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	86.0000 (1b)	3.1500 (2b)	270.9000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0000		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 270.9000 (5)
Dwelling volume			

2. Ventilation rate

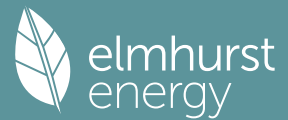
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (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	0.2862	0.2825	0.2787	0.2600	0.2562	0.2375	0.2375	0.2337	0.2450	0.2562	0.2637	0.2712 (25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K					
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K					
Glazing			22.2000	0.7752	17.2093			(27)				
External Wall North	21.7700	14.8000	6.9700	0.1400	0.9758	70.0000	487.9000	(29a)				
External Wall East	39.9100		39.9100	0.1400	5.5874	70.0000	2793.7000	(29a)				
External Wall South	21.5800	7.4000	14.1800	0.1400	1.9852	70.0000	992.6000	(29a)				
Total net area of external elements Aum(A, m2)			83.2600					(31)				
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7577			(33)				
Main dwelling												
Party Wall 1 West			39.3100	0.0000	0.0000	45.0000	1768.9500	(32)				
Party Floor 1			82.0000			30.0000	2460.0000	(32d)				
Party Ceiling 1			82.0000			30.0000	2460.0000	(32b)				
Internal Wall 1			89.5900			9.0000	806.3100	(32c)				
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		11769.4600	(34)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							136.8542	(35)				
List of Thermal Bridges												
K1 Element					Length	Psi-value	Total					
E7 Party floor between dwellings (in blocks of flats)					41.5000	0.0300	1.2450					
E18 Party wall between dwellings					12.6000	0.0300	0.3780					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								1.6230 (36)				
Point Thermal bridges							(36a) =	0.0000				
Total fabric heat loss						(33) + (36) + (36a) =		27.3807 (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
	25.5899	25.2547	24.9194	23.2432	22.9080	21.2318	21.2318	20.8965	21.9023	22.9080	23.5785	24.2489 (38)
Heat transfer coeff												
	52.9706	52.6354	52.3001	50.6239	50.2887	48.6125	48.6125	48.2773	49.2830	50.2887	50.9592	51.6296 (39)
Average = Sum(39)m / 12 =												50.5401
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.6159	0.6120	0.6081	0.5887	0.5848	0.5653	0.5653	0.5614	0.5731	0.5848	0.5925	0.6003 (40)
HLP (average)												0.5877
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5669 (42)
Hot water usage for mixer showers												73.6877 (42a)
Hot water usage for baths												28.3765 (42b)
Hot water usage for other uses												40.9178 (42c)
Average daily hot water use (litres/day)												131.5263 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	143.0710	140.0253	136.2634	131.3022	126.6975	120.8677	117.4701	122.9762	126.5081	132.2969	138.2619	142.9820 (44)
Energy content (annual)	210.6253	185.2817	194.7176	171.5135	163.2626	139.7795	129.8079	144.7453	146.7431	170.4780	186.8656	209.9796 (45)
Distribution loss (46)m = 0.15 x (45)m												2053.7995
Water storage loss:												
Store volume												110.0000 (47)
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												
If cylinder contains dedicated solar storage												
Primary 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)
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 (57)
Total heat required for water heating calculated for each month												
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 (61)
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 (62)
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 (63a)
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 (63b)
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 (63c)
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	114.2544	101.5481	108.9650	99.8232	98.5062	89.2716	87.3826	92.3492	91.5870	100.9054	104.9278	114.0396 (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	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.5102	21.7697	17.7043	13.4033	10.0191	8.4586	9.1398	11.8802	15.9456	20.2466	23.6308	25.1914 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	345.5573	349.1431	340.1070	320.8702	296.5872	273.7646	258.5177	254.9319	263.9680	283.2048	307.4878	330.3104 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684 (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)	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768 (71)
Water heating gains (Table 5)	153.5677	151.1133	146.4584	138.6433	132.4009	123.9884	117.4497	124.1253	127.2042	135.6255	145.7330	153.2791 (72)
Total internal gains	627.9420	626.3329	608.5765	577.2236	543.3140	510.5183	489.4140	495.2443	511.4246	543.3838	581.1585	613.0877 (73)

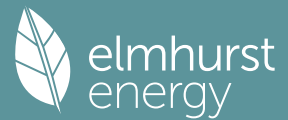
6. Solar gains

[Jan]												Gains
					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	W
North					14.8000	10.6334	0.3500		0.8500		0.7700	32.4454 (74)
South					7.4000	46.7521	0.3500		0.8500		0.7700	71.3268 (78)
Solar gains	103.7722	178.8198	254.1630	337.4156	403.2304	412.7138	392.6463	340.8084	282.1194	199.8046	124.5722	88.6810 (83)
Total gains	731.7142	805.1528	862.7395	914.6392	946.5444	923.2322	882.0603	836.0526	793.5440	743.1883	705.7307	701.7688 (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	61.7190	62.1121	62.5103	64.5800	65.0105	67.2521	67.2521	67.7192	66.3372	65.0105	64.1552	63.3220
alpha	5.1146	5.1408	5.1674	5.3053	5.3340	5.4835	5.4835	5.5146	5.4225	5.3340	5.2770	5.2215
util living area	0.9046	0.8578	0.7794	0.6411	0.4882	0.3364	0.2424	0.2655	0.4260	0.6679	0.8422	0.9138 (86)
MIT	20.4906	20.6409	20.8030	20.9395	20.9871	20.9988	20.9998	20.9997	20.9954	20.9384	20.7373	20.4801 (87)
Th 2	20.4157	20.4192	20.4227	20.4402	20.4437	20.4614	20.4614	20.4649	20.4543	20.4437	20.4367	20.4297 (88)
util rest of house	0.8936	0.8431	0.7595	0.6160	0.4603	0.3083	0.2128	0.2347	0.3931	0.6385	0.8244	0.9037 (89)
MIT 2	19.8293	20.0136	20.2081	20.3786	20.4320	20.4604	20.4613	20.4647	20.4507	20.3830	20.1474	19.8285 (90)
Living area fraction												0.3859 (91)
MIT	20.0845	20.2557	20.4377	20.5951	20.6462	20.6682	20.6691	20.6712	20.6609	20.5973	20.3751	20.0799 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0845	20.2557	20.4377	20.5951	20.6462	20.6682	20.6691	20.6712	20.6609	20.5973	20.3751	20.0799 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8868	0.8388	0.7600	0.6230	0.4705	0.3191	0.2242	0.2466	0.4056	0.6468	0.8224	0.8969	(94)
Useful gains	648.8828	675.3294	655.7211	569.8408	445.3863	294.6046	197.7680	206.1337	321.8632	480.6731	580.3766	629.3989	(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	836.1149	808.2529	728.9446	592.0506	449.8933	294.9899	197.8102	206.2027	323.3404	502.7524	676.4860	819.8751	(97)
Space heating kWh	139.3007	89.3246	54.4783	15.9910	3.3532	0.0000	0.0000	0.0000	0.0000	16.4270	69.1987	141.7143	(98a)
Space heating requirement - total per year (kWh/year)												529.7878	
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	139.3007	89.3246	54.4783	15.9910	3.3532	0.0000	0.0000	0.0000	0.0000	16.4270	69.1987	141.7143	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												529.7878	
Space heating per m2										(98c) / (4) =		6.1603	(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												1.0000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	139.3007	89.3246	54.4783	15.9910	3.3532	0.0000	0.0000	0.0000	0.0000	16.4270	69.1987	141.7143	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													
307a	139.3007	89.3246	54.4783	15.9910	3.3532	0.0000	0.0000	0.0000	0.0000	16.4270	69.1987	141.7143	
Space heating requirement	139.3007	89.3246	54.4783	15.9910	3.3532	0.0000	0.0000	0.0000	0.0000	16.4270	69.1987	141.7143	(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	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310a	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564	
Water heating fuel	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564	(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	19.6488	17.7473	19.6488	19.0150	19.6488	19.0150	19.6488	19.6488	19.0150	19.6488	19.0150	19.6488	(331)
Lighting	21.4536	17.2109	15.4965	11.3534	8.7697	7.1649	8.0000	10.3987	13.5069	17.7218	20.0167	22.0499	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												529.7878	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2704.6393	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												5.2979	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)													
mechanical ventilation fans (SFP = 0.7000)												231.3486	(330a)
Total electricity for the above, kWh/year												231.3486	(331)
Electricity for lighting (calculated in Appendix L)												173.1429	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3638.9186	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	529.7878	4.4400	23.5226	(340a)
Space heating total			23.5226	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2704.6393	4.4400	120.0860	(342a)
Water heating total			120.0860	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	231.3486	16.4900	38.1494	(349)
Energy for lighting	173.1429	16.4900	28.5513	(350)
Additional standing charges			92.0000	(351)
Total energy cost			302.3092	(355)

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11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.8308 (357)
SAP value		86.5332
SAP rating (Section 12)		87 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Efficiency of heat source Heat pump			262.0000 (367)
Space and Water heating from Heat pump	1234.5142	0.1583	32.0019 (367)
Electrical energy for heat distribution (space & water)	5.2979	0.0000	4.6490 (372)
Overall CO ₂ factor for heat network			0.0563 (386)
Total CO ₂ associated with community systems			182.0898 (373)
Space and water heating			182.0898 (376)
Pumps, fans and electric keep-hot	231.3486	0.1387	32.0909 (378)
Energy for lighting	173.1429	0.1443	24.9899 (379)
Total CO ₂ , kg/year			239.1706 (383)
CO ₂ emissions per m ²			2.7800 (384)
EI value			97.5535 (384a)
EI rating			98 (385)
EI band			A

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	86.0000 (1b)	x 3.1500 (2b)	= 270.9000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	270.9000 (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	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (21)

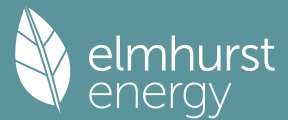
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.8000	4.5000	4.4000	3.9000	3.9000	3.6000	3.7000	3.5000	3.7000	4.0000	4.1000	4.4000 (22)
Wind factor	1.2000	1.1250	1.1000	0.9750	0.9750	0.9000	0.9250	0.8750	0.9250	1.0000	1.0250	1.1000 (22a)
Adj infilt rate	0.1800	0.1687	0.1650	0.1462	0.1462	0.1350	0.1388	0.1313	0.1388	0.1500	0.1537	0.1650 (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	0.2750	0.2637	0.2600	0.2412	0.2412	0.2300	0.2337	0.2262	0.2337	0.2450	0.2487	0.2600 (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							
Glazing			22.2000	0.7752	17.2093		(27)
External Wall North	21.7700	14.8000	6.9700	0.1400	0.9758	70.0000	487.9000 (29a)
External Wall East	39.9100		39.9100	0.1400	5.5874	70.0000	2793.7000 (29a)
External Wall South	21.5800	7.4000	14.1800	0.1400	1.9852	70.0000	992.6000 (29a)
Total net area of external elements Aum(A, m ²)			83.2600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7577		(33)

6. Solar gains						
[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	14.8000	12.7054	0.3500	0.8500	0.7700	38.7677 (74)
South	7.4000	53.5774	0.3500	0.8500	0.7700	81.7397 (78)

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Solar gains	120.5074	185.2392	264.3899	373.7005	432.1187	473.6379	445.0547	388.2777	315.4848	221.8909	146.1821	99.5379 (83)
Total gains	748.4494	811.5722	872.9664	950.9241	975.4327	984.1562	934.4686	883.5220	826.9095	765.2747	727.3405	712.6256 (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	62.9135	64.1552	64.5800	66.7915	66.7915	68.1927	67.7192	68.6729	67.7192	66.3372	65.8890	64.5800
alpha	5.1942	5.2770	5.3053	5.4528	5.4528	5.5462	5.5146	5.5782	5.5146	5.4225	5.3926	5.3053
util living area	0.8792	0.8319	0.7390	0.5776	0.4193	0.2726	0.1860	0.1886	0.3496	0.5834	0.7851	0.8857 (86)
MIT	20.6019	20.7237	20.8649	20.9683	20.9950	20.9997	21.0000	21.0000	20.9987	20.9725	20.8400	20.6106 (87)
Th 2	20.4262	20.4367	20.4402	20.4578	20.4578	20.4684	20.4649	20.4720	20.4649	20.4543	20.4508	20.4402 (88)
util rest of house	0.8659	0.8156	0.7176	0.5529	0.3928	0.2468	0.1583	0.1601	0.3187	0.5525	0.7634	0.8728 (89)
MIT 2	19.9738	20.1280	20.2955	20.4263	20.4535	20.4682	20.4649	20.4720	20.4639	20.4286	20.2796	19.9973 (90)
Living area fraction	20.2162	20.3579	20.5153	20.6355	20.6625	20.6733	20.6714	20.6757	20.6703	20.6385	20.4959	20.2340 (92)
MIT	20.2162	20.3579	20.5153	20.6355	20.6625	20.6733	20.6714	20.6757	20.6703	20.6385	20.4959	20.2340 (93)
Temperature adjustment												0.0000
adjusted MIT	20.2162	20.3579	20.5153	20.6355	20.6625	20.6733	20.6714	20.6757	20.6703	20.6385	20.4959	20.2340 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8607	0.8132	0.7206	0.5611	0.4028	0.2568	0.1690	0.1711	0.3305	0.5630	0.7653	0.8677 (94)
Useful gains	644.1725	659.9713	629.0507	533.5535	392.9439	252.7128	157.9264	151.1798	273.3331	430.8829	556.6075	618.3635 (95)
Ext temp.	5.0000	5.4000	7.1000	9.5000	12.6000	15.4000	17.4000	17.5000	15.0000	11.7000	8.1000	5.2000 (96)
Heat loss rate W	790.7064	762.2430	679.1340	545.0579	394.6397	252.8129	157.9337	151.1864	273.7457	440.5165	615.0612	761.0812 (97)
Space heating kWh	109.0213	68.7265	37.2620	8.2832	1.2617	0.0000	0.0000	0.0000	0.0000	7.1674	42.0866	106.1820 (98a)
Space heating requirement - total per year (kWh/year)												379.9907
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	109.0213	68.7265	37.2620	8.2832	1.2617	0.0000	0.0000	0.0000	0.0000	7.1674	42.0866	106.1820 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												379.9907
Space heating per m2										(98c) / (4) =		4.4185 (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												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	109.0213	68.7265	37.2620	8.2832	1.2617	0.0000	0.0000	0.0000	0.0000	7.1674	42.0866	106.1820 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	109.0213	68.7265	37.2620	8.2832	1.2617	0.0000	0.0000	0.0000	0.0000	7.1674	42.0866	106.1820
Space heating requirement	109.0213	68.7265	37.2620	8.2832	1.2617	0.0000	0.0000	0.0000	0.0000	7.1674	42.0866	106.1820 (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	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00												
310a	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564
Water heating fuel	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564 (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	19.6488	17.7473	19.6488	19.0150	19.6488	19.0150	19.6488	19.6488	19.0150	19.6488	19.0150	19.6488 (311)
Lighting	21.4536	17.2109	15.4965	11.3534	8.7697	7.1649	8.0000	10.3987	13.5069	17.7218	20.0167	22.0499 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												379.9907 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2704.6393 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												3.7999 (313)
Space cooling fuel												0.0000 (321)

Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)												
mechanical ventilation fans (SFP = 0.7000)												231.3486 (330a)
Total electricity for the above, kWh/year												231.3486 (331)
Electricity for lighting (calculated in Appendix L)												173.1429 (332)

Energy saving/generation technologies (Appendices M ,N and Q)

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PV generation	0.0000 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	3489.1215 (338)

10b. Fuel costs - using BEDF prices (568)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating from Heat pump	379.9907	5.6000	21.2795 (340a)
Space heating total			21.2795 (340)
Total CO2 associated with community systems			0.0000 (473)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Heat pump	2704.6393	5.6000	151.4598 (342a)
Water heating total			151.4598 (342)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (347a)
Pumps, fans and electric keep-hot	231.3486	26.0600	60.2894 (349)
Energy for lighting	173.1429	26.0600	45.1210 (350)
Additional standing charges			99.0000 (351)
Total energy cost			377.1498 (355)

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			262.0000 (367)
Space and Water heating from Heat pump	1177.3397	0.1591	23.0749 (367)
Electrical energy for heat distribution (space & water)	3.7999	0.0000	4.4151 (372)
Overall CO2 factor for heat network			0.0561 (386)
Total CO2 associated with community systems			172.9290 (373)
Space and water heating			172.9290 (376)
Pumps, fans and electric keep-hot	231.3486	0.1387	32.0909 (378)
Energy for lighting	173.1429	0.1443	24.9899 (379)
Total CO2, kg/year			230.0097 (383)

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			262.0000 (467a)
Space and Water heating from Heat pump	1177.3397	1.5889	230.4490 (467)
Electrical energy for heat distribution (space & water)	3.7999	0.0000	47.1740 (472)
Overall CO2 factor for heat network			0.5990 (486)
Total CO2 associated with community systems			1847.7069 (473)
Space and water heating			1847.7069 (476)
Pumps, fans and electric keep-hot	231.3486	1.5128	349.9842 (478)
Energy for lighting	173.1429	1.5338	265.5723 (479)
Total Primary energy kWh/year			2463.2634 (483)

SAP 10 EPC IMPROVEMENTS

0307_2B3P_BL

Current energy efficiency rating:	B 87
Current environmental impact rating:	A 98

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures: (none)	SAP change	Cost change	CO2 change
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Recommended measures (none)	Typical annual savings	Energy efficiency	Environmental impact
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Total Savings £0 0.00 kg/m²

Potential energy efficiency rating:	B 87
Potential environmental impact rating:	A 98

Fuel prices for cost data on this page from database revision number 568 TEST (31 Mar 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, South East England):

	Current	Potential	Saving
Electricity	£105	£105	£0
Community scheme	£272	£272	£0
Space heating	£181	£181	£0
Water heating	£151	£151	£0
Lighting	£45	£45	£0
Total cost of fuels	£377	£377	£0
Total cost of uses	£377	£377	£0
Delivered energy	41 kWh/m²	41 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	3 kg/m²	3 kg/m²	0 kg/m²
Primary energy	29 kWh/m²	29 kWh/m²	0 kWh/m²

Full SAP Calculation Printout



SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	86.0000 (1b)	x 3.1500 (2b)	= 270.9000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 270.9000 (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		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.1500 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000
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
Adj infilt rate												
	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762
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	0.2862	0.2825	0.2787	0.2600	0.2562	0.2375	0.2375	0.2337	0.2450	0.2562	0.2637	0.2712
												(25)

3. Heat losses and heat loss parameter

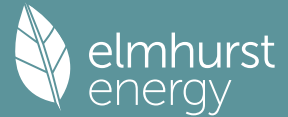
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Glazing			22.2000	0.7752	17.2093		(27)
External Wall North	21.7700	14.8000	6.9700	0.1400	0.9758	70.0000	487.9000 (29a)
External Wall East	39.9100		39.9100	0.1400	5.5874	70.0000	2793.7000 (29a)
External Wall South	21.5800	7.4000	14.1800	0.1400	1.9852	70.0000	992.6000 (29a)
Total net area of external elements Aum(A, m ²)			83.2600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7577		(33)
Main dwelling							
Party Wall 1 West			39.3100	0.0000	0.0000	45.0000	1768.9500 (32)
Party Floor 1			82.0000			30.0000	2460.0000 (32d)
Party Ceiling 1			82.0000			30.0000	2460.0000 (32b)
Internal Wall 1			89.5900			9.0000	806.3100 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11769.4600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		136.8542 (35)

List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450
E18 Party wall between dwellings	12.6000	0.0300	0.3780
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			1.6230 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 27.3807 (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
	25.5899	25.2547	24.9194	23.2432	22.9080	21.2318	21.2318	20.8965	21.9023	22.9080	23.5785	24.2489
Heat transfer coeff												
	52.9706	52.6354	52.3001	50.6239	50.2887	48.6125	48.6125	48.2773	49.2830	50.2887	50.9592	51.6296
Average = Sum(39)m / 12 =												50.5401
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.6159	0.6120	0.6081	0.5887	0.5848	0.5653	0.5653	0.5614	0.5731	0.5848	0.5925	0.6003
HLP (average)												0.5877
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

Full SAP Calculation Printout



4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5669 (42)
Hot water usage for mixer showers												73.6877 (42a)
Hot water usage for baths												28.3765 (42b)
Hot water usage for other uses												40.9178 (42c)
Average daily hot water use (litres/day)												131.5263 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	143.0710	140.0253	136.2634	131.3022	126.6975	120.8677	117.4701	122.9762	126.5081	132.2969	138.2619	142.9820 (44)
Distribution loss (46)m = 0.15 x (45)m	210.6253	185.2817	194.7176	171.5135	163.2626	139.7795	129.8079	144.7453	146.7431	170.4780	186.8656	209.9796 (45)
Water storage loss:												Total = Sum(45)m = 2053.7995
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												0.0152 (51)
Hot water storage loss factor from Table 2 (kWh/litre/day)												1.0294 (52)
Volume factor from Table 2a												0.6000 (53)
Temperature factor from Table 2b												1.0327 (55)
Enter (49) or (54) in (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	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564 (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	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564 (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	114.2544	101.5481	108.9650	99.8232	98.5062	89.2716	87.3826	92.3492	91.5870	100.9054	104.9278	114.0396 (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	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.5102	21.7697	17.7043	13.4033	10.0191	8.4586	9.1398	11.8802	15.9456	20.2466	23.6308	25.1914 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	345.5573	349.1431	340.1070	320.8702	296.5872	273.7646	258.5177	254.9319	263.9680	283.2048	307.4878	330.3104 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684 (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)	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768 (71)
Water heating gains (Table 5)	153.5677	151.1133	146.4584	138.6433	132.4009	123.9884	117.4497	124.1253	127.2042	135.6255	145.7330	153.2791 (72)
Total internal gains	627.9420	626.3329	608.5765	577.2236	543.3140	510.5183	489.4140	495.2443	511.4246	543.3838	581.1585	613.0877 (73)

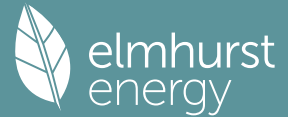
6. Solar gains

[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				14.8000	10.6334		0.3500		0.8500		0.7700		32.4454 (74)
South				7.4000	46.7521		0.3500		0.8500		0.7700		71.3268 (78)
Solar gains	103.7722	178.8198	254.1630	337.4156	403.2304	412.7138	392.6463	340.8084	282.1194	199.8046	124.5722		88.6810 (83)
Total gains	731.7142	805.1528	862.7395	914.6392	946.5444	923.2322	882.0603	836.0526	793.5440	743.1883	705.7307		701.7688 (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	61.7190	62.1121	62.5103	64.5800	65.0105	67.2521	67.2521	67.7192	66.3372	65.0105	64.1552	63.3220
alpha	5.1146	5.1408	5.1674	5.3053	5.3340	5.4835	5.4835	5.5146	5.4225	5.3340	5.2770	5.2215
util living area	0.9046	0.8578	0.7794	0.6411	0.4882	0.3364	0.2424	0.2655	0.4260	0.6679	0.8422	0.9138 (86)
MIT	20.4906	20.6409	20.8030	20.9395	20.9871	20.9988	20.9998	20.9997	20.9954	20.9384	20.7373	20.4801 (87)
Th 2	20.4157	20.4192	20.4227	20.4402	20.4437	20.4614	20.4614	20.4649	20.4543	20.4437	20.4367	20.4297 (88)
util rest of house	0.8936	0.8431	0.7595	0.6160	0.4603	0.3083	0.2128	0.2347	0.3931	0.6385	0.8244	0.9037 (89)
MIT 2	19.8293	20.0136	20.2081	20.3786	20.4320	20.4604	20.4613	20.4647	20.4507	20.3830	20.1474	19.8285 (90)
Living area fraction	20.0845	20.2557	20.4377	20.5951	20.6462	20.6682	20.6691	20.6712	20.6609	20.5973	20.3751	20.0799 (91)
MIT	20.0845	20.2557	20.4377	20.5951	20.6462	20.6682	20.6691	20.6712	20.6609	20.5973	20.3751	20.0799 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0845	20.2557	20.4377	20.5951	20.6462	20.6682	20.6691	20.6712	20.6609	20.5973	20.3751	20.0799 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8868	0.8388	0.7600	0.6230	0.4705	0.3191	0.2242	0.2466	0.4056	0.6468	0.8224	0.8969	(94)
Useful gains	648.8828	675.3294	655.7211	569.8408	445.3863	294.6046	197.7680	206.1337	321.8632	480.6731	580.3766	629.3989	(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	836.1149	808.2529	728.9446	592.0506	449.8933	294.9899	197.8102	206.2027	323.3404	502.7524	676.4860	819.8751	(97)
Space heating kWh	139.3007	89.3246	54.4783	15.9910	3.3532	0.0000	0.0000	0.0000	0.0000	16.4270	69.1987	141.7143	(98a)
Space heating requirement - total per year (kWh/year)												529.7878	
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	139.3007	89.3246	54.4783	15.9910	3.3532	0.0000	0.0000	0.0000	0.0000	16.4270	69.1987	141.7143	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												529.7878	
Space heating per m2										(98c) / (4) =		6.1603	(99)

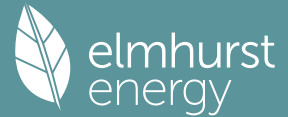
9b. Energy requirements

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												1.0000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	139.3007	89.3246	54.4783	15.9910	3.3532	0.0000	0.0000	0.0000	0.0000	16.4270	69.1987	141.7143	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													
307a	139.3007	89.3246	54.4783	15.9910	3.3532	0.0000	0.0000	0.0000	0.0000	16.4270	69.1987	141.7143	
Space heating requirement	139.3007	89.3246	54.4783	15.9910	3.3532	0.0000	0.0000	0.0000	0.0000	16.4270	69.1987	141.7143	(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	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310a	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564	
Water heating fuel	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564	(310)
Cooling System Energy Efficiency Ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	19.6488	17.7473	19.6488	19.0150	19.6488	19.0150	19.6488	19.6488	19.0150	19.6488	19.0150	19.6488	(331)
Lighting	21.4536	17.2109	15.4965	11.3534	8.7697	7.1649	8.0000	10.3987	13.5069	17.7218	20.0167	22.0499	(332)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												529.7878	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2704.6393	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												5.2979	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)													
mechanical ventilation fans (SFP = 0.7000)												231.3486	(330a)
Total electricity for the above, kWh/year												231.3486	(331)
Electricity for lighting (calculated in Appendix L)												173.1429	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												3638.9186	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	529.7878	4.4400	23.5226	(340a)
Space heating total			23.5226	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary		0.0000	0.0000	(341)
Water heating from Heat pump	2704.6393	4.4400	120.0860	(342a)
Water heating total			120.0860	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	231.3486	16.4900	38.1494	(349)
Energy for lighting	173.1429	16.4900	28.5513	(350)
Additional standing charges			92.0000	(351)
Total energy cost			302.3092	(355)

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11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.8308 (357)
SAP value		86.5332
SAP rating (Section 12)		87 (358)
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Efficiency of heat source Heat pump			262.0000 (367)
Space and Water heating from Heat pump	1234.5142	0.1583	32.0019 (367)
Electrical energy for heat distribution (space & water)	5.2979	0.0000	4.6490 (372)
Overall CO ₂ factor for heat network			0.0563 (386)
Total CO ₂ associated with community systems			182.0898 (373)
Space and water heating			182.0898 (376)
Pumps, fans and electric keep-hot	231.3486	0.1387	32.0909 (378)
Energy for lighting	173.1429	0.1443	24.9899 (379)
Total CO ₂ , kg/year			239.1706 (383)
CO ₂ emissions per m ²			2.7800 (384)
EI value			97.5535 (384a)
EI rating			98 (385)
EI band			A

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	86.0000 (1b)	x 3.1500 (2b)	= 270.9000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	270.9000 (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	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.8000	4.5000	4.4000	3.9000	3.9000	3.6000	3.7000	3.5000	3.7000	4.0000	4.1000	4.4000 (22)
Wind factor	1.2000	1.1250	1.1000	0.9750	0.9750	0.9000	0.9250	0.8750	0.9250	1.0000	1.0250	1.1000 (22a)
Adj infilt rate	0.1800	0.1687	0.1650	0.1462	0.1462	0.1350	0.1388	0.1313	0.1388	0.1500	0.1537	0.1650 (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	0.2750	0.2637	0.2600	0.2412	0.2412	0.2300	0.2337	0.2262	0.2337	0.2450	0.2487	0.2600 (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							
Glazing			22.2000	0.7752	17.2093		(27)
External Wall North	21.7700	14.8000	6.9700	0.1400	0.9758	70.0000	487.9000 (29a)
External Wall East	39.9100		39.9100	0.1400	5.5874	70.0000	2793.7000 (29a)
External Wall South	21.5800	7.4000	14.1800	0.1400	1.9852	70.0000	992.6000 (29a)
Total net area of external elements Aum(A, m ²)			83.2600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7577		(33)
Main dwelling							
Party Wall 1 West			39.3100	0.0000	0.0000	45.0000	1768.9500 (32)
Party Floor 1			82.0000			30.0000	2460.0000 (32d)

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Party Ceiling 1	82.0000	30.0000	2460.0000 (32b)
Internal Wall 1	89.5900	9.0000	806.3100 (32c)

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

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450	
E18 Party wall between dwellings	12.6000	0.0300	0.3780	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				1.6230 (36)
Point Thermal Bridges				0.0000
Total fabric heat loss				(33) + (36) + (36a) = 27.3807 (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	24.5842	23.5785	23.2432	21.5670	21.5670	20.5613	20.8965	20.2261	20.8965	21.9023	22.2375	23.2432 (38)
Average = Sum(39)m / 12 =	51.9649	50.9592	50.6239	48.9477	48.9477	47.9420	48.2773	47.6068	48.2773	49.2830	49.6182	50.6239 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.6042	0.5925	0.5887	0.5692	0.5692	0.5575	0.5614	0.5536	0.5614	0.5731	0.5770	0.5887 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

												2.5669 (42)
Assumed occupancy												
Hot water usage for mixer showers												
	73.7542	72.6250	70.9609	68.4009	66.1073	62.8985	60.3606	63.3276	64.8199	67.9980	71.3078	73.6877 (42a)
Hot water usage for baths												
	28.3991	27.9704	27.3605	26.4472	25.6241	24.4910	23.6313	24.6825	25.2342	26.3569	27.5242	28.3765 (42b)
Hot water usage for other uses												
	40.9178	39.4299	37.9420	36.4541	34.9661	33.4782	33.4782	34.9661	36.4541	37.9420	39.4299	40.9178 (42c)
Average daily hot water use (litres/day)												131.5263 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
	143.0710	140.0253	136.2634	131.3022	126.6975	120.8677	117.4701	122.9762	126.5081	132.2969	138.2619	142.9820 (44)
Energy content (annual)												
	210.6253	185.2817	194.7176	171.5135	163.2626	139.7795	129.8079	144.7453	146.7431	170.4780	186.8656	209.9796 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 2053.7995
	31.5938	27.7923	29.2076	25.7270	24.4894	20.9669	19.4712	21.7118	22.0115	25.5717	28.0298	31.4969 (46)
Water storage loss:												
Store volume												110.0000 (47)
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												
	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564 (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												
	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564 (64)
Total per year (kWh/year) = Sum(64)m =												2704.6393 (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												
	114.2544	101.5481	108.9650	99.8232	98.5062	89.2716	87.3826	92.3492	91.5870	100.9054	104.9278	114.0396 (65)

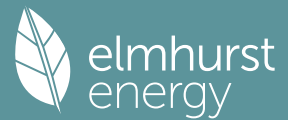
5. Internal gains (see Table 5 and 5a)

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	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	24.5102	21.7697	17.7043	13.4033	10.0191	8.4586	9.1398	11.8802	15.9456	20.2466	23.6308	25.1914 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	345.5573	349.1431	340.1070	320.8702	296.5872	273.7646	258.5177	254.9319	263.9680	283.2048	307.4878	330.3104 (68)
Pumps, fans	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684 (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)	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768 (71)
Total internal gains	153.5677	151.1133	146.4584	138.6433	132.4009	123.9884	117.4497	124.1253	127.2042	135.6255	145.7330	153.2791 (72)
	627.9420	626.3329	608.5765	577.2236	543.3140	510.5183	489.4140	495.2443	511.4246	543.3838	581.1585	613.0877 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
	m2	Table 6a	Specific data	Specific data	factor	W
		W/m2	or Table 6b	or Table 6c	Table 6d	
North	14.8000	12.7054	0.3500	0.8500	0.7700	38.7677 (74)
South	7.4000	53.5774	0.3500	0.8500	0.7700	81.7397 (78)
Solar gains	120.5074	185.2392	264.3899	373.7005	432.1187	473.6379
	445.0547	388.2777	315.4848	221.8909	146.1821	99.5379 (83)

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Total gains 748.4494 811.5722 872.9664 950.9241 975.4327 984.1562 934.4686 883.5220 826.9095 765.2747 727.3405 712.6256 (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	62.9135	64.1552	64.5800	66.7915	66.7915	68.1927	67.7192	68.6729	67.7192	66.3372	65.8890	64.5800
alpha	5.1942	5.2770	5.3053	5.4528	5.4528	5.5462	5.5146	5.5782	5.5146	5.4225	5.3926	5.3053
util living area	0.8792	0.8319	0.7390	0.5776	0.4193	0.2726	0.1860	0.1886	0.3496	0.5834	0.7851	0.8857 (86)
MIT	20.6019	20.7237	20.8649	20.9683	20.9950	20.9997	21.0000	21.0000	20.9987	20.9725	20.8400	20.6106 (87)
Th 2	20.4262	20.4367	20.4402	20.4578	20.4578	20.4684	20.4649	20.4720	20.4649	20.4543	20.4508	20.4402 (88)
util rest of house	0.8659	0.8156	0.7176	0.5529	0.3928	0.2468	0.1583	0.1601	0.3187	0.5525	0.7634	0.8728 (89)
MIT 2	19.9738	20.1280	20.2955	20.4263	20.4535	20.4682	20.4649	20.4720	20.4639	20.4286	20.2796	19.9973 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	20.2162	20.3579	20.5153	20.6355	20.6625	20.6733	20.6714	20.6757	20.6703	20.6385	20.4959	20.2340 (92)
Temperature adjustment	0.0000											
adjusted MIT	20.2162	20.3579	20.5153	20.6355	20.6625	20.6733	20.6714	20.6757	20.6703	20.6385	20.4959	20.2340 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8607	0.8132	0.7206	0.5611	0.4028	0.2568	0.1690	0.1711	0.3305	0.5630	0.7653	0.8677 (94)
Useful gains	644.1725	659.9713	629.0507	533.5535	392.9439	252.7128	157.9264	151.1798	273.3331	430.8829	556.6075	618.3635 (95)
Ext temp.	5.0000	5.4000	7.1000	9.5000	12.6000	15.4000	17.4000	17.5000	15.0000	11.7000	8.1000	5.2000 (96)
Heat loss rate W	790.7064	762.2430	679.1340	545.0579	394.6397	252.8129	157.9337	151.1864	273.7457	440.5165	615.0612	761.0812 (97)
Space heating kWh	109.0213	68.7265	37.2620	8.2832	1.2617	0.0000	0.0000	0.0000	0.0000	7.1674	42.0866	106.1820 (98a)
Space heating requirement - total per year (kWh/year)	379.9907											
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	0.0000											
Space heating kWh	109.0213	68.7265	37.2620	8.2832	1.2617	0.0000	0.0000	0.0000	0.0000	7.1674	42.0866	106.1820 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	379.9907											
Space heating per m2	(98c) / (4) = 4.4185 (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												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement												
109.0213	68.7265	37.2620	8.2832	1.2617	0.0000	0.0000	0.0000	0.0000	0.0000	7.1674	42.0866	106.1820 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	109.0213	68.7265	37.2620	8.2832	1.2617	0.0000	0.0000	0.0000	0.0000	7.1674	42.0866	106.1820
Space heating requirement												
109.0213	68.7265	37.2620	8.2832	1.2617	0.0000	0.0000	0.0000	0.0000	0.0000	7.1674	42.0866	106.1820 (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	0.0000 (309)
Water heating												
Annual water heating requirement												
265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564 (64)	
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00												
310a	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564
Water heating fuel												
265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564 (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	19.6488	17.7473	19.6488	19.0150	19.6488	19.0150	19.6488	19.6488	19.0150	19.6488	19.0150	19.6488 (331)
Lighting	21.4536	17.2109	15.4965	11.3534	8.7697	7.1649	8.0000	10.3987	13.5069	17.7218	20.0167	22.0499 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												379.9907 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2704.6393 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												3.7999 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)												
mechanical ventilation fans (SFP = 0.7000)												231.3486 (330a)
Total electricity for the above, kWh/year												231.3486 (331)
Electricity for lighting (calculated in Appendix L)												173.1429 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (333)
Wind generation												0.0000 (334)
Hydro-electric generation (Appendix N)												0.0000 (335a)

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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	3489.1215 (338)

10b. Fuel costs - using BEDF prices (568)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating from Heat pump	379.9907	5.6000	21.2795 (340a)
Space heating total			21.2795 (340)
Total CO2 associated with community systems			0.0000 (473)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Heat pump	2704.6393	5.6000	151.4598 (342a)
Water heating total			151.4598 (342)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (347a)
Pumps, fans and electric keep-hot	231.3486	26.0600	60.2894 (349)
Energy for lighting	173.1429	26.0600	45.1210 (350)
Additional standing charges			99.0000 (351)
Total energy cost			377.1498 (355)

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			262.0000 (367)
Space and Water heating from Heat pump	1177.3397	0.1591	23.0749 (367)
Electrical energy for heat distribution (space & water)	3.7999	0.0000	4.4151 (372)
Overall CO2 factor for heat network			0.0561 (386)
Total CO2 associated with community systems			172.9290 (373)
Space and water heating			172.9290 (376)
Pumps, fans and electric keep-hot	231.3486	0.1387	32.0909 (378)
Energy for lighting	173.1429	0.1443	24.9899 (379)
Total CO2, kg/year			230.0097 (383)

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			262.0000 (467a)
Space and Water heating from Heat pump	1177.3397	1.5889	230.4490 (467)
Electrical energy for heat distribution (space & water)	3.7999	0.0000	47.1740 (472)
Overall CO2 factor for heat network			0.5990 (486)
Total CO2 associated with community systems			1847.7069 (473)
Space and water heating			1847.7069 (476)
Pumps, fans and electric keep-hot	231.3486	1.5128	349.9842 (478)
Energy for lighting	173.1429	1.5338	265.5723 (479)
Total Primary energy kWh/year			2463.2634 (483)

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Property Reference	Be Green			Issued on Date	08/04/2025
Assessment Reference	0301_2B4P_BG	Prop Type Ref			
Property					
SAP Rating	90 B	DER	1.59	TER	12.79
Environmental	99 A	% DER < TER			87.57
CO ₂ Emissions (t/year)	0.11	DFEE	26.10	TFEE	33.03
Compliance Check	See BREL	% DFEE < TFEE			20.99
% DPER < TPER	75.87	DPER	16.56	TPER	68.61
Assessor Details	Alfie Gamble-Thornton			Assessor ID	CM02-0001
Client	Fifth State, Fifth State				

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	82.0000 (1b)	3.1500 (2b)	258.3000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	258.3000 (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	0	(19)

Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1500 (21)

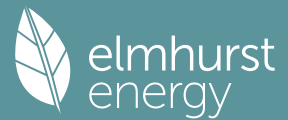
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (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	0.2862	0.2825	0.2787	0.2600	0.2562	0.2375	0.2375	0.2337	0.2450	0.2562	0.2637	0.2712 (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							
Glazing			14.9000	0.7752	11.4729		(27)
External Wall North	34.6500	7.4000	27.2500	0.1400	3.8150	70.0000	1907.5000 (29a)
External Wall West	27.7200		27.7200	0.1400	3.8808	70.0000	1940.4000 (29a)
External Wall South	37.8000	7.4000	30.4000	0.1400	4.2560	70.0000	2128.0000 (29a)
Total net area of external elements Aum(A, m ²)			100.1700				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	23.4247	(33)
Main dwelling							
Party Wall 1 East			30.5600	0.0000	0.0000	45.0000	1375.2000 (32)
Party Floor 1			82.0000			30.0000	2460.0000 (32d)
Party Ceiling 1			82.0000			20.0000	1640.0000 (32b)
Internal Wall 1			104.6100			9.0000	941.4900 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12392.5900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		151.1291 (35)
List of Thermal Bridges		

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K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450
E18 Party wall between dwellings	12.6000	0.0300	0.3780
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			1.6230 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	25.0477 (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	24.3997	24.0800	23.7604	22.1621	21.8425	20.2443	20.2443	19.9246	20.8836	21.8425	22.4818	23.1211
Average = Sum(39)m / 12 =	49.4473	49.1277	48.8080	47.2098	46.8902	45.2919	45.2919	44.9723	45.9312	46.8902	47.5295	48.1687
												47.1299
HLP	0.6030	0.5991	0.5952	0.5757	0.5718	0.5523	0.5523	0.5484	0.5601	0.5718	0.5796	0.5874
HLP (average)												0.5748
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.4997 (42)
Hot water usage for mixer showers													
	72.5185	71.4083	69.7721	67.2550	64.9998	61.8448	59.3493	62.2666	63.7339	66.8588	70.1132	72.4531	(42a)
Hot water usage for baths													
	27.9253	27.5038	26.9041	26.0060	25.1966	24.0824	23.2371	24.2707	24.8132	25.9172	27.0651	27.9032	(42b)
Hot water usage for other uses													
	40.2296	38.7667	37.3038	35.8409	34.3780	32.9151	32.9151	34.3780	35.8409	37.3038	38.7667	40.2296	(42c)
Average daily hot water use (litres/day)													129.3222 (43)
Daily hot water use													
	140.6734	137.6787	133.9799	129.1019	124.5744	118.8423	115.5015	120.9154	124.3880	130.0799	135.9449	140.5859	(44)
Energy conte	207.0955	182.1768	191.4545	168.6393	160.5267	137.4371	127.6326	142.3196	144.2839	167.6210	183.7340	206.4606	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
	31.0643	27.3265	28.7182	25.2959	24.0790	20.6156	19.1449	21.3479	21.6426	25.1432	27.5601	30.9691	(46)
Water storage loss:													
Store volume													110.0000 (47)
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													
	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(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													
	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(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													
	113.0807	100.5157	107.8801	98.8675	97.5966	88.4928	86.6593	91.5427	90.7693	99.9554	103.8865	112.8696	(65)

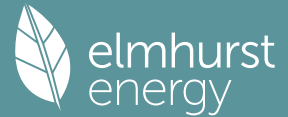
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	112.8185	124.9061	112.8185	116.5791	112.8185	116.5791	112.8185	112.8185	116.5791	112.8185	116.5791	112.8185	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	223.5697	225.8896	220.0434	207.5975	191.8868	177.1210	167.2565	164.9365	170.7828	183.2286	198.9393	213.7052	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	(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)													
	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	(71)
Water heating gains (Table 5)													
	151.9902	149.5770	145.0001	137.3160	131.1782	122.9066	116.4775	123.0413	126.0685	134.3487	144.2868	151.7065	(72)
Total internal gains													
	548.8740	560.8684	538.3577	521.9883	496.3792	477.1024	457.0482	461.2920	473.9261	490.8915	520.3009	538.7258	(73)

6. Solar gains

[Jan]													
		Area	Solar flux	g	FF	Access	Gains						
		m2	Table 6a	Specific data	Specific data	factor	W						
			W/m2	or Table 6b	or Table 6c	Table 6d							
North		7.4000	10.6334	0.3500	0.8500	0.7700	16.2227	(74)					
South		7.4000	46.7521	0.3500	0.8500	0.7700	71.3268	(78)					
Solar gains	87.5495	147.8174	201.4822	252.7968	289.2411	290.6849	278.7168	250.4198	218.7800	162.9002	104.5594	75.1570	(83)
Total gains	636.4235	708.6858	739.8399	774.7851	785.6203	767.7874	735.7650	711.7118	692.7061	653.7917	624.8603	613.8828	(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, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	69.6172	70.0702	70.5291	72.9168	73.4138	76.0044	76.0044	76.5446	74.9465	73.4138	72.4264	71.4651
alpha	5.6411	5.6713	5.7019	5.8611	5.8943	6.0670	6.0670	6.1030	5.9964	5.8943	5.8284	5.7643
util living area	0.9359	0.8926	0.8313	0.7003	0.5473	0.3769	0.2708	0.2906	0.4552	0.7071	0.8762	0.9419 (86)
MIT	20.4880	20.6473	20.7933	20.9356	20.9862	20.9989	20.9999	20.9998	20.9964	20.9430	20.7465	20.4837 (87)
Th 2	20.4273	20.4308	20.4343	20.4519	20.4554	20.4731	20.4731	20.4766	20.4660	20.4554	20.4484	20.4413 (88)
util rest of house	0.9271	0.8796	0.8128	0.6746	0.5171	0.3461	0.2384	0.2575	0.4207	0.6773	0.8600	0.9340 (89)
MIT 2	19.8353	20.0318	20.2088	20.3867	20.4430	20.4723	20.4730	20.4765	20.4632	20.3998	20.1693	19.8420 (90)
Living area fraction									fLA = Living area / (4) =			0.2439 (91)
MIT	19.9945	20.1819	20.3514	20.5206	20.5755	20.6007	20.6015	20.6042	20.5933	20.5323	20.3101	19.9985 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9945	20.1819	20.3514	20.5206	20.5755	20.6007	20.6015	20.6042	20.5933	20.5323	20.3101	19.9985 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9197	0.8735	0.8099	0.6779	0.5238	0.3536	0.2463	0.2656	0.4290	0.6816	0.8556	0.9269 (94)
Useful gains	585.3404	619.0277	599.1956	525.2423	411.4874	271.4615	181.2088	189.0280	297.1560	445.6462	534.6266	568.9834 (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	776.0525	750.7651	676.0594	548.6045	416.1714	271.7840	181.2366	189.0706	298.2441	465.7274	627.8665	760.9941 (97)
Space heating kWh	141.8898	88.5276	57.1867	16.8208	3.4849	0.0000	0.0000	0.0000	0.0000	14.9405	67.1328	142.8560 (98a)
Space heating requirement - total per year (kWh/year)												532.8389
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	141.8898	88.5276	57.1867	16.8208	3.4849	0.0000	0.0000	0.0000	0.0000	14.9405	67.1328	142.8560 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												532.8389
Space heating per m2										(98c) / (4) =		6.4980 (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												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	141.8898	88.5276	57.1867	16.8208	3.4849	0.0000	0.0000	0.0000	0.0000	14.9405	67.1328	142.8560 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	141.8898	88.5276	57.1867	16.8208	3.4849	0.0000	0.0000	0.0000	0.0000	14.9405	67.1328	142.8560
Space heating requirement	141.8898	88.5276	57.1867	16.8208	3.4849	0.0000	0.0000	0.0000	0.0000	14.9405	67.1328	142.8560 (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	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00												
310a	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374
Water heating fuel	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374 (310)
Cooling System Energy Efficiency Ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	18.7349	16.9218	18.7349	18.1305	18.7349	18.1305	18.7349	18.7349	18.1305	18.7349	18.1305	18.7349 (331)
Lighting	20.7264	16.6275	14.9712	10.9685	8.4724	6.9220	7.7288	10.0462	13.0490	17.1210	19.3382	21.3024 (332)
Electricity generated by PVs (Appendix M) (negative quantity)	-20.0839	-30.0387	-45.8825	-54.9402	-62.2016	-59.1968	-58.4577	-53.6636	-45.7567	-35.7455	-22.6762	-17.1644 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												532.8389 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2670.2216 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												5.3284 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)												
mechanical ventilation fans (SFP = 0.7000)												220.5882 (330a)
Total electricity for the above, kWh/year												220.5882 (331)
Electricity for lighting (calculated in Appendix L)												167.2737 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-505.8077 (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												3085.1146 (338)

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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			333.0000 (367)
Space and Water heating from Heat pump	961.8800	0.1583	25.3339 (367)
Electrical energy for heat distribution (space & water)	5.3284	0.0000	4.6054 (372)
Overall CO2 factor for heat network			0.0446 (386)
Total CO2 associated with community systems			142.9055 (373)
Space and water heating			142.9055 (376)
Pumps, fans and electric keep-hot	220.5882	0.1387	30.5983 (378)
Energy for lighting	167.2737	0.1443	24.1428 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-505.8077	0.1333	-67.4353
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-67.4353 (380)
Total CO2, kg/year			130.2112 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.5900 (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			333.0000 (467a)
Space and Water heating from Heat pump	961.8800	1.5861	253.7906 (467)
Electrical energy for heat distribution (space & water)	5.3284	0.0000	49.0631 (472)
Overall CO2 factor for heat network			0.4753 (486)
Total CO2 associated with community systems			1522.4283 (473)
Space and water heating			1522.4283 (476)
Pumps, fans and electric keep-hot	220.5882	1.5128	333.7058 (478)
Energy for lighting	167.2737	1.5338	256.5699 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-505.8077	1.4927	-755.0005
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-755.0005 (480)
Total Primary energy kWh/year			1357.7035 (483)
Dwelling Primary energy Rate (DPER)			16.5600 (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	82.0000 (1b)	x 3.1500 (2b)	= 258.3000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 258.3000 (5)

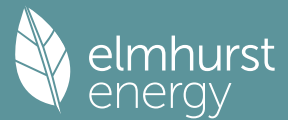
2. Ventilation rate

	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)+(7a)+(7b)+(7c) = 30.0000 / (5) = 0.1161 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3661 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3661 (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	0.4668	0.4577	0.4485	0.4028	0.3936	0.3478	0.3478	0.3387	0.3661	0.3936	0.4119	0.4302 (22b)
Effective ac	0.6090	0.6047	0.6006	0.5811	0.5775	0.5605	0.5605	0.5574	0.5670	0.5775	0.5848	0.5925 (25)

3. Heat losses and heat loss parameter

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Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Main dwelling													
TER Opening Type			14.8000	1.1450	16.9466			(27)					
External Wall North	34.6500	7.4000	27.2500	0.1800	4.9050			(29a)					
External Wall West	27.7200		27.7200	0.1800	4.9896			(29a)					
External Wall South	37.8000	7.4000	30.4000	0.1800	5.4720			(29a)					
Total net area of external elements Aum(A, m2)			100.1700					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)... (30) + (32) =		32.3132			(33)					
Main dwelling													
Party Wall 1 East			30.5600	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							161.1291	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value		Total						
E7 Party floor between dwellings (in blocks of flats)				41.5000	0.0700		2.9050						
E18 Party wall between dwellings				12.6000	0.0600		0.7560						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.6610	(36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	35.9742	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 51.9077	Feb 51.5470	Mar 51.1935	Apr 49.5330	May 49.2223	Jun 47.7761	Jul 47.7761	Aug 47.5082	Sep 48.3331	Oct 49.2223	Nov 49.8508	Dec 50.5079	(38)
Heat transfer coeff	87.8819	87.5212	87.1677	85.5072	85.1965	83.7502	83.7502	83.4824	84.3073	85.1965	85.8250	86.4820	(39)
Average = Sum(39)m / 12 =												85.5057	
HLP	Jan 1.0717	Feb 1.0673	Mar 1.0630	Apr 1.0428	May 1.0390	Jun 1.0213	Jul 1.0213	Aug 1.0181	Sep 1.0281	Oct 1.0390	Nov 1.0466	Dec 1.0547	(40)
HLP (average)												1.0428	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

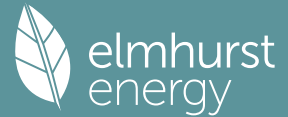
4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.4997 (42)
Hot water usage for mixer showers												
66.1317	65.1379	63.6897	60.9188	58.8739	56.5936	55.2974	56.7346	58.3101	60.7586	63.5890	65.8783	(42a)
Hot water usage for baths												
28.5620	28.1378	27.5405	26.4391	25.6144	24.6999	24.2060	24.7991	25.4450	26.4235	27.5476	28.4655	(42b)
Hot water usage for other uses												
40.2296	38.7667	37.3038	35.8409	34.3780	32.9151	32.9151	34.3780	35.8409	37.3038	38.7667	40.2296	(42c)
Average daily hot water use (litres/day)												124.0251 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
134.9233	132.0424	128.5340	123.1988	118.8663	114.2086	112.4185	115.9118	119.5960	124.4859	129.9032	134.5734	(44)
Energy conte	213.6855	188.0266	197.5519	168.6530	160.0169	140.4328	135.9604	143.5230	147.4738	168.9261	185.0710	210.7094 (45)
Energy content (annual)												Total = Sum(45)m =
Distribution loss (46)m = 0.15 x (45)m												2060.0305
32.0528	28.2040	29.6328	25.2979	24.0025	21.0649	20.3941	21.5284	22.1211	25.3389	27.7606	31.6064	(46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (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	(61)
Total heat required for water heating calculated for each month												
260.2804	230.1123	244.1468	213.7448	206.6118	185.5246	182.5553	190.1179	192.5657	215.5210	230.1628	257.3043	(62)
WWHRS	-30.2327	-26.7380	-27.9985	-23.1839	-21.6065	-18.4889	-17.3304	-18.4291	-19.1293	-22.5513	-25.5479	-29.6728 (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	230.0478	203.3743	216.1483	190.5610	185.0053	167.0358	165.2249	171.6888	173.4364	192.9697	204.6149	227.6315 (64)
12Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m =
Electric shower(s)												2327.7386 (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	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
108.3264	96.1874	102.9619	92.1506	90.4816	82.7674	82.4828	84.9973	85.1085	93.4439	97.6096	107.3368	(65)

5. Internal gains (see Table 5 and 5a)													
Metabolic gains (Table 5), Watts													
(66)m	Jan 124.9857	Feb 124.9857	Mar 124.9857	Apr 124.9857	May 124.9857	Jun 124.9857	Jul 124.9857	Aug 124.9857	Sep 124.9857	Oct 124.9857	Nov 124.9857	Dec 124.9857	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	115.1238	127.4585	115.1238	118.9613	115.1238	118.9613	115.1238	115.1238	118.9613	115.1238	118.9613	115.1238	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	223.5697	225.8896	220.0434	207.5975	191.8868	177.1210	167.2565	164.9365	170.7828	183.2286	198.9393	213.7052	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	(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)	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	(71)
Water heating gains (Table 5)	145.6000	143.1361	138.3897	127.9869	121.6150	114.9547	110.8639	114.2437	118.2063	125.5966	135.5688	144.2699	(72)
Total internal gains	547.7892	559.9799	537.0527	518.0415	492.1214	471.5327	453.7400	454.7998	468.4461	487.4448	516.9652	536.5946	(73)

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

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		W/m2	or Table 6b	or Table 6c	Table 6d	
North	7.4000	10.6334	0.6300	0.7000	0.7700	24.0478 (74)
South	7.4000	46.7521	0.6300	0.7000	0.7700	105.7315 (78)

Solar gains	129.7793	219.1175	298.6678	374.7340	428.7574	430.8977	413.1566	371.2105	324.3092	241.4756	154.9939	111.4092	(83)
Total gains	677.5685	779.0974	835.7204	892.7755	920.8788	902.4304	866.8966	826.0103	792.7553	728.9204	671.9591	648.0038	(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	41.7625	41.9346	42.1046	42.9223	43.0788	43.8227	43.8227	43.9633	43.5332	43.0788	42.7634	42.4384
alpha	3.7842	3.7956	3.8070	3.8615	3.8719	3.9215	3.9215	3.9309	3.9022	3.8719	3.8509	3.8292
util living area	0.9704	0.9499	0.9187	0.8484	0.7312	0.5601	0.4164	0.4524	0.6590	0.8643	0.9490	0.9743 (86)
MIT	19.4972	19.7575	20.0776	20.4819	20.7774	20.9425	20.9859	20.9805	20.8888	20.5210	19.9632	19.4693 (87)
Th 2	20.0240	20.0276	20.0311	20.0478	20.0510	20.0656	20.0656	20.0683	20.0600	20.0510	20.0446	20.0380 (88)
util rest of house	0.9645	0.9403	0.9030	0.8195	0.6822	0.4891	0.3317	0.3660	0.5900	0.8323	0.9375	0.9692 (89)
MIT 2	18.2902	18.6183	19.0176	19.5163	19.8511	20.0262	20.0592	20.0588	19.9763	19.5744	18.8923	18.2648 (90)
Living area fraction	18.5846	18.8961	19.2761	19.7518	20.0770	20.2497	20.2852	20.2836	20.1988	fLA = Living area / (4) = 19.8053	19.1535	0.2439 (91)
MIT	18.5846	18.8961	19.2761	19.7518	20.0770	20.2497	20.2852	20.2836	20.1988	19.8053	19.1535	18.5585 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5846	18.8961	19.2761	19.7518	20.0770	20.2497	20.2852	20.2836	20.1988	19.8053	19.1535	18.5585 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9529	0.9262	0.8882	0.8093	0.6836	0.5036	0.3520	0.3864	0.6008	0.8228	0.9241	0.9586	(94)
Useful gains	645.6646	721.6384	742.3113	722.5609	629.5241	454.4909	305.1523	319.1768	476.2796	599.7216	620.9641	621.1660	(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	1255.3578	1224.9598	1113.6644	927.9102	713.6896	473.1640	308.6368	324.2137	514.1751	784.2565	1034.4884	1241.7559	(97)
Space heating kWh	453.6118	338.2320	276.2867	147.8515	62.6191	0.0000	0.0000	0.0000	0.0000	137.2940	297.7375	461.7189	(98a)
Space heating requirement - total per year (kWh/year)												2175.3513	
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	453.6118	338.2320	276.2867	147.8515	62.6191	0.0000	0.0000	0.0000	0.0000	137.2940	297.7375	461.7189	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2175.3513	
Space heating per m2										(98c) / (4) =		26.5287	(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	453.6118	338.2320	276.2867	147.8515	62.6191	0.0000	0.0000	0.0000	0.0000	137.2940	297.7375	461.7189 (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)	491.4537	366.4485	299.3355	160.1858	67.8430	0.0000	0.0000	0.0000	0.0000	148.7475	322.5758	500.2371 (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	230.0478	203.3743	216.1483	190.5610	185.0053	167.0358	165.2249	171.6888	173.4364	192.9697	204.6149	227.6315	(64)
Efficiency of water heater (217)m	85.5532	85.1921	84.6114	83.4973	81.8990	79.8000	79.8000	79.8000	79.8000	83.3101	84.8999	85.6117	(216)
Fuel for water heating, kWh/month	268.8944	238.7243	255.4601	228.2242	225.8944	209.3180	207.0488	215.1488	217.3388	231.6283	241.0072	265.8884	(219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	23.9205	19.1899	17.2784	12.6589	9.7781	7.9888	8.9199	11.5944	15.0600	19.7595	22.3183	24.5853	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-13.5036	-20.5454	-31.8395	-38.6837	-44.3007	-42.3032	-41.7849	-38.1437	-32.2167	-24.7093	-15.3697	-11.5054	(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	-3.6484	-7.9325	-16.2639	-25.1830	-34.0602	-34.5113	-34.1107	-28.5315	-20.4576	-11.5895	-4.9471	-2.8666	(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												2356.8270	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	

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Water heating fuel used	2804.5757 (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)	193.0518 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-579.0079 (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	4861.4466 (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	2356.8270	0.2100	494.9337 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2804.5757	0.2100	588.9609 (264)
Space and water heating			1083.8946 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	193.0518	0.1443	27.8633 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-354.9056	0.1330	-47.2129
PV Unit electricity exported	-224.1023	0.1250	-28.0155
Total			-75.2284 (269)
Total CO2, kg/year			1048.4587 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.7900 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2356.8270	1.1300	2663.2145 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2804.5757	1.1300	3169.1706 (278)
Space and water heating			5832.3851 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	193.0518	1.5338	296.1093 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-354.9056	1.4916	-529.3650
PV Unit electricity exported	-224.1023	0.4588	-102.8264
Total			-632.1913 (283)
Total Primary energy kWh/year			5626.4039 (286)
Target Primary Energy Rate (TPER)			68.6100 (287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF FABRIC ENERGY EFFICIENCY

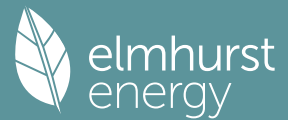
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	82.0000 (1b)	3.1500 (2b)	258.3000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	258.3000 (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) = 0.1161 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2661 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2661 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3393	0.3327	0.3260	0.2928	0.2861	0.2528	0.2528	0.2462	0.2661	0.2861	0.2994	0.3127 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5576	0.5553	0.5531	0.5429	0.5409	0.5320	0.5320	0.5303	0.5354	0.5409	0.5448	0.5489 (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								
Glazing			14.8000	0.7752	11.4729			(27)
External Wall North	34.6500	7.4000	27.2500	0.1400	3.8150	70.0000	1907.5000	(29a)
External Wall West	27.7200		27.7200	0.1400	3.8808	70.0000	1940.4000	(29a)
External Wall South	37.8000	7.4000	30.4000	0.1400	4.2560	70.0000	2128.0000	(29a)
Total net area of external elements Aum(A, m2)			100.1700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	23.4247			(33)
Main dwelling								
Party Wall 1 East			30.5600	0.0000	0.0000	45.0000	1375.2000	(32)
Party Floor 1			82.0000			30.0000	2460.0000	(32d)
Party Ceiling 1			82.0000			30.0000	2460.0000	(32b)
Internal Wall 1			104.6100			9.0000	941.4900	(32c)
Heat capacity Cm = Sum(A x k)					(28) ... (30) + (32) + (32a) ... (32e) =		13212.5900	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							161.1291	(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		
E7 Party floor between dwellings (in blocks of flats)				41.5000	0.0300	1.2450		
E18 Party wall between dwellings				12.6000	0.0300	0.3780		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							1.6230	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		25.0477	(37)

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

(38)m	Jan 47.5270	Feb 47.3365	Mar 47.1497	Apr 46.2723	May 46.1082	Jun 45.3440	Jul 45.3440	Aug 45.2025	Sep 45.6384	Oct 46.1082	Nov 46.4402	Dec 46.7874 (38)
Heat transfer coeff	72.5747	72.3841	72.1973	71.3200	71.1558	70.3917	70.3917	70.2502	70.6860	71.1558	71.4879	71.8351 (39)
Average = Sum(39)m / 12 =												71.3192

HLP	Jan 0.8851	Feb 0.8827	Mar 0.8805	Apr 0.8698	May 0.8678	Jun 0.8584	Jul 0.8584	Aug 0.8567	Sep 0.8620	Oct 0.8678	Nov 0.8718	Dec 0.8760 (40)
HLP (average)												0.8697
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

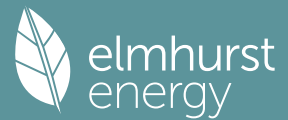
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.4997 (42)
Hot water usage for mixer showers													
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	(42a)
Hot water usage for baths													
27.9253	27.5038	26.9041	26.0060	25.1966	24.0824	23.2371	24.2707	24.8132	25.9172	27.0651	27.9032		(42b)
Hot water usage for other uses													
40.2296	38.7667	37.3038	35.8409	34.3780	32.9151	32.9151	34.3780	35.8409	37.3038	38.7667	40.2296		(42c)
Average daily hot water use (litres/day)													62.4657 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1549	66.2704	64.2078	61.8469	59.5746	56.9975	56.1522	58.6488	60.6541	63.2210	65.8317	68.1327	(44)
Energy content (annual)	100.3358	87.6892	91.7517	80.7875	76.7679	65.9157	62.0498	69.0307	70.3558	81.4667	88.9738	100.0579	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		975.1823	
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	(46)
Water storage 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	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	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	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													
85.2854	74.5358	77.9889	68.6693	65.2527	56.0284	52.7424	58.6761	59.8024	69.2467	75.6277	85.0492		(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	85.2854	74.5358	77.9889	68.6693	65.2527	56.0284	52.7424	58.6761	59.8024	69.2467	75.6277	85.0492	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		828.9050	(64)
Electric shower(s)	52.9605	47.1882	51.5277	49.1723	50.0950	47.7858	49.3786	50.0950	49.1723	51.5277	50.5588	52.9605	(64a)
												602.4224	(64a)
Heat gains from water heating, kWh/month													
34.5615	30.4310	32.3792	29.4604	28.8369	25.9535	25.5302	27.1928	27.2437	30.1936	31.5466	34.5024		(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	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	112.8185	124.9061	112.8185	116.5791	112.8185	116.5791	112.8185	112.8185	116.5791	112.8185	116.5791	112.8185 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	223.5697	225.8896	220.0434	207.5975	191.8868	177.1210	167.2565	164.9365	170.7828	183.2286	198.9393	213.7052 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986 (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)												

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	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886 (71)
Water heating gains (Table 5)	46.4536	45.2842	43.5204	40.9172	38.7593	36.0466	34.3148	36.5494	37.8384	40.5828	43.8148	46.3742 (72)
Total internal gains	443.3374	456.5757	436.8780	425.5895	403.9603	390.2423	374.8855	374.8001	385.6960	397.1256	419.8289	433.3936 (73)

6. Solar gains

[Jan]	Area m2		Solar flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		FF Access factor Table 6d		Gains W	
North	7.4000		10.6334		0.3500		0.8500		0.7700		16.2227	(74)
South	7.4000		46.7521		0.3500		0.8500		0.7700		71.3268	(78)
Solar gains	87.5495	147.8174	201.4822	252.7968	289.2411	290.6849	278.7168	250.4198	218.7800	162.9002	104.5594	75.1570 (83)
Total gains	530.8869	604.3931	638.3602	678.3863	693.2014	680.9273	653.6023	625.2199	604.4760	560.0258	524.3883	508.5505 (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	50.5709	50.7040	50.8352	51.4605	51.5792	52.1392	52.1392	52.2442	51.9221	51.5792	51.3397	51.0915	
alpha	4.3714	4.3803	4.3890	4.4307	4.4386	4.4759	4.4759	4.4829	4.4615	4.4386	4.4226	4.4061	
util living area	0.9846	0.9721	0.9522	0.8990	0.7967	0.6223	0.4649	0.5035	0.7202	0.9095	0.9711	0.9870 (86)	
MIT	19.6565	19.8730	20.1432	20.5047	20.7856	20.9474	20.9885	20.9836	20.8972	20.5483	20.0524	19.6228 (87)	
Th 2	20.1802	20.1822	20.1841	20.1933	20.1950	20.2030	20.2030	20.2045	20.1999	20.1950	20.1915	20.1879 (88)	
util rest of house	0.9815	0.9666	0.9425	0.8784	0.7563	0.5569	0.3846	0.4220	0.6595	0.8869	0.9645	0.9844 (89)	
MIT 2	18.9495	19.1642	19.4303	19.7832	20.0379	20.1732	20.1985	20.1977	20.1361	19.8307	19.3502	18.9221 (90)	
Living area fraction	fLA = Living area / (4) =												0.2439 (91)
MIT	19.1220	19.3370	19.6042	19.9592	20.2203	20.3620	20.3912	20.3894	20.3218	20.0057	19.5215	19.0930 (92)	
Temperature adjustment													0.0000
adjusted MIT	19.1220	19.3370	19.6042	19.9592	20.2203	20.3620	20.3912	20.3894	20.3218	20.0057	19.5215	19.0930 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9764	0.9596	0.9343	0.8716	0.7577	0.5705	0.4039	0.4414	0.6694	0.8807	0.9577	0.9798 (94)
Useful gains	518.3325	579.9549	596.3945	591.2964	525.2130	388.4608	263.9834	275.9673	404.6079	493.2425	502.2121	498.2949 (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	1075.6984	1045.0121	946.0847	788.7387	606.2683	405.5991	266.8703	280.2574	439.7913	669.2700	887.9861	1069.8385 (97)
Space heating kWh	414.6803	312.5185	260.1695	142.1584	60.3051	0.0000	0.0000	0.0000	0.0000	130.9644	277.7573	425.2284 (98a)
Space heating requirement - total per year (kWh/year)												2023.7819
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	414.6803	312.5185	260.1695	142.1584	60.3051	0.0000	0.0000	0.0000	0.0000	130.9644	277.7573	425.2284 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2023.7819
Space heating per m2										(98c) / (4) =		24.6803 (99)

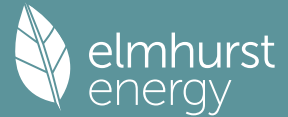
8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Heat loss rate W												
	0.0000	0.0000	0.0000	0.0000	0.0000	661.6818	520.8984	533.9013	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8658	0.9227	0.9058	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	572.8646	480.6305	483.6012	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	752.5313	722.8827	691.7784	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	129.3600	180.2357	154.8838	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	32.3400	45.0589	38.7210	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												116.1199 (107)
Energy for space heating												24.6803 (99)
Energy for space cooling												1.4161 (108)
Total												26.0964 (109)
Fabric Energy Efficiency (DFEE)												26.1 (109)

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

1. Overall dwelling characteristics

Full SAP Calculation Printout



Main dwelling		Area (m ²)	Storey height (m)	Volume (m ³)	
Ground floor		82.0000 (1b)	x 3.1500 (2b)	= 258.3000 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.0000				(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	258.3000 (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													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) =												Air changes per hour 30.0000 / (5) = 0.1161 (8)
Pressure test													Yes
Pressure Test Method													Blower Door
Measured/design AP50													5.0000 (17)
Infiltration rate													0.3661 (18)
Number of sides sheltered													0 (19)
Shelter factor													(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor													(21) = (18) x (20) = 0.3661 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	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	0.4668	0.4577	0.4485	0.4028	0.3936	0.3478	0.3478	0.3387	0.3661	0.3936	0.4119	0.4302	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.6090	0.6047	0.6006	0.5811	0.5775	0.5605	0.5605	0.5574	0.5670	0.5775	0.5848	0.5925	(25)

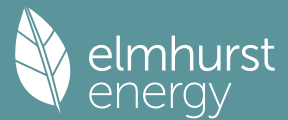
3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Main dwelling													
TER Opening Type			14.8000	1.1450	16.9466			(27)					
External Wall North	34.6500	7.4000	27.2500	0.1800	4.9050			(29a)					
External Wall West	27.7200		27.7200	0.1800	4.9896			(29a)					
External Wall South	37.8000	7.4000	30.4000	0.1800	5.4720			(29a)					
Total net area of external elements Aum(A, m2)			100.1700					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.3132			(33)					
Main dwelling													
Party Wall 1 East			30.5600	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								161.1291 (35)					
List of Thermal Bridges													
K1 Element					Length	Psi-value	Total						
E7 Party floor between dwellings (in blocks of flats)					41.5000	0.0700	2.9050						
E18 Party wall between dwellings					12.6000	0.0600	0.7560						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								3.6610 (36)					
Point Thermal bridges							(36a) =	0.0000					
Total fabric heat loss						(33) + (36) + (36a) =		35.9742 (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	
	51.9077	51.5470	51.1935	49.5330	49.2223	47.7761	47.7761	47.5082	48.3331	49.2223	49.8508	50.5079	(38)
Heat transfer coeff	87.8819	87.5212	87.1677	85.5072	85.1965	83.7502	83.7502	83.4824	84.3073	85.1965	85.8250	86.4820	(39)
Average = Sum(39)m / 12 =												85.5057	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	1.0717	1.0673	1.0630	1.0428	1.0390	1.0213	1.0213	1.0181	1.0281	1.0390	1.0466	1.0547	(40)
HLP (average)												1.0428	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.4997 (42)
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	28.5620	28.1378	27.5405	26.4391	25.6144	24.6999	24.2060	24.7991	25.4450	26.4235	27.5476	28.4655	(42b)
Hot water usage for other uses													
	40.2296	38.7667	37.3038	35.8409	34.3780	32.9151	32.9151	34.3780	35.8409	37.3038	38.7667	40.2296	(42c)
Average daily hot water use (litres/day)												63.0538	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	68.7916	66.9045	64.8443	62.2800	59.9924	57.6150	57.1211	59.1771	61.2859	63.7273	66.3143	68.6950	(44)
Energy conte	108.9491	95.2711	99.6633	85.2582	80.7613	70.8444	69.0830	73.2737	75.5716	86.4773	94.4768	107.5598	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													1047.1896
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage 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	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)

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Total heat required for water heating calculated for each month												
	92.6067	80.9805	84.7138	72.4695	68.6471	60.2177	58.7205	62.2826	64.2359	73.5057	80.3053	91.4259 (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	92.6067	80.9805	84.7138	72.4695	68.6471	60.2177	58.7205	62.2826	64.2359	73.5057	80.3053	91.4259 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											890.1111 (64)
Electric shower(s)	52.9605	47.1882	51.5277	49.1723	50.0950	47.7858	49.3786	50.0950	49.1723	51.5277	50.5588	52.9605 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											602.4224 (64a)
Heat gains from water heating, kWh/month	36.3918	32.0422	34.0604	30.4104	29.6855	27.0009	27.0248	28.0944	28.3520	31.2584	32.7160	36.0966 (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	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	115.1238	127.4585	115.1238	118.9613	115.1238	118.9613	115.1238	115.1238	118.9613	115.1238	118.9613	115.1238 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	223.5697	225.8896	220.0434	207.5975	191.8868	177.1210	167.2565	164.9365	170.7828	183.2286	198.9393	213.7052 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986 (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)	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886 (71)
Water heating gains (Table 5)	48.9137	47.6818	45.7801	42.2367	39.8999	37.5012	36.3236	37.7613	39.3778	42.0139	45.4389	48.5169 (72)
Total internal gains	448.1029	461.5257	441.4430	429.2913	407.4063	394.0792	379.1997	378.3174	389.6176	400.8621	423.8353	437.8416 (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					7.4000	10.6334	0.6300	0.7000	0.7700			24.0478 (74)
South					7.4000	46.7521	0.6300	0.7000	0.7700			105.7315 (78)
Solar gains	129.7793	219.1175	298.6678	374.7340	428.7574	430.8977	413.1566	371.2105	324.3092	241.4756	154.9939	111.4092 (83)
Total gains	577.8822	680.6432	740.1108	804.0253	836.1637	824.9769	792.3564	749.5279	713.9269	642.3378	578.8292	549.2508 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												
Utilisation factor for gains for living area, nil,m (see Table 9a)												21.0000 (85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	41.7625	41.9346	42.1046	42.9223	43.0788	43.8227	43.8227	43.9633	43.5332	43.0788	42.7634	42.4384
alpha	3.7842	3.7956	3.8070	3.8615	3.8719	3.9215	3.9215	3.9309	3.9022	3.8719	3.8509	3.8292
util living area	0.9820	0.9663	0.9415	0.8809	0.7728	0.6021	0.4524	0.4936	0.7077	0.9000	0.9672	0.9849 (86)
MIT	19.3302	19.6046	19.9456	20.3899	20.7266	20.9261	20.9812	20.9736	20.8565	20.4238	19.8179	19.3008 (87)
Th 2	20.0240	20.0276	20.0311	20.0478	20.0510	20.0656	20.0656	20.0683	20.0600	20.0510	20.0446	20.0380 (88)
util rest of house	0.9782	0.9594	0.9293	0.8559	0.7262	0.5289	0.3617	0.4013	0.6394	0.8737	0.9594	0.9817 (89)
MIT 2	18.5092	18.7816	19.1170	19.5524	19.8560	20.0254	20.0588	20.0581	19.9736	19.5945	19.0072	18.4906 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.7094	18.9823	19.3191	19.7567	20.0683	20.2450	20.2838	20.2814	20.1890	19.7968	19.2049	18.6882 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.7094	18.9823	19.3191	19.7567	20.0683	20.2450	20.2838	20.2814	20.1890	19.7968	19.2049	18.6882 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9714	0.9501	0.9184	0.8472	0.7271	0.5436	0.3834	0.4231	0.6495	0.8654	0.9505	0.9757 (94)
Useful gains	561.3560	646.6703	679.6953	681.1300	608.0140	448.4622	303.8082	317.1073	463.6644	555.8628	550.2007	535.8884 (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	1266.3287	1232.4999	1117.4087	928.3255	712.9512	472.7740	308.5163	324.0262	513.3438	783.5317	1038.9030	1252.9671 (97)
Space heating kWh	524.4997	393.6775	325.6588	177.9808	78.0733	0.0000	0.0000	0.0000	0.0000	169.3857	351.8657	533.5066 (98a)
Space heating requirement - total per year (kWh/year)												2554.6480
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	524.4997	393.6775	325.6588	177.9808	78.0733	0.0000	0.0000	0.0000	0.0000	169.3857	351.8657	533.5066 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2554.6480
Space heating per m2												31.1542 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	787.2520	619.7516	634.4662	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8531	0.9096	0.8898	0.0000	0.0000	0.0000	0.0000 (101)

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Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	671.5804	563.7376	564.5755	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	918.0727	882.2470	834.4575	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	177.4744	236.9710	200.7922	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	44.3686	59.2428	50.1981	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												153.8094 (107)
Energy for space heating												31.1542 (99)
Energy for space cooling												1.8757 (108)
Total												33.0300 (109)
Fabric Energy Efficiency (TFEE)												33.0 (109)

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

1. Overall dwelling characteristics

Main dwelling		Area (m2)	Storey height (m)	Volume (m3)	
Ground floor		82.0000 (1b)	x 3.1500 (2b)	= 258.3000 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.0000			= 258.3000 (4)	
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	258.3000 (5)	

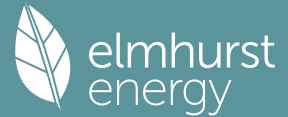
2. Ventilation rate

											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													3.0000 (17)		
Infiltration rate													0.1500 (18)		
Number of sides sheltered													0 (19)		
Shelter factor													(20) = 1 - [0.075 x (19)] =		1.0000 (20)
Infiltration rate adjusted to include shelter factor													(21) = (18) x (20) =		0.1500 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)		
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															
	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762	(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	0.2862	0.2825	0.2787	0.2600	0.2562	0.2375	0.2375	0.2337	0.2450	0.2562	0.2637	0.2712	(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												
Glazing			14.8000	0.7752	11.4729			(27)				
External Wall North	34.6500	7.4000	27.2500	0.1400	3.8150	70.0000	1907.5000	(29a)				
External Wall West	27.7200		27.7200	0.1400	3.8808	70.0000	1940.4000	(29a)				
External Wall South	37.8000	7.4000	30.4000	0.1400	4.2560	70.0000	2128.0000	(29a)				
Total net area of external elements Aum(A, m2)			100.1700					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	23.4247			(33)				
Main dwelling												
Party Wall 1 East			30.5600	0.0000	0.0000	45.0000	1375.2000	(32)				
Party Floor 1			82.0000			30.0000	2460.0000	(32d)				
Party Ceiling 1			82.0000			30.0000	2460.0000	(32b)				
Internal Wall 1			104.6100			9.0000	941.4900	(32c)				
Heat capacity Cm = Sum(A x k)												
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K					(28)...(30) + (32) + (32a)...(32e) =		13212.5900	(34)				
List of Thermal Bridges							161.1291	(35)				
K1 Element					Length	Psi-value	Total					
E7 Party floor between dwellings (in blocks of flats)					41.5000	0.0300	1.2450					
E18 Party wall between dwellings					12.6000	0.0300	0.3780					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								1.6230 (36)				
Point Thermal bridges							(36a) =	0.0000				
Total fabric heat loss						(33) + (36) + (36a) =	25.0477	(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

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(38)m	24.3997	24.0800	23.7604	22.1621	21.8425	20.2443	20.2443	19.9246	20.8836	21.8425	22.4818	23.1211 (38)
Heat transfer coeff	49.4473	49.1277	48.8080	47.2098	46.8902	45.2919	45.2919	44.9723	45.9312	46.8902	47.5295	48.1687 (39)
Average = Sum(39)m / 12 =												47.1299
HLP	Jan 0.6030	Feb 0.5991	Mar 0.5952	Apr 0.5757	May 0.5718	Jun 0.5523	Jul 0.5523	Aug 0.5484	Sep 0.5601	Oct 0.5718	Nov 0.5796	Dec 0.5874 (40)
HLP (average)												0.5748
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4997 (42)
Hot water usage for mixer showers												
72.5185	71.4083	69.7721	67.2550	64.9998	61.8448	59.3493	62.2666	63.7339	66.8588	70.1132	72.4531 (42a)	
Hot water usage for baths												
27.9253	27.5038	26.9041	26.0060	25.1966	24.0824	23.2371	24.2707	24.8132	25.9172	27.0651	27.9032 (42b)	
Hot water usage for other uses												
40.2296	38.7667	37.3038	35.8409	34.3780	32.9151	32.9151	34.3780	35.8409	37.3038	38.7667	40.2296 (42c)	
Average daily hot water use (litres/day)												129.3222 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
140.6734	137.6787	133.9799	129.1019	124.5744	118.8423	115.5015	120.9154	124.3880	130.0799	135.9449	140.5859 (44)	
Energy content	207.0955	182.1768	191.4545	168.6393	160.5267	137.4371	127.6326	142.3196	144.2839	167.6210	183.7340	206.4606 (45)
Energy content (annual)										Total = Sum(45)m =		2019.3818
Distribution loss (46)m = 0.15 x (45)m												
31.0643	27.3265	28.7182	25.2959	24.0790	20.6156	19.1449	21.3479	21.6426	25.1432	27.5601	30.9691 (46)	
Water storage loss:												
Store volume												110.0000 (47)
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												
262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374 (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												
262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374 (64)	
												</

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	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.6793	21.0318	17.1042	12.9490	9.6795	8.1718	8.8300	11.4775	15.4051	19.5603	22.8298	24.3374 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	333.6861	337.1487	328.4230	309.8470	286.3982	264.3597	249.6366	246.1740	254.8996	273.4756	296.9244	318.9629 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980 (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)	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886 (71)
Water heating gains (Table 5)	151.9902	149.5770	145.0001	137.3160	131.1782	122.9066	116.4775	123.0413	126.0685	134.3487	144.2868	151.7065 (72)
Total internal gains	611.8479	610.2497	593.0196	562.6043	529.7482	497.9305	477.4363	483.1850	498.8656	529.8769	566.5333	597.4991 (73)

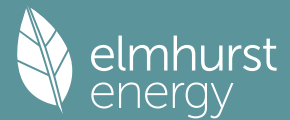
6. Solar gains

[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					7.4000	10.6334	0.3500	0.8500	0.7700		16.2227 (74)		
South					7.4000	46.7521	0.3500	0.8500	0.7700		71.3268 (78)		
Solar gains	87.5495	147.8174	201.4822	252.7968	289.2411	290.6849	278.7168	250.4198	218.7800	162.9002	104.5594	75.1570 (83)	
Total gains	699.3974	758.0671	794.5018	815.4010	818.9893	788.6154	756.1531	733.6048	717.6456	692.7771	671.0927	672.6561 (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	74.2237	74.7066	75.1959	77.7416	78.2715	81.0335	81.0335	81.6095	79.9056	78.2715	77.2187	76.1939
alpha	5.9482	5.9804	6.0131	6.1828	6.2181	6.4022	6.4022	6.4406	6.3270	6.2181	6.1479	6.0796
util living area												
	0.9168	0.8743	0.8034	0.6754	0.5275	0.3672	0.2635	0.2819	0.4402	0.6784	0.8533	0.9248 (86)

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MIT	20.6104	20.7291	20.8532	20.9563	20.9913	20.9994	20.9999	20.9999	20.9978	20.9624	20.8129	20.6032 (87)
Th 2	20.4273	20.4308	20.4343	20.4519	20.4554	20.4731	20.4731	20.4766	20.4660	20.4554	20.4484	20.4413 (88)
util rest of house	0.9058	0.8595	0.7831	0.6493	0.4978	0.3371	0.2320	0.2499	0.4066	0.6481	0.8348	0.9148 (89)
MIT 2	19.9833	20.1286	20.2771	20.4085	20.4477	20.4726	20.4731	20.4766	20.4644	20.4196	20.2460	19.9870 (90)
Living area fraction									fLA = Living area / (4) =			0.2439 (91)
MIT	20.1362	20.2751	20.4176	20.5421	20.5803	20.6011	20.6016	20.6042	20.5945	20.5520	20.3843	20.1373 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1362	20.2751	20.4176	20.5421	20.5803	20.6011	20.6016	20.6042	20.5945	20.5520	20.3843	20.1373 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8997	0.8552	0.7825	0.6537	0.5047	0.3444	0.2397	0.2577	0.4147	0.6536	0.8326	0.9088	(94)
Useful gains	629.2453	648.2957	621.6933	533.0099	413.3247	271.6065	181.2237	189.0506	297.6245	452.7963	558.7250	611.2887	(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	783.0595	755.3428	679.2904	549.6204	416.3988	271.8011	181.2384	189.0732	298.3002	466.6487	631.3947	767.6779	(97)
Space heating kWh	114.4378	71.9356	42.8523	11.9595	2.2871	0.0000	0.0000	0.0000	0.0000	10.3062	52.3222	116.3535	(98a)
Space heating requirement - total per year (kWh/year)												422.4542	
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	114.4378	71.9356	42.8523	11.9595	2.2871	0.0000	0.0000	0.0000	0.0000	10.3062	52.3222	116.3535	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												422.4542	
Space heating per m2										(98c) / (4) =		5.1519	(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												1.0000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	114.4378	71.9356	42.8523	11.9595	2.2871	0.0000	0.0000	0.0000	0.0000	10.3062	52.3222	116.3535	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													
307a	114.4378	71.9356	42.8523	11.9595	2.2871	0.0000	0.0000	0.0000	0.0000	10.3062	52.3222	116.3535	
Space heating requirement	114.4378	71.9356	42.8523	11.9595	2.2871	0.0000	0.0000	0.0000	0.0000	10.3062	52.3222	116.3535	(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	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310a	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	
Water heating fuel	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(310)
Cooling System Energy Efficiency Ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	18.7349	16.9218	18.7349	18.1305	18.7349	18.1305	18.7349	18.7349	18.1305	18.7349	18.1305	18.7349	(331)
Lighting	20.7264	16.6275	14.9712	10.9685	8.4724	6.9220	7.7288	10.0462	13.0490	17.1210	19.3382	21.3024	(332)
Electricity generated by PVs (Appendix M) (negative quantity)	-20.0839	-30.0387	-45.8825	-54.9402	-62.2016	-59.1968	-58.4577	-53.6636	-45.7567	-35.7455	-22.6762	-17.1644	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												422.4542	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2670.2216	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												4.2245	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)													
mechanical ventilation fans (SFP = 0.7000)												220.5882	(330a)
Total electricity for the above, kWh/year												220.5882	(331)
Electricity for lighting (calculated in Appendix L)												167.2737	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-505.8077	(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												2974.7299	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	422.4542	4.4400	18.7570	(340a)
Space heating total			18.7570	(340)

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Total CO2 associated with community systems			0.0000 (473)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Heat pump	2670.2216	4.4400	118.5578 (342a)
Water heating total			118.5578 (342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (347a)
Pumps, fans and electric keep-hot	220.5882	16.4900	36.3750 (349)
Energy for lighting	167.2737	16.4900	27.5834 (350)
Additional standing charges			92.0000 (351)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-505.8077	16.4900	-83.4077
PV Unit electricity exported	0.0000	5.5900	0.0000
Total			-83.4077 (352)
Total energy cost			209.8655 (355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.5949 (357)
SAP value		90.3568
SAP rating (Section 12)		90 (358)
SAP band		B

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			333.0000 (367)
Space and Water heating from Heat pump	928.7315	0.1586	20.1200 (367)
Electrical energy for heat distribution (space & water)	4.2245	0.0000	4.4318 (372)
Overall CO2 factor for heat network			0.0445 (386)
Total CO2 associated with community systems			137.5179 (373)
Space and water heating			137.5179 (376)
Pumps, fans and electric keep-hot	220.5882	0.1387	30.5983 (378)
Energy for lighting	167.2737	0.1443	24.1428 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-505.8077	0.1333	-67.4353
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-67.4353 (380)
Total CO2, kg/year			124.8237 (383)
CO2 emissions per m2			1.5200 (384)
EI value			98.6830 (384a)
EI rating			99 (385)
EI band			A

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

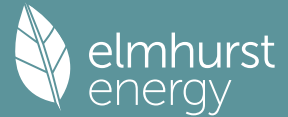
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	82.0000 (1b)	x 3.1500 (2b)	= 258.3000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	258.3000 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.8000	4.5000	4.4000	3.9000	3.9000	3.6000	3.7000	3.5000	3.7000	4.0000	4.1000	4.4000 (22)
Wind factor	1.2000	1.1250	1.1000	0.9750	0.9750	0.9000	0.9250	0.8750	0.9250	1.0000	1.0250	1.1000 (22a)
Adj infilt rate	0.1800	0.1687	0.1650	0.1462	0.1462	0.1350	0.1388	0.1313	0.1388	0.1500	0.1537	0.1650 (22b)
Balanced mechanical ventilation with heat recovery												

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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	0.2750	0.2637	0.2600	0.2412	0.2412	0.2300	0.2337	0.2262	0.2337	0.2450	0.2487	0.2600 (25)
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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								
Glazing			14.8000	0.7752	11.4729			(27)
External Wall North	34.6500	7.4000	27.2500	0.1400	3.8150	70.0000	1907.5000	(29a)
External Wall West	27.7200		27.7200	0.1400	3.8808	70.0000	1940.4000	(29a)
External Wall South	37.8000	7.4000	30.4000	0.1400	4.2560	70.0000	2128.0000	(29a)
Total net area of external elements Aum(A, m2)			100.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.4247			(33)
Main dwelling								
Party Wall 1 East			30.5600	0.0000	0.0000	45.0000	1375.2000	(32)
Party Floor 1			82.0000			30.0000	2460.0000	(32d)
Party Ceiling 1			82.0000			30.0000	2460.0000	(32b)
Internal Wall 1			104.6100			9.0000	941.4900	(32c)
Heat capacity Cm = Sum(A x k)								
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								(34)
List of Thermal Bridges								(35)
K1 Element				Length	Psi-value		Total	
E7 Party floor between dwellings (in blocks of flats)				41.5000	0.0300		1.2450	
E18 Party wall between dwellings				12.6000	0.0300		0.3780	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								1.6230 (36)
Point Thermal bridges							(36a) =	0.0000
Total fabric heat loss							(33) + (36) + (36a) =	25.0477 (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	23.4407	22.4818	22.1621	20.5639	20.5639	19.6050	19.9246	19.2853	19.9246	20.8836	21.2032	22.1621	(38)
Average = Sum(39)m / 12 =	48.4884	47.5295	47.2098	45.6116	45.6116	44.6526	44.9723	44.3330	44.9723	45.9312	46.2509	47.2098	(39)
												46.0644	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.5913	0.5796	0.5757	0.5562	0.5562	0.5445	0.5484	0.5406	0.5484	0.5601	0.5640	0.5757	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	

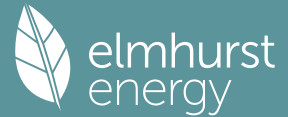
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.4997 (42)
Hot water usage for mixer showers													
	72.5185	71.4083	69.7721	67.2550	64.9998	61.8448	59.3493	62.2666	63.7339	66.8588	70.1132	72.4531	(42a)
Hot water usage for baths													
	27.9253	27.5038	26.9041	26.0060	25.1966	24.0824	23.2371	24.2707	24.8132	25.9172	27.0651	27.9032	(42b)
Hot water usage for other uses													
	40.2296	38.7667	37.3038	35.8409	34.3780	32.9151	32.9151	34.3780	35.8409	37.3038	38.7667	40.2296	(42c)
Average daily hot water use (litres/day)													129.3222 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	140.6734	137.6787	133.9799	129.1019	124.5744	118.8423	115.5015	120.9154	124.3880	130.0799	135.9449	140.5859	(44)
Energy content (annual)	207.0955	182.1768	191.4545	168.6393	160.5267	137.4371	127.6326	142.3196	144.2839	167.6210	183.7340	206.4606	(45)
Distribution loss (46)m = 0.15 x (45)m													
	31.0643	27.3265	28.7182	25.2959	24.0790	20.6156	19.1449	21.3479	21.6426	25.1432	27.5601	30.9691	(46)
Water storage loss:													
Store volume													110.0000 (47)
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													
	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(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													
	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(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													
	113.0807	100.5157	107.8801	98.8675	97.5966	88.4928	86.6593	91.5427	90.7693	99.9554	103.8865	112.8696	(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	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	23.6793	21.0318	17.1042	12.9490	9.6795	8.1718	8.8300	11.4775	15.4051	19.5603	22.8298	24.3374	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	333.6861	337.1487	328.4230	309.8470	286.3982	264.3597	249.6366	246.1740	254.8996	273.4756	296.9244	318.9629	(68)
	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	(69)

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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)	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886 (71)
Water heating gains (Table 5)	151.9902	149.5770	145.0001	137.3160	131.1782	122.9066	116.4775	123.0413	126.0685	134.3487	144.2868	151.7065 (72)
Total internal gains	611.8479	610.2497	593.0196	562.6043	529.7482	497.9305	477.4363	483.1850	498.8656	529.8769	566.5333	597.4991 (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	7.4000		12.7054		0.3500		0.8500		0.7700		19.3838 (74)	
South	7.4000		53.5774		0.3500		0.8500		0.7700		81.7397 (78)	
Solar gains	101.1236	151.9331	207.2974	276.6322	306.7359	330.5462	312.8445	282.0126	241.7787	179.2674	121.9575	83.9595 (83)
Total gains	712.9714	762.1828	800.3169	839.2365	836.4842	828.4766	790.2808	765.1977	740.6443	709.1443	688.4908	681.4586 (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	75.6916	77.2187	77.7416	80.4656	80.4656	82.1937	81.6095	82.7863	81.6095	79.9056	79.3534	77.7416
alpha	6.0461	6.1479	6.1828	6.3644	6.3644	6.4796	6.4406	6.5191	6.4406	6.3270	6.2902	6.1828
util living area	0.8916	0.8480	0.7630	0.6129	0.4563	0.3017	0.2049	0.2028	0.3640	0.5924	0.7941	0.8965 (86)
MIT	20.7033	20.7978	20.9030	20.9782	20.9969	20.9998	21.0000	21.0000	20.9994	20.9849	20.8934	20.7128 (87)
Th 2	20.4378	20.4484	20.4519	20.4695	20.4695	20.4802	20.4766	20.4837	20.4766	20.4660	20.4625	20.4519 (88)
util rest of house	0.8781	0.8313	0.7410	0.5870	0.4280	0.2738	0.1751	0.1729	0.3324	0.5608	0.7715	0.8833 (89)
MIT 2	20.1049	20.2258	20.3500	20.4484	20.4670	20.4801	20.4766	20.4837	20.4762	20.4525	20.3512	20.1295 (90)
Living area fraction	20.2508	20.3653	20.4849	20.5776	20.5962	20.6068	20.6043	20.6096	20.6039	20.5824	20.4834	20.2717 (92)
MIT	20.2508	20.3653	20.4849	20.5776	20.5962	20.6068	20.6043	20.6096	20.6039	20.5824	20.4834	20.2717 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2508	20.3653	20.4849	20.5776	20.5962	20.6068	20.6043	20.6096	20.6039	20.5824	20.4834	20.2717 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8733	0.8287	0.7424	0.5923	0.4348	0.2806	0.1823	0.1802	0.3401	0.5678	0.7724	0.8787 (94)
Useful gains	622.6051	631.6221	594.1223	497.1151	363.6731	232.4546	144.1013	137.8577	251.8577	402.6419	531.7893	598.7673 (95)
Ext temp.	5.0000	5.4000	7.1000	9.5000	12.6000	15.4000	17.4000	17.5000	15.0000	11.7000	8.1000	5.2000 (96)
Heat loss rate W	739.4884	711.2926	631.8987	505.2688	364.7199	232.4991	144.1034	137.8593	252.0182	407.9780	572.7452	711.5334 (97)
Space heating kWh	86.9611	53.5385	28.1056	5.8706	0.7788	0.0000	0.0000	0.0000	0.0000	3.9701	29.4883	83.8980 (98a)
Space heating requirement - total per year (kWh/year)												292.6110
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	86.9611	53.5385	28.1056	5.8706	0.7788	0.0000	0.0000	0.0000	0.0000	3.9701	29.4883	83.8980 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												292.6110
Space heating per m2										(98c) / (4) =		3.5684 (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												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	86.9611	53.5385	28.1056	5.8706	0.7788	0.0000	0.0000	0.0000	0.0000	3.9701	29.4883	83.8980 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	86.9611	53.5385	28.1056	5.8706	0.7788	0.0000	0.0000	0.0000	0.0000	3.9701	29.4883	83.8980
Space heating requirement	86.9611	53.5385	28.1056	5.8706	0.7788	0.0000	0.0000	0.0000	0.0000	3.9701	29.4883	83.8980 (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	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00												
310a	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374
Water heating fuel	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374 (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	18.7349	16.9218	18.7349	18.1305	18.7349	18.1305	18.7349	18.7349	18.1305	18.7349	18.1305	18.7349 (331)
Lighting	20.7264	16.6275	14.9712	10.9685	8.4724	6.9220	7.7288	10.0462	13.0490	17.1210	19.3382	21.3024 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-23.1948	-31.3680	-47.6697	-58.9363	-64.8136	-64.1172	-62.8834	-58.2506	-49.6437	-39.1704	-26.2836	-19.3001 (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)												

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(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												292.6110	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2670.2216	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												2.9261	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)													
mechanical ventilation fans (SFP = 0.7000)												220.5882	(330a)
Total electricity for the above, kWh/year												220.5882	(331)
Electricity for lighting (calculated in Appendix L)												167.2737	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-545.6313	(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												2805.0631	(338)

10b. Fuel costs - using BEDF prices (568)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	292.6110	5.6000	16.3862	(340a)
Space heating total			16.3862	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2670.2216	5.6000	149.5324	(342a)
Water heating total			149.5324	(342)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(347a)
Pumps, fans and electric keep-hot	220.5882	26.0600	57.4853	(349)
Energy for lighting	167.2737	26.0600	43.5915	(350)
Additional standing charges			99.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-545.6313	26.0600	-142.1915	
PV Unit electricity exported	0.0000	5.8100	0.0000	
Total			-142.1915	(352)
Total energy cost			223.8039	(355)

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			333.0000	(367)
Space and Water heating from Heat pump	889.7395	0.1594	14.0094	(367)
Electrical energy for heat distribution (space & water)	2.9261	0.0000	4.2283	(372)
Overall CO2 factor for heat network			0.0443	(386)
Total CO2 associated with community systems			131.2039	(373)
Space and water heating			131.2039	(376)
Pumps, fans and electric keep-hot	220.5882	0.1387	30.5983	(378)
Energy for lighting	167.2737	0.1443	24.1428	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-545.6313	0.1334	-72.7730	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-72.7730	(380)
Total CO2, kg/year			113.1719	(383)

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			333.0000	(467a)
Space and Water heating from Heat pump	889.7395	1.5901	139.7281	(467)
Electrical energy for heat distribution (space & water)	2.9261	0.0000	45.2648	(472)
Overall CO2 factor for heat network			0.4741	(486)
Total CO2 associated with community systems			1404.5675	(473)
Space and water heating			1404.5675	(476)
Pumps, fans and electric keep-hot	220.5882	1.5128	333.7058	(478)
Energy for lighting	167.2737	1.5338	256.5699	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-545.6313	1.4928	-814.5434	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-814.5434	(480)
Total Primary energy kWh/year			1180.2998	(483)

SAP 10 EPC IMPROVEMENTS

0301_2B4P_BG

Current energy efficiency rating: B 90
Current environmental impact rating: A 99

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N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures Typical annual savings Energy Environmental
(none) efficiency impact

Total Savings £0 0.00 kg/m²

Potential energy efficiency rating: B 90
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 568 TEST (31 Mar 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, South East England):

	Current	Potential	Saving
Electricity	£101	£101	£0
Community scheme	£265	£265	£0
Space heating	£173	£173	£0
Water heating	£150	£150	£0
Lighting	£44	£44	£0
Generated (PV)	-£142	-£142	£0
Total cost of fuels	£224	£224	£0
Total cost of uses	£225	£225	£0
Delivered energy	34 kWh/m ²	34 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m ²	1 kg/m ²	1 kg/m ²	0 kg/m ²
Primary energy	14 kWh/m ²	14 kWh/m ²	0 kWh/m ²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	82.0000 (1b)	x 3.1500 (2b)	= 258.3000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 258.3000 (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)

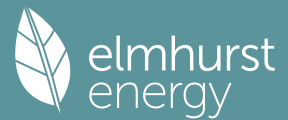
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour
Pressure test		0.0000 / (5) = 0.0000 (8)
Pressure Test Method		Yes
Measured/design AP50		Blower Door
Infiltration rate		3.0000 (17)
Number of sides sheltered		0.1500 (18)
		0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1500 (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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (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	0.2862	0.2825	0.2787	0.2600	0.2562	0.2375	0.2375	0.2337	0.2450	0.2562	0.2637	0.2712 (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							
Glazing			14.8000	0.7752	11.4729		(27)

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External Wall North	34.6500	7.4000	27.2500	0.1400	3.8150	70.0000	1907.5000 (29a)
External Wall West	27.7200		27.7200	0.1400	3.8808	70.0000	1940.4000 (29a)
External Wall South	37.8000	7.4000	30.4000	0.1400	4.2560	70.0000	2128.0000 (29a)
Total net area of external elements Aum(A, m2)			100.1700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	23.4247			(33)
Main dwelling							
Party Wall 1 East			30.5600	0.0000	0.0000	45.0000	1375.2000 (32)
Party Floor 1			82.0000			30.0000	2460.0000 (32d)
Party Ceiling 1			82.0000			30.0000	2460.0000 (32b)
Internal Wall 1			104.6100			9.0000	941.4900 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13212.5900 (34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		161.1291 (35)	
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450
E18 Party wall between dwellings	12.6000	0.0300	0.3780
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			1.6230 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) =	25.0477 (37)	

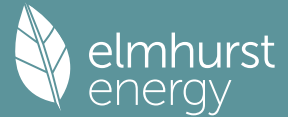
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(38)
Heat transfer coeff	24.3997	24.0800	23.7604	22.1621	21.8425	20.2443	20.2443	19.9246	20.8836	21.8425	22.4818	23.1211	(38)
Average = Sum(39)m / 12 =	49.4473	49.1277	48.8080	47.2098	46.8902	45.2919	45.2919	44.9723	45.9312	46.8902	47.5295	48.1687	(39)
												47.1299	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(40)
HLP (average)	0.6030	0.5991	0.5952	0.5757	0.5718	0.5523	0.5523	0.5484	0.5601	0.5718	0.5796	0.5874	(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													2.4997 (42)
Hot water usage for mixer showers													
	72.5185	71.4083	69.7721	67.2550	64.9998	61.8448	59.3493	62.2666	63.7339	66.8588	70.1132	72.4531	(42a)
Hot water usage for baths													
	27.9253	27.5038	26.9041	26.0060	25.1966	24.0824	23.2371	24.2707	24.8132	25.9172	27.0651	27.9032	(42b)
Hot water usage for other uses													
	40.2296	38.7667	37.3038	35.8409	34.3780	32.9151	32.9151	34.3780	35.8409	37.3038	38.7667	40.2296	(42c)
Average daily hot water use (litres/day)													129.3222 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	140.6734	137.6787	133.9799	129.1019	124.5744	118.8423	115.5015	120.9154	124.3880	130.0799	135.9449	140.5859	(44)
Energy conte	207.0955	182.1768	191.4545	168.6393	160.5267	137.4371	127.6326	142.3196	144.2839	167.6210	183.7340	206.4606	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
	31.0643	27.3265	28.7182	25.2959	24.0790	20.6156	19.1449	21.3479	21.6426	25.1432	27.5601	30.9691	(46)
Water storage loss:													
Store volume													110.0000 (47)
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													
	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(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	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(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													
	113.0807	100.5157	107.8801	98.8675	97.5966	88.4928	86.6593	91.5427	90.7693	99.9554	103.8865	112.8696	(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	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	
	23.6793	21.0318	17.1042	12.9490	9.6795	8.1718	8.8300	11.4775	15.4051	19.5603	22.8298	24.3374	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	333.6861	337.1487	328.4230	309.8470	286.3982	264.3597	249.6366	246.1740	254.8996	273.4756	296.9244	318.9629	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	(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)													
	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	(71)
Water heating gains (Table 5)													
	151.9902	149.5770	145.0001	137.3160	131.1782	122.9066	116.4775	123.0413	126.0685	134.3487	144.2868	151.7065	(72)
Total internal gains													
	611.8479	610.2497	593.0196	562.6043	529.7482	497.9305	477.4363	483.1850	498.8656	529.8769	566.5333	597.4991	(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				7.4000		10.6334		0.3500		0.8500		0.7700		16.2227 (74)	
South				7.4000		46.7521		0.3500		0.8500		0.7700		71.3268 (78)	
Solar gains	87.5495	147.8174	201.4822	252.7968	289.2411	290.6849	278.7168	250.4198	218.7800	162.9002	104.5594	75.1570 (83)			
Total gains	699.3974	758.0671	794.5018	815.4010	818.9893	788.6154	756.1531	733.6048	717.6456	692.7771	671.0927	672.6561 (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	74.2237	74.7066	75.1959	77.7416	78.2715	81.0335	81.0335	81.6095	79.9056	78.2715	77.2187	76.1939			
alpha	5.9482	5.9804	6.0131	6.1828	6.2181	6.4022	6.4022	6.4406	6.3270	6.2181	6.1479	6.0796			
util living area	0.9168	0.8743	0.8034	0.6754	0.5275	0.3672	0.2635	0.2819	0.4402	0.6784	0.8533	0.9248 (86)			
MIT	20.6104	20.7291	20.8532	20.9563	20.9913	20.9994	20.9999	20.9999	20.9978	20.9624	20.8129	20.6032 (87)			
Th 2	20.4273	20.4308	20.4343	20.4519	20.4554	20.4731	20.4731	20.4766	20.4660	20.4554	20.4484	20.4413 (88)			
util rest of house	0.9058	0.8595	0.7831	0.6493	0.4978	0.3371	0.2320	0.2499	0.4066	0.6481	0.8348	0.9148 (89)			
MIT 2	19.9833	20.1286	20.2771	20.4085	20.4477	20.4726	20.4731	20.4766	20.4644	20.4196	20.2460	19.9870 (90)			
Living area fraction										fLA = Living area / (4) =		0.2439 (91)			
MIT	20.1362	20.2751	20.4176	20.5421	20.5803	20.6011	20.6016	20.6042	20.5945	20.5520	20.3843	20.1373 (92)			
Temperature adjustment												0.0000			
adjusted MIT	20.1362	20.2751	20.4176	20.5421	20.5803	20.6011	20.6016	20.6042	20.5945	20.5520	20.3843	20.1373 (93)			
8. Space heating requirement															
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Utilisation	0.8997	0.8552	0.7825	0.6537	0.5047	0.3444	0.2397	0.2577	0.4147	0.6536	0.8326	0.9088 (94)			
Useful gains	629.2453	648.2957	621.6933	533.0099	413.3247	271.6065	181.2237	189.0506	297.6245	452.7963	558.7250	611.2887 (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	783.0595	755.3428	679.2904	549.6204	416.3988	271.8011	181.2384	189.0732	298.3002	466.6487	631.3947	767.6779 (97)			
Space heating kWh	114.4378	71.9356	42.8523	11.9595	2.2871	0.0000	0.0000	0.0000	0.0000	10.3062	52.3222	116.3535 (98a)			
Space heating requirement - total per year (kWh/year)												422.4542			
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	114.4378	71.9356	42.8523	11.9595	2.2871	0.0000	0.0000	0.0000	0.0000	10.3062	52.3222	116.3535 (98c)			
Space heating requirement after solar contribution - total per year (kWh/year)												422.4542			
Space heating per m2										(98c) / (4) =			5.1519 (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													1.0000 (306)		
Efficiency of secondary/supplementary heating system, %													0.0000 (208)		
Space heating:															
Space heating requirement															
	114.4378	71.9356	42.8523	11.9595	2.2871	0.0000	0.0000	0.0000	0.0000	10.3062	52.3222	116.3535 (98)			
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00															
307a	114.4378	71.9356	42.8523	11.9595	2.2871	0.0000	0.0000	0.0000	0.0000	10.3062	52.3222	116.3535			
Space heating requirement	114.4378	71.9356	42.8523	11.9595	2.2871	0.0000	0.0000	0.0000	0.0000	10.3062	52.3222	116.3535 (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															
	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374 (64)			
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00															
310a	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374			
Water heating fuel	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374 (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	18.7349	16.9218	18.7349	18.1305	18.7349	18.1305	18.7349	18.7349	18.1305	18.7349	18.1305	18.7349 (331)			
Lighting	20.7264	16.6275	14.9712	10.9685	8.4724	6.9220	7.7288	10.0462	13.0490	17.1210	19.3382	21.3024 (332)			
Electricity generated by PVs (Appendix M) (negative quantity)															
(333a)m	-20.0839	-30.0387	-45.8825	-54.9402	-62.2016	-59.1968	-58.4577	-53.6636	-45.7567	-35.7455	-22.6762	-17.1644 (333a)			
Electricity generated by wind turbines (Appendix M) (negative quantity)															
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)			
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)															
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)			
Electricity generated by PVs (Appendix M) (negative quantity)															
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)			
Electricity generated by wind turbines (Appendix M) (negative quantity)															
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)			
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)															
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)			
Annual totals kWh/year															
Space heating fuel - community heating												422.4542 (307)			
Space heating fuel - secondary												0.0000 (309)			
Water heating fuel - community heating												2670.2216 (310)			
Efficiency of water heater												0.0000 (311)			
Electricity used for heat distribution												4.2245 (313)			
Space cooling fuel												0.0000 (321)			
Electricity for pumps and fans:															
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)															

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mechanical ventilation fans (SFP = 0.7000) 220.5882 (330a)
 Total electricity for the above, kWh/year 220.5882 (331)
 Electricity for lighting (calculated in Appendix L) 167.2737 (332)

Energy saving/generation technologies (Appendices M ,N and Q)
 PV generation -505.8077 (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 2974.7299 (338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating from Heat pump	422.4542	4.4400	18.7570 (340a)
Space heating total			18.7570 (340)
Total CO2 associated with community systems			0.0000 (473)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Heat pump	2670.2216	4.4400	118.5578 (342a)
Water heating total			118.5578 (342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (347a)
Pumps, fans and electric keep-hot	220.5882	16.4900	36.3750 (349)
Energy for lighting	167.2737	16.4900	27.5834 (350)
Additional standing charges			92.0000 (351)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-505.8077	16.4900	-83.4077
PV Unit electricity exported	0.0000	5.5900	0.0000
Total			-83.4077 (352)
Total energy cost			209.8655 (355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12): 0.3600 (356)
 Energy cost factor (ECF) $[(255) \times (256)] / [(4) + 45.0] =$ 0.5949 (357)
 SAP value 90.3568
 SAP rating (Section 12) 90 (358)
 SAP band B

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			333.0000 (367)
Space and Water heating from Heat pump	928.7315	0.1586	20.1200 (367)
Electrical energy for heat distribution (space & water)	4.2245	0.0000	4.4318 (372)
Overall CO2 factor for heat network			0.0445 (386)
Total CO2 associated with community systems			137.5179 (373)
Space and water heating			137.5179 (376)
Pumps, fans and electric keep-hot	220.5882	0.1387	30.5983 (378)
Energy for lighting	167.2737	0.1443	24.1428 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-505.8077	0.1333	-67.4353
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-67.4353 (380)
Total CO2, kg/year			124.8237 (383)
CO2 emissions per m2			1.5200 (384)
EI value			98.6830 (384a)
EI rating			99 (385)
EI band			A

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
 CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

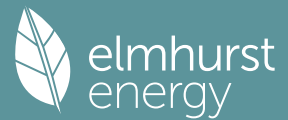
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	82.0000 (1b)	3.1500 (2b)	258.3000 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.0000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	258.3000 (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)

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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 0 (19)
Shelter factor (20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1500 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.8000	4.5000	4.4000	3.9000	3.9000	3.6000	3.7000	3.5000	3.7000	4.0000	4.1000	4.4000	(22)
Wind factor	1.2000	1.1250	1.1000	0.9750	0.9750	0.9000	0.9250	0.8750	0.9250	1.0000	1.0250	1.1000	(22a)
Adj infilt rate	0.1800	0.1687	0.1650	0.1462	0.1462	0.1350	0.1388	0.1313	0.1388	0.1500	0.1537	0.1650	(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	0.2750	0.2637	0.2600	0.2412	0.2412	0.2300	0.2337	0.2262	0.2337	0.2450	0.2487	0.2600	(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								
Glazing			14.8000	0.7752	11.4729			(27)
External Wall North	34.6500	7.4000	27.2500	0.1400	3.8150	70.0000	1907.5000	(29a)
External Wall West	27.7200		27.7200	0.1400	3.8808	70.0000	1940.4000	(29a)
External Wall South	37.8000	7.4000	30.4000	0.1400	4.2560	70.0000	2128.0000	(29a)
Total net area of external elements Aum(A, m2)			100.1700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	23.4247			(33)
Main dwelling								
Party Wall 1 East			30.5600	0.0000	0.0000	45.0000	1375.2000	(32)
Party Floor 1			82.0000			30.0000	2460.0000	(32d)
Party Ceiling 1			82.0000			30.0000	2460.0000	(32b)
Internal Wall 1			104.6100			9.0000	941.4900	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13212.5900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 161.1291 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450	
E18 Party wall between dwellings	12.6000	0.0300	0.3780	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				1.6230 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	25.0477 (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	23.4407	22.4818	22.1621	20.5639	20.5639	19.6050	19.9246	19.2853	19.9246	20.8836	21.2032	22.1621	(38)
Heat transfer coeff	48.4884	47.5295	47.2098	45.6116	45.6116	44.6526	44.9723	44.3330	44.9723	45.9312	46.2509	47.2098	(39)
Average = Sum(39)m / 12 =													46.0644

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.5913	0.5796	0.5757	0.5562	0.5562	0.5445	0.5484	0.5406	0.5484	0.5601	0.5640	0.5757	(40)
HLP (average)													0.5618
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4997 (42)

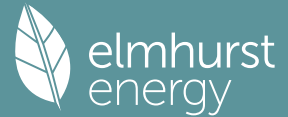
Hot water usage for mixer showers

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
72.5185	71.4083	69.7721	67.2550	64.9998	61.8448	59.3493	62.2666	63.7339	66.8588	70.1132	72.4531	72.4531	(42a)
Hot water usage for baths	27.9253	27.5038	26.9041	26.0060	25.1966	24.0824	23.2371	24.2707	24.8132	25.9172	27.0651	27.9032	(42b)
Hot water usage for other uses	40.2296	38.7667	37.3038	35.8409	34.3780	32.9151	32.9151	34.3780	35.8409	37.3038	38.7667	40.2296	(42c)
Average daily hot water use (litres/day)													129.3222 (43)

Daily hot water use

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
140.6734	137.6787	133.9799	129.1019	124.5744	118.8423	115.5015	120.9154	124.3880	130.0799	135.9449	140.5859	140.5859	(44)
Energy conte	207.0955	182.1768	191.4545	168.6393	160.5267	137.4371	127.6326	142.3196	144.2839	167.6210	183.7340	206.4606	(45)
Energy content (annual)													Total = Sum(45)m = 2019.3818
Distribution loss (46)m = 0.15 x (45)m													
31.0643	27.3265	28.7182	25.2959	24.0790	20.6156	19.1449	21.3479	21.6426	25.1432	27.5601	30.9691	30.9691	(46)
Water storage loss:													
Store volume													110.0000 (47)
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	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(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)

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Output from w/h	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374 (64)
	Total per year (kWh/year) = Sum(64)m = 2670.2216 (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	113.0807	100.5157	107.8801	98.8675	97.5966	88.4928	86.6593	91.5427	90.7693	99.9554	103.8865	112.8696 (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	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.6793	21.0318	17.1042	12.9490	9.6795	8.1718	8.8300	11.4775	15.4051	19.5603	22.8298	24.3374	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	333.6861	337.1487	328.4230	309.8470	286.3982	264.3597	249.6366	246.1740	254.8996	273.4756	296.9244	318.9629	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	(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)	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	(71)
Water heating gains (Table 5)	151.9902	149.5770	145.0001	137.3160	131.1782	122.9066	116.4775	123.0413	126.0685	134.3487	144.2868	151.7065	(72)
Total internal gains	611.8479	610.2497	593.0196	562.6043	529.7482	497.9305	477.4363	483.1850	498.8656	529.8769	566.5333	597.4991	(73)

6. Solar gains

[Jan]													Gains
				Area	Solar flux	g		FF		Access		W	
				m2	Table 6a	Specific data		Specific data		factor			
					W/m2	or Table 6b		or Table 6c		Table 6d			
North				7.4000	12.7054	0.3500		0.8500		0.7700		19.3838 (74)	
South				7.4000	53.5774	0.3500		0.8500		0.7700		81.7397 (78)	
Solar gains	101.1236	151.9331	207.2974	276.6322	306.7359	330.5462	312.8445	282.0126	241.7787	179.2674	121.9575	83.9595 (83)	
Total gains	712.9714	762.1828	800.3169	839.2365	836.4842	828.4766	790.2808	765.1977	740.6443	709.1443	688.4908	681.4586 (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	75.6916	77.2187	77.7416	80.4656	80.4656	82.1937	81.6095	82.7863	81.6095	79.9056	79.3534	77.7416	
alpha	6.0461	6.1479	6.1828	6.3644	6.3644	6.4796	6.4406	6.5191	6.4406	6.3270	6.2902	6.1828	
util living area	0.8916	0.8480	0.7630	0.6129	0.4563	0.3017	0.2049	0.2028	0.3640	0.5924	0.7941	0.8965	(86)
MIT	20.7033	20.7978	20.9030	20.9782	20.9969	20.9998	21.0000	21.0000	20.9994	20.9849	20.8934	20.7128	(87)
Th 2	20.4378	20.4484	20.4519	20.4695	20.4695	20.4802	20.4766	20.4837	20.4766	20.4660	20.4625	20.4519	(88)
util rest of house	0.8781	0.8313	0.7410	0.5870	0.4280	0.2738	0.1751	0.1729	0.3324	0.5608	0.7715	0.8833	(89)
MIT 2	20.1049	20.2258	20.3500	20.4484	20.4670	20.4801	20.4766	20.4837	20.4762	20.4525	20.3512	20.1295	(90)
Living area fraction	20.2508	20.3653	20.4849	20.5776	20.5962	20.6068	20.6043	20.6096	FLA = Living area / (4) =	20.5824	20.4834	20.2717	(91)
MIT	20.2508	20.3653	20.4849	20.5776	20.5962	20.6068	20.6043	20.6096	20.6039	20.5824	20.4834	20.2717	(92)
Temperature adjustment	20.2508	20.3653	20.4849	20.5776	20.5962	20.6068	20.6043	20.6096	20.6039	20.5824	20.4834	20.2717	(93)
adjusted MIT	20.2508	20.3653	20.4849	20.5776	20.5962	20.6068	20.6043	20.6096	20.6039	20.5824	20.4834	20.2717	(93)

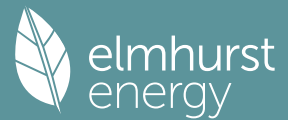
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	622.6051	631.6221	594.1223	497.1151	363.6731	232.4546	144.1013	137.8577	251.8577	402.6419	531.7893	598.7673	(94)
Ext temp.	5.0000	5.4000	7.1000	9.5000	12.6000	15.4000	17.4000	17.5000	15.0000	11.7000	8.1000	5.2000	(96)
Heat loss rate W	739.4884	711.2926	631.8987	505.2688	364.7199	232.4991	144.1034	137.8593	252.0182	407.9780	572.7452	711.5334	(97)
Space heating kWh	86.9611	53.5385	28.1056	5.8706	0.7788	0.0000	0.0000	0.0000	0.0000	3.9701	29.4883	83.8980	(98a)
Space heating requirement - total per year (kWh/year)												292.6110	
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	86.9611	53.5385	28.1056	5.8706	0.7788	0.0000	0.0000	0.0000	0.0000	3.9701	29.4883	83.8980	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												292.6110	
Space heating per m2												(98c) / (4) = 3.5684	(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													1.0000 (306)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating:													
Space heating requirement	86.9611	53.5385	28.1056	5.8706	0.7788	0.0000	0.0000	0.0000	0.0000	3.9701	29.4883	83.8980	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00	86.9611	53.5385	28.1056	5.8706	0.7788	0.0000	0.0000	0.0000	0.0000	3.9701	29.4883	83.8980	
307a	86.9611	53.5385	28.1056	5.8706	0.7788	0.0000	0.0000	0.0000	0.0000	3.9701	29.4883	83.8980	
Space heating requirement													

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Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	86.9611	53.5385	28.1056	5.8706	0.7788	0.0000	0.0000	0.0000	0.0000	3.9701	29.4883	83.8980 (307)
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 (308)
Water heating	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Annual water heating requirement	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374
Water heating fuel	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374 (310)
Cooling System Energy Efficiency Ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	18.7349	16.9218	18.7349	18.1305	18.7349	18.1305	18.7349	18.7349	18.1305	18.7349	18.1305	18.7349 (331)
Lighting	20.7264	16.6275	14.9712	10.9685	8.4724	6.9220	7.7288	10.0462	13.0490	17.1210	19.3382	21.3024 (332)
Electricity generated by PVs (Appendix M) (negative quantity)	-23.1948	-31.3680	-47.6697	-58.9363	-64.8136	-64.1172	-62.8834	-58.2506	-49.6437	-39.1704	-26.2836	-19.3001 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												292.6110 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2670.2216 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												2.9261 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)												
mechanical ventilation fans (SFP = 0.7000)												220.5882 (330a)
Total electricity for the above, kWh/year												220.5882 (331)
Electricity for lighting (calculated in Appendix L)												167.2737 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-545.6313 (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												2805.0631 (338)

10b. Fuel costs - using BEDF prices (568)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating from Heat pump	292.6110	5.6000	16.3862 (340a)
Space heating total			16.3862 (340)
Total CO2 associated with community systems			0.0000 (473)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Heat pump	2670.2216	5.6000	149.5324 (342a)
Water heating total			149.5324 (342)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (347a)
Pumps, fans and electric keep-hot	220.5882	26.0600	57.4853 (349)
Energy for lighting	167.2737	26.0600	43.5915 (350)
Additional standing charges			99.0000 (351)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-545.6313	26.0600	-142.1915
PV Unit electricity exported	0.0000	5.8100	0.0000
Total			-142.1915 (352)
Total energy cost			223.8039 (355)

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			333.0000 (367)
Space and Water heating from Heat pump	889.7395	0.1594	14.0094 (367)
Electrical energy for heat distribution (space & water)	2.9261	0.0000	4.2283 (372)
Overall CO2 factor for heat network			0.0443 (386)
Total CO2 associated with community systems			131.2039 (373)
Space and water heating			131.2039 (376)
Pumps, fans and electric keep-hot	220.5882	0.1387	30.5983 (378)
Energy for lighting	167.2737	0.1443	24.1428 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-545.6313	0.1334	-72.7730
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-72.7730 (380)
Total CO2, kg/year			113.1719 (383)

13b. Primary energy - Community heating scheme

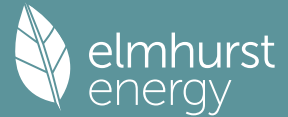
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			333.0000 (467a)
Space and Water heating from Heat pump	889.7395	1.5901	139.7281 (467)
Electrical energy for heat distribution (space & water)	2.9261	0.0000	45.2648 (472)
Overall CO2 factor for heat network			0.4741 (486)
Total CO2 associated with community systems			1404.5675 (473)
Space and water heating			1404.5675 (476)

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Pumps, fans and electric keep-hot	220.5882	1.5128	333.7058 (478)
Energy for lighting	167.2737	1.5338	256.5699 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-545.6313	1.4928	-814.5434
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-814.5434 (480)
Total Primary energy kWh/year			1180.2998 (483)

Full SAP Calculation Printout



Property Reference	Be Green				Issued on Date	08/04/2025
Assessment Reference	0302_1B2P_BG		Prop Type Ref			
Property						
SAP Rating	90 B	DER	1.57	TER	13.47	
Environmental	99 A	% DER < TER				88.34
CO ₂ Emissions (t/year)	0.08	DFEE	22.11	TFEE	28.68	
Compliance Check	See BREL	% DFEE < TFEE				22.89
% DPER < TPER	77.36	DPER	16.44	TPER	72.63	
Assessor Details	Alfie Gamble-Thornton				Assessor ID	CM02-0001
Client	Fifth State, Fifth State					

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	60.0000 (1b)	3.1500 (2b)	189.0000 (1b)	- (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.0000			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	189.0000 (5)	

2. Ventilation rate

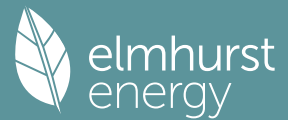
	m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	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	0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1500 (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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762	(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	0.2862	0.2825	0.2787	0.2600	0.2562	0.2375	0.2375	0.2337	0.2450	0.2562	0.2637	0.2712	(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								
Glazing			10.6500	0.7752	8.2558			(27)
External Wall North	18.0200	2.5100	15.5100	0.1400	2.1714	70.0000	1085.7000	(29a)
External Wall South	35.1500	8.1400	27.0100	0.1400	3.7814	70.0000	1890.7000	(29a)
Total net area of external elements Aum(A, m ²)			53.1700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	14.2086			(33)
Main dwelling								
Party Wall 1 East			22.4900	0.0000	0.0000	45.0000	1012.0500	(32)
Party Wall 2 West			21.8000	0.0000	0.0000	45.0000	981.0000	(32)
Party Floor 1			60.0000			30.0000	1800.0000	(32d)
Party Ceiling 1			60.0000			20.0000	1200.0000	(32b)
Internal Wall 1			56.2600			9.0000	506.3400	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		8475.7900	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							141.2632	(35)
List of Thermal Bridges								

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K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450
E18 Party wall between dwellings	12.6000	0.0300	0.3780
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			1.6230 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	15.8316 (37)

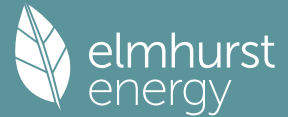
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	17.8534	17.6195	17.3856	16.2162	15.9823	14.8129	14.8129	14.5790	15.2806	15.9823	16.4501	16.9179 (38)
Heat transfer coeff												
	33.6850	33.4511	33.2173	32.0478	31.8139	30.6445	30.6445	30.4106	31.1123	31.8139	32.2817	32.7495 (39)
Average = Sum(39)m / 12 =												31.9893
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.5614	0.5575	0.5536	0.5341	0.5302	0.5107	0.5107	0.5068	0.5185	0.5302	0.5380	0.5458 (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												1.9816 (42)
Hot water usage for mixer showers												
62.9929	62.0285	60.6072	58.4208	56.4618	53.7212	51.5536	54.0877	55.3622	58.0767	60.9035	62.9361	(42a)
Hot water usage for baths												
24.2730	23.9066	23.3854	22.6047	21.9012	20.9327	20.1980	21.0965	21.5680	22.5276	23.5253	24.2538	(42b)
Hot water usage for other uses												
34.9239	33.6540	32.3840	31.1140	29.8441	28.5741	28.5741	29.8441	31.1140	32.3840	33.6540	34.9239	(42c)
Average daily hot water use (litres/day)												112.3305 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	122.1899	119.5891	116.3766	112.1396	108.2071	103.2281	100.3257	105.0282	108.0442	112.9883	118.0828	122.1138 (44)
Energy content (annual)	179.8846	158.2406	166.2998	146.4823	139.4358	119.3798	110.8628	123.6201	125.3259	145.5968	159.5928	179.3331 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1754.0545
26.9827	23.7361	24.9450	21.9723	20.9154	17.9070	16.6294	18.5430	18.7989	21.8395	23.9389	26.9000	(46)
Water storage loss:												
Store volume												110.0000 (47)
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	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	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												
235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099	(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												
235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099	(64)
12Total per year (kWh/year)									Total per year (kWh/year) = Sum(64)m =		2404.8943	(64)
Electric shower(s)											2405	(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	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
104.0331	92.5569	99.5161	91.5003	90.5838	82.4887	81.0833	85.3251	84.4658	92.6324	95.8596	103.8497	(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
99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
87.3348	96.6921	87.3348	90.2460	87.3348	90.2460	87.3348	87.3348	90.2460	87.3348	90.2460	87.3348	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
172.9469	174.7416	170.2191	160.5914	148.4380	137.0156	129.3847	127.5901	132.1125	141.7403	153.8936	165.3161	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	(71)
Water heating gains (Table 5)												
139.8294	137.7335	133.7582	127.0838	121.7525	114.5677	108.9830	114.6843	117.3136	124.5059	133.1383	139.5829	(72)
Total internal gains												
452.8357	461.8917	444.0367	430.6456	410.2498	394.5538	378.4270	382.3337	392.3966	406.3055	430.0024	444.9583	(73)

6. Solar gains												
[Jan]												
	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
North	2.5100	10.6334	0.3500	0.8500	0.7700	5.5026	(74)					
South	8.1400	46.7521	0.3500	0.8500	0.7700	78.4595	(78)					
Solar gains	83.9620	139.0121	181.5504	213.6975	231.4410	226.9125	219.9096	206.6932	192.4688	151.1130	99.7894	72.3834 (83)
Total gains	536.7977	600.9038	625.5870	644.3431	641.6908	621.4663	598.3366	589.0269	584.8654	557.4185	529.7917	517.3417 (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, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	69.8941	70.3828	70.8784	73.4648	74.0049	76.8290	76.8290	77.4199	75.6739	74.0049	72.9325	71.8908
alpha	5.6596	5.6922	5.7252	5.8977	5.9337	6.1219	6.1219	6.1613	6.0449	5.9337	5.8622	5.7927
util living area	0.8690	0.8003	0.7220	0.5895	0.4586	0.3154	0.2253	0.2375	0.3665	0.5823	0.7750	0.8777 (86)
MIT	20.6874	20.8121	20.9022	20.9738	20.9947	20.9996	21.0000	20.9999	20.9990	20.9794	20.8749	20.6855 (87)
Th 2	20.4648	20.4684	20.4719	20.4896	20.4932	20.5110	20.5110	20.5146	20.5039	20.4932	20.4861	20.4790 (88)
util rest of house	0.8558	0.7836	0.7018	0.5667	0.4342	0.2914	0.2003	0.2124	0.3403	0.5562	0.7552	0.8653 (89)
MIT 2	20.1094	20.2597	20.3671	20.4633	20.4884	20.5107	20.5110	20.5145	20.5030	20.4734	20.3512	20.1202 (90)
Living area fraction									fLA = Living area / (4) =			0.5708 (91)
MIT	20.4393	20.5750	20.6726	20.7547	20.7774	20.7898	20.7901	20.7916	20.7861	20.7622	20.6502	20.4429 (92)
Temperature adjustment												0.0000
adjusted MIT	20.4393	20.5750	20.6726	20.7547	20.7774	20.7898	20.7901	20.7916	20.7861	20.7622	20.6502	20.4429 (93)

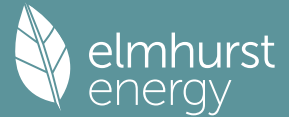
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8552	0.7871	0.7096	0.5786	0.4479	0.3051	0.2146	0.2267	0.3552	0.5702	0.7616	0.8644 (94)
Useful gains	459.0589	472.9447	443.9290	372.8177	287.3902	189.5909	128.3955	133.5409	207.7612	317.8159	403.5079	447.1828 (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	543.6540	524.3482	470.7732	379.9184	288.7870	189.6831	128.4036	133.5520	208.0204	323.3007	437.4226	531.9464 (97)
Space heating kWh	62.9387	34.5432	19.9721	5.1125	1.0392	0.0000	0.0000	0.0000	0.0000	4.0807	24.4186	63.0641 (98a)
Space heating requirement - total per year (kWh/year)												215.1692
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	62.9387	34.5432	19.9721	5.1125	1.0392	0.0000	0.0000	0.0000	0.0000	4.0807	24.4186	63.0641 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												215.1692
Space heating per m2										(98c) / (4) =		3.5862 (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												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	62.9387	34.5432	19.9721	5.1125	1.0392	0.0000	0.0000	0.0000	0.0000	4.0807	24.4186	63.0641 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	62.9387	34.5432	19.9721	5.1125	1.0392	0.0000	0.0000	0.0000	0.0000	4.0807	24.4186	63.0641
Space heating requirement	62.9387	34.5432	19.9721	5.1125	1.0392	0.0000	0.0000	0.0000	0.0000	4.0807	24.4186	63.0641 (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	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00												
310a	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099
Water heating fuel	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099 (310)
Cooling System Energy Efficiency Ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	13.7085	12.3818	13.7085	13.2662	13.7085	13.2662	13.7085	13.7085	13.2662	13.7085	13.2662	13.7085 (313)
Lighting	16.0447	12.8716	11.5895	8.4909	6.5586	5.3585	5.9830	7.7770	10.1015	13.2537	14.9700	16.4906 (332)
Electricity generated by PVs (Appendix M) (negative quantity)	-19.2912	-28.4286	-42.7919	-50.4751	-56.4945	-53.5475	-52.8952	-48.8798	-42.1472	-33.5180	-21.6400	-16.5347 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												215.1692 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2404.8943 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												2.1517 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)												
mechanical ventilation fans (SFP = 0.7000)												161.4060 (330a)
Total electricity for the above, kWh/year												161.4060 (331)
Electricity for lighting (calculated in Appendix L)												129.4896 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-466.6436 (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												2444.3154 (338)

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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			333.0000 (367)
Space and Water heating from Heat pump	786.8058	0.1591	10.2797 (367)
Electrical energy for heat distribution (space & water)	2.1517	0.0000	3.7284 (372)
Overall CO2 factor for heat network			0.0442 (386)
Total CO2 associated with community systems			115.6938 (373)
Space and water heating			115.6938 (376)
Pumps, fans and electric keep-hot	161.4060	0.1387	22.3890 (378)
Energy for lighting	129.4896	0.1443	18.6893 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-466.6436	0.1336	-62.3502
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-62.3502 (380)
Total CO2, kg/year			94.4219 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.5700 (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			333.0000 (467a)
Space and Water heating from Heat pump	786.8058	1.5889	102.6652 (467)
Electrical energy for heat distribution (space & water)	2.1517	0.0000	39.9882 (472)
Overall CO2 factor for heat network			0.4736 (486)
Total CO2 associated with community systems			1240.8363 (473)
Space and water heating			1240.8363 (476)
Pumps, fans and electric keep-hot	161.4060	1.5128	244.1750 (478)
Energy for lighting	129.4896	1.5338	198.6154 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-466.6436	1.4938	-697.0536
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-697.0536 (480)
Total Primary energy kWh/year			986.5731 (483)
Dwelling Primary energy Rate (DPER)			16.4400 (484)

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)
Main dwelling	60.0000	3.1500	189.0000
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.0000		189.0000
Dwelling volume			189.0000

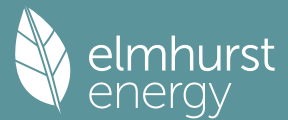
2. Ventilation rate

	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	20.0000 / (5) = 0.1058 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3558 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3558 (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
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
Adj infilt rate	0.4537	0.4448	0.4359	0.3914	0.3825	0.3380	0.3380	0.3291	0.3558	0.3825	0.4003	0.4181
Effective ac	0.6029	0.5989	0.5950	0.5766	0.5732	0.5571	0.5571	0.5542	0.5633	0.5732	0.5801	0.5874

3. Heat losses and heat loss parameter

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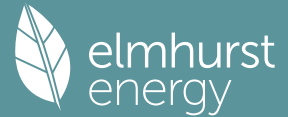
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Main dwelling													
TER Opening Type			10.6500	1.1450	12.1947			(27)					
External Wall North	18.0200	2.5100	15.5100	0.1800	2.7918			(29a)					
External Wall South	35.1500	8.1400	27.0100	0.1800	4.8618			(29a)					
Total net area of external elements Aum(A, m2)			53.1700					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.8483			(33)					
Main dwelling													
Party Wall 1 East			22.4900	0.0000	0.0000			(32)					
Party Wall 2 West			21.8000	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							151.2632	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value		Total						
E7 Party floor between dwellings (in blocks of flats)				41.5000	0.0700		2.9050						
E18 Party wall between dwellings				12.6000	0.0600		0.7560						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)													
Point Thermal bridges						(36a) =	3.6610	(36)					
Total fabric heat loss						(33) + (36) + (36a) =	23.5093	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 37.6034	Feb 37.3542	Mar 37.1099	Apr 35.9624	May 35.7477	Jun 34.7483	Jul 34.7483	Aug 34.5632	Sep 35.1333	Oct 35.7477	Nov 36.1820	Dec 36.6361	(38)
Heat transfer coeff	61.1127	60.8634	60.6191	59.4717	59.2570	58.2576	58.2576	58.0725	58.6425	59.2570	59.6913	60.1453	(39)
Average = Sum(39)m / 12 =												59.4706	
HLP	Jan 1.0185	Feb 1.0144	Mar 1.0103	Apr 0.9912	May 0.9876	Jun 0.9710	Jul 0.9710	Aug 0.9679	Sep 0.9774	Oct 0.9876	Nov 0.9949	Dec 1.0024	(40)
HLP (average)												0.9912	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)													
Assumed occupancy													1.9816 (42)
Hot water usage for mixer showers													
57.4451	56.5818	55.3238	52.9169	51.1406	49.1598	48.0339	49.2823	50.6509	52.7777	55.2363	57.2250	57.2250	(42a)
Hot water usage for baths													
24.8265	24.4578	23.9386	22.9812	22.2644	21.4695	21.0401	21.5557	22.1171	22.9676	23.9447	24.7426	24.7426	(42b)
Hot water usage for other uses													
34.9239	33.6540	32.3840	31.1140	29.8441	28.5741	28.5741	29.8441	31.1140	32.3840	33.6540	34.9239	34.9239	(42c)
Average daily hot water use (litres/day)													107.7295 (43)
Daily hot water use	Jan 117.1955	Feb 114.6935	Mar 111.6463	Apr 107.0121	May 103.2491	Jun 99.2034	Jul 97.6481	Aug 100.6821	Sep 103.8820	Oct 108.1293	Nov 112.8350	Dec 116.8914	(44)
Energy conte	185.6090	163.3220	171.5963	146.4943	138.9931	121.9821	118.0969	124.6655	128.0969	146.7305	160.7541	183.0237	(45)
Energy content (annual)										Total = Sum(45)m =		1789.3645	
Distribution loss (46)m = 0.15 x (45)m													
27.8413	24.4983	25.7394	21.9741	20.8490	18.2973	17.7145	18.6998	19.2145	22.0096	24.1131	27.4536	27.4536	(46)
Water storage loss:													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.3938 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.7527 (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	232.2039	205.4077	218.1912	191.5861	185.5880	167.0740	164.6918	171.2604	173.1888	193.3254	205.8460	229.6186	(62)
WWHRS	-26.2615	-23.2259	-24.3208	-20.1386	-18.7684	-16.0603	-15.0540	-16.0084	-16.6166	-19.5891	-22.1921	-25.7752	(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	205.9424	182.1819	193.8704	171.4475	166.8196	151.0137	149.6379	155.2520	156.5722	173.7363	183.6539	203.8435	(64)
Total 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	98.9909	87.9731	94.3317	84.7828	83.4911	76.6325	76.5432	78.7272	78.6657	86.0638	89.5242	98.1313	(65)

5. Internal gains (see Table 5 and 5a)													
Metabolic gains (Table 5), Watts													
(66)m	Jan 99.0817	Feb 99.0817	Mar 99.0817	Apr 99.0817	May 99.0817	Jun 99.0817	Jul 99.0817	Aug 99.0817	Sep 99.0817	Oct 99.0817	Nov 99.0817	Dec 99.0817	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	89.2975	88.8651	89.2975	92.2741	89.2975	92.2741	89.2975	89.2975	92.2741	89.2975	92.2741	89.2975	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	172.9469	174.7416	170.2191	160.5914	148.4380	137.0156	129.3847	127.5901	132.1125	141.7403	153.8936	165.3161	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	(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)	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	(71)
Water heating gains (Table 5)	133.0523	130.9124	126.7899	117.7539	112.2193	106.4341	102.8806	105.8161	109.2579	115.6772	124.3392	131.8969	(72)
Total internal gains	451.0213	460.2436	442.0311	426.3439	405.6793	388.4483	374.2874	375.4283	386.3691	402.4395	426.2315	442.2350	(73)

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

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		W/m2	or Table 6b	or Table 6c	Table 6d	

North	2.5100	10.6334	0.6300	0.7000	0.7700	8.1568 (74)
South	8.1400	46.7521	0.6300	0.7000	0.7700	116.3046 (78)

Solar gains	124.4614	206.0650	269.1217	316.7752	343.0772	336.3645	325.9837	306.3922	285.3067	224.0028	147.9231	107.2978 (83)
Total gains	575.4827	666.3086	711.1528	743.1191	748.7565	724.8128	700.2710	681.8205	671.6758	626.4423	574.1545	549.5328 (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	41.2525	41.4215	41.5884	42.3908	42.5444	43.2743	43.2743	43.4122	42.9902	42.5444	42.2349	41.9160
alpha	3.7502	3.7614	3.7726	3.8261	3.8363	3.8850	3.8850	3.8941	3.8660	3.8363	3.8157	3.7944
util living area	0.9455	0.9108	0.8651	0.7799	0.6584	0.4948	0.3613	0.3855	0.5655	0.7867	0.9090	0.9522 (86)
MIT	19.7177	19.9948	20.2884	20.6201	20.8424	20.9612	20.9910	20.9883	20.9325	20.6649	20.1661	19.6830 (87)
Th 2	20.0679	20.0714	20.0747	20.0907	20.0937	20.1076	20.1076	20.1102	20.1022	20.0937	20.0876	20.0813 (88)
util rest of house	0.9362	0.8965	0.8439	0.7470	0.6104	0.4321	0.2901	0.3136	0.5026	0.7486	0.8921	0.9439 (89)
MIT 2	18.6007	18.9442	19.3038	19.7064	19.9531	20.0807	20.1034	20.1044	20.0519	19.7676	19.1733	18.5672 (90)
Living area fraction	19.2383	19.5439	19.8659	20.2280	20.4607	20.5833	20.6101	20.6090	20.5546	20.2798	19.7400	19.2042 (91)
MIT	19.2383	19.5439	19.8659	20.2280	20.4607	20.5833	20.6101	20.6090	20.5546	20.2798	19.7400	19.2042 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2383	19.5439	19.8659	20.2280	20.4607	20.5833	20.6101	20.6090	20.5546	20.2798	19.7400	19.2042 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9263	0.8873	0.8387	0.7522	0.6305	0.4660	0.3305	0.3542	0.5350	0.7569	0.8848	0.9344 (94)
Useful gains	533.0504	591.2013	596.4209	559.0088	472.0661	337.7409	231.4180	241.5191	359.3459	474.1616	508.0052	513.4667 (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	912.9216	891.2796	810.2271	673.6959	519.1345	348.5729	233.6162	244.4251	378.5151	573.5948	754.4986	902.4299 (97)
Space heating kWh	282.6242	201.6526	159.0718	82.5747	35.0189	0.0000	0.0000	0.0000	0.0000	73.9784	177.4753	289.3886 (98a)
Space heating requirement - total per year (kWh/year)												1301.7846
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	282.6242	201.6526	159.0718	82.5747	35.0189	0.0000	0.0000	0.0000	0.0000	73.9784	177.4753	289.3886 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1301.7846
Space heating per m2										(98c) / (4) =		21.6964 (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	282.6242	201.6526	159.0718	82.5747	35.0189	0.0000	0.0000	0.0000	0.0000	73.9784	177.4753	289.3886 (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)	306.2017	218.4752	172.3422	89.4634	37.9403	0.0000	0.0000	0.0000	0.0000	80.1499	192.2809	313.5305 (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	205.9424	182.1819	193.8704	171.4475	166.8196	151.0137	149.6379	155.2520	156.5722	173.7363	183.6539	203.8435 (64)
Efficiency of water heater (217)m	84.7700	84.2880	83.6197	82.5187	81.2284	79.8000	79.8000	79.8000	79.8000	82.2908	83.9831	79.8000 (216)
Fuel for water heating, kWh/month	242.9425	216.1421	231.8478	207.7681	205.3711	189.2402	187.5162	194.5514	196.2057	211.1249	218.6796	84.8453 (217)
Space cooling fuel requirement												

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	18.5543	14.8849	13.4022	9.8190	7.5845	6.1966	6.9188	8.9934	11.6815	15.3268	17.3115	19.0699 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-9.9698	-15.2187	-23.6641	-28.8568	-33.1506	-31.7048	-31.3272	-28.5528	-24.0440	-18.3559	-11.3677	-8.4898 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
(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)	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)
(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)	-2.5805	-5.6189	-11.5335	-17.8749	-24.1866	-24.5009	-24.2061	-20.2339	-14.4981	-8.2042	-3.4982	-2.0263 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
(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)	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	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1410.3841 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.8000

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Water heating fuel used	2541.6427 (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)	149.7435 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-423.6643 (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	3764.1061 (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	1410.3841	0.2100	296.1807 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2541.6427	0.2100	533.7450 (264)
Space and water heating			829.9256 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	149.7435	0.1443	21.6126 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-264.7021	0.1330	-35.1930
PV Unit electricity exported	-158.9622	0.1250	-19.8698
Total			-55.0628 (269)
Total CO2, kg/year			808.4047 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.4700 (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	1410.3841	1.1300	1593.7341 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2541.6427	1.1300	2872.0563 (278)
Space and water heating			4465.7904 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	149.7435	1.5338	229.6816 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-264.7021	1.4913	-394.7446
PV Unit electricity exported	-158.9622	0.4588	-72.9290
Total			-467.6737 (283)
Total Primary energy kWh/year			4357.8991 (286)
Target Primary Energy Rate (TPER)			72.6300 (287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF FABRIC ENERGY EFFICIENCY

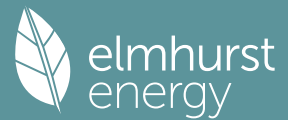
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	60.0000 (1b)	3.1500 (2b)	189.0000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	189.0000 (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	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) = 0.1058 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2558 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2558 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3262	0.3198	0.3134	0.2814	0.2750	0.2430	0.2430	0.2366	0.2558	0.2750	0.2878	0.3006 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5532	0.5511	0.5491	0.5396	0.5378	0.5295	0.5295	0.5280	0.5327	0.5378	0.5414	0.5452 (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							
Glazing			10.6500	0.7752	8.2558		(27)
External Wall North	18.0200	2.5100	15.5100	0.1400	2.1714	70.0000	1085.7000 (29a)
External Wall South	35.1500	8.1400	27.0100	0.1400	3.7814	70.0000	1890.7000 (29a)
Total net area of external elements Aum(A, m ²)			53.1700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		14.2086		(33)
Main dwelling							
Party Wall 1 East			22.4900	0.0000	0.0000	45.0000	1012.0500 (32)
Party Wall 2 West			21.8000	0.0000	0.0000	45.0000	981.0000 (32)
Party Floor 1			60.0000			30.0000	1800.0000 (32d)
Party Ceiling 1			60.0000			30.0000	1800.0000 (32b)
Internal Wall 1			56.2600			9.0000	506.3400 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		9075.7900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							151.2632 (35)
List of Thermal Bridges							
K1 Element				Length 41.5000	Psi-value 0.0300	Total 1.2450	
E7 Party floor between dwellings (in blocks of flats)							
E18 Party wall between dwellings				12.6000	0.0300	0.3780	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							1.6230 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	15.8316 (37)

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

(38)m	Jan 34.5027	Feb 34.3739	Mar 34.2476	Apr 33.6545	May 33.5435	Jun 33.0269	Jul 33.0269	Aug 32.9312	Sep 33.2259	Oct 33.5435	Nov 33.7680	Dec 34.0027 (38)
Heat transfer coeff	50.3343	50.2055	50.0792	49.4861	49.3751	48.8585	48.8585	48.7628	49.0575	49.3751	49.5996	49.8343 (39)
Average = Sum(39)m / 12 =												49.4855

HLP	Jan 0.8389	Feb 0.8368	Mar 0.8347	Apr 0.8248	May 0.8229	Jun 0.8143	Jul 0.8143	Aug 0.8127	Sep 0.8176	Oct 0.8229	Nov 0.8267	Dec 0.8306 (40)
HLP (average)												0.8248
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

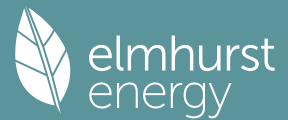
4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9816 (42)
Hot water usage for mixer showers												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	24.2730	23.9066	23.3854	22.6047	21.9012	20.9327	20.1980	21.0965	21.5680	22.5276	23.5253	24.2538 (42b)
Hot water usage for other uses	34.9239	33.6540	32.3840	31.1140	29.8441	28.5741	28.5741	29.8441	31.1140	32.3840	33.6540	34.9239 (42c)
Average daily hot water use (litres/day)												54.2559 (43)
Daily hot water use	Jan 59.1970	Feb 57.5606	Mar 55.7694	Apr 53.7188	May 51.7453	Jun 49.5068	Jul 48.7721	Aug 50.9405	Sep 52.6820	Oct 54.9116	Nov 57.1793	Dec 59.1777 (44)
Energy conte	87.1481	76.1643	79.6933	70.1701	66.6790	57.2530	53.8946	59.9579	61.1085	70.7591	77.2797	86.9068 (45)
Energy content (annual)										Total = Sum(45)m =		847.0145
Distribution loss (46)m = 0.15 x (45)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 (46)
Water storage 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	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	74.0759	64.7397	67.7393	59.6446	56.6772	48.6651	45.8104	50.9642	51.9422	60.1453	65.6877	73.8708 (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	74.0759	64.7397	67.7393	59.6446	56.6772	48.6651	45.8104	50.9642	51.9422	60.1453	65.6877	73.8708 (64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				719.9624 (64)
Electric shower(s)	46.0039	40.9899	44.7594	42.7133	43.5148	41.5089	42.8925	43.5148	42.7133	44.7594	43.9177	46.0039 (64a)
Heat gains from water heating, kWh/month	30.0200	26.4324	28.1247	25.5895	25.0480	22.5435	22.1757	23.6198	23.6639	26.2262	27.4014	29.9687 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan 99.0817	Feb 99.0817	Mar 99.0817	Apr 99.0817	May 99.0817	Jun 99.0817	Jul 99.0817	Aug 99.0817	Sep 99.0817	Oct 99.0817	Nov 99.0817	Dec 99.0817 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	87.3348	96.6921	87.3348	90.2460	87.3348	90.2460	87.3348	87.3348	90.2460	87.3348	90.2460	87.3348 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	172.9469	174.7416	170.2191	160.5914	148.4380	137.0156	129.3847	127.5901	132.1125	141.7403	153.8936	165.3161 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082 (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)												

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	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654 (71)
Water heating gains (Table 5)	40.3494	39.3339	37.8020	35.5409	33.6667	31.3104	29.8061	31.7470	32.8665	35.2502	38.0574	40.2805 (72)
Total internal gains	353.3557	363.4921	348.0804	339.1028	322.1640	311.2965	299.2501	299.3964	307.9495	317.0498	334.9216	345.6558 (73)

6. Solar gains

[Jan]	Area m2		Solar flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
North	2.5100		10.6334		0.3500		0.8500		0.7700		5.5026 (74)	
South	8.1400		46.7521		0.3500		0.8500		0.7700		78.4595 (78)	
Solar gains	83.9620	139.0121	181.5504	213.6975	231.4410	226.9125	219.9096	206.6932	192.4688	151.1130	99.7894	72.3834 (83)
Total gains	437.3177	502.5042	529.6308	552.8003	553.6050	538.2090	519.1598	506.0896	500.4183	468.1628	434.7109	418.0393 (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	50.0862	50.2147	50.3413	50.9447	51.0592	51.5991	51.5991	51.7003	51.3898	51.0592	50.8281	50.5887
alpha	4.3391	4.3476	4.3561	4.3963	4.4039	4.4399	4.4399	4.4467	4.4260	4.4039	4.3885	4.3726
util living area	0.9710	0.9480	0.9161	0.8457	0.7318	0.5579	0.4092	0.4365	0.6323	0.8505	0.9467	0.9754 (86)
MIT	19.8224	20.0598	20.3170	20.6268	20.8463	20.9646	20.9928	20.9903	20.9372	20.6721	20.2106	19.7813 (87)
Th 2	20.2197	20.2216	20.2234	20.2319	20.2335	20.2409	20.2409	20.2423	20.2381	20.2335	20.2303	20.2269 (88)
util rest of house	0.9658	0.9393	0.9020	0.8205	0.6902	0.4989	0.3407	0.3674	0.5747	0.8214	0.9364	0.9710 (89)
MIT 2	19.1470	19.3797	19.6295	19.9272	20.1220	20.2208	20.2381	20.2383	20.1996	19.9744	19.5365	19.1123 (90)
Living area fraction	19.5326	19.7679	20.0220	20.3266	20.5354	20.6454	20.6689	20.6676	20.6206	20.3726	19.9213	19.4942 (92)
Temperature adjustment	19.5326	19.7679	20.0220	20.3266	20.5354	20.6454	20.6689	20.6676	20.6206	20.3726	19.9213	19.4942 (93)
adjusted MIT	19.5326	19.7679	20.0220	20.3266	20.5354	20.6454	20.6689	20.6676	20.6206	20.3726	19.9213	19.4942 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9604	0.9335	0.8979	0.8238	0.7072	0.5309	0.3796	0.4065	0.6043	0.8270	0.9316	0.9660 (94)
Useful gains	420.0165	469.0846	475.5726	455.3906	391.5165	285.7158	197.0611	205.7246	302.4196	387.1926	404.9742	403.8178 (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	766.7211	746.4495	677.1684	565.4554	436.2506	295.3691	198.7995	208.0984	319.8850	482.5242	635.9312	762.1757 (97)
Space heating kWh	257.9482	186.3892	149.9872	79.2467	33.2821	0.0000	0.0000	0.0000	0.0000	70.9267	166.2890	266.6182 (98a)
Space heating requirement - total per year (kWh/year)												1210.6874 (88)
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 (88)
Space heating kWh	257.9482	186.3892	149.9872	79.2467	33.2821	0.0000	0.0000	0.0000	0.0000	70.9267	166.2890	266.6182 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1210.6874 (99)
Space heating per m2										(98c) / (4) =		20.1781 (99)

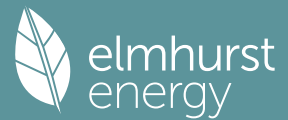
8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	459.2699	361.5529	370.5975	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9053	0.9491	0.9407	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	415.7939	343.1335	348.6176	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	597.1793	576.7159	563.0061	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	130.5975	173.7853	159.5050	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	32.6494	43.4463	39.8763	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												115.9719 (107)
Energy for space heating												20.1781 (99)
Energy for space cooling												1.9329 (108)
Total												22.1110 (109)
Fabric Energy Efficiency (DFEE)												22.1 (109)

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

1. Overall dwelling characteristics

Full SAP Calculation Printout



Main dwelling		Area (m ²)	Storey height (m)	Volume (m ³)	
Ground floor		60.0000 (1b)	x 3.1500 (2b)	= 189.0000 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.0000				(4)
Dwelling volume		(3a) + (3b) + (3c) + (3d) + (3e) ... (3n) =		189.0000 (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) =		0.1058 (8)
Pressure test													Yes
Pressure Test Method													Blower Door
Measured/design AP50													5.0000 (17)
Infiltration rate													0.3558 (18)
Number of sides sheltered													0 (19)
Shelter factor													(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor													(21) = (18) x (20) = 0.3558 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	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	0.4537	0.4448	0.4359	0.3914	0.3825	0.3380	0.3380	0.3291	0.3558	0.3825	0.4003	0.4181	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													0.0000 (23c)
Effective ac	0.6029	0.5989	0.5950	0.5766	0.5732	0.5571	0.5571	0.5542	0.5633	0.5732	0.5801	0.5874	(25)

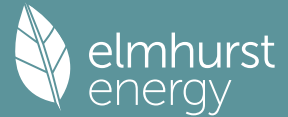
3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K						
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K						
TER Opening Type			10.6500	1.1450	12.1947			(27)					
External Wall North	18.0200	2.5100	15.5100	0.1800	2.7918			(29a)					
External Wall South	35.1500	8.1400	27.0100	0.1800	4.8618			(29a)					
Total net area of external elements Aum(A, m2)			53.1700					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.8483			(33)					
Main dwelling													
Party Wall 1 East			22.4900	0.0000	0.0000			(32)					
Party Wall 2 West			21.8000	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								151.2632 (35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
E7 Party floor between dwellings (in blocks of flats)				41.5000	0.0700	2.9050							
E18 Party wall between dwellings				12.6000	0.0600	0.7560							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								3.6610 (36)					
Point Thermal bridges						(36a) =		0.0000					
Total fabric heat loss					(33) + (36) + (36a) =			23.5093 (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	
	37.6034	37.3542	37.1099	35.9624	35.7477	34.7483	34.7483	34.5632	35.1333	35.7477	36.1820	36.6361	(38)
Heat transfer coeff	61.1127	60.8634	60.6191	59.4717	59.2570	58.2576	58.2576	58.0725	58.6425	59.2570	59.6913	60.1453	(39)
Average = Sum(39)m / 12 =												59.4706	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	1.0185	1.0144	1.0103	0.9912	0.9876	0.9710	0.9710	0.9679	0.9774	0.9876	0.9949	1.0024	(40)
HLP (average)												0.9912	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.9816 (42)
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	24.8265	24.4578	23.9386	22.9812	22.2644	21.4695	21.0401	21.5557	22.1171	22.9676	23.9447	24.7426	(42b)
Hot water usage for other uses													
	34.9239	33.6540	32.3840	31.1140	29.8441	28.5741	28.5741	29.8441	31.1140	32.3840	33.6540	34.9239	(42c)
Average daily hot water use (litres/day)												54.7671	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	59.7504	58.1117	56.3226	54.0952	52.1084	50.0436	49.6143	51.3998	53.2311	55.3516	57.5987	59.6665	(44)
Energy conte	94.6300	82.7503	86.5657	74.0537	70.1480	61.5345	60.0041	63.6437	65.6393	75.1117	82.0599	93.4233	(45)
Energy content (annual)													909.5641
Distribution loss (46)m = 0.15 x (45)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	(46)
Water storage 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	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)

Full SAP Calculation Printout



Total heat required for water heating calculated for each month												
	80.4355	70.3378	73.5808	62.9456	59.6258	52.3043	51.0035	54.0971	55.7934	63.8449	69.7509	79.4098 (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	80.4355	70.3378	73.5808	62.9456	59.6258	52.3043	51.0035	54.0971	55.7934	63.8449	69.7509	79.4098 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											773.1295 (64)
Electric shower(s)	46.0039	40.9899	44.7594	42.7133	43.5148	41.5089	42.8925	43.5148	42.7133	44.7594	43.9177	46.0039 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											523.2919 (64a)
Heat gains from water heating, kWh/month	31.6099	27.8319	29.5850	26.4147	25.7852	23.4533	23.4740	24.4030	24.6267	27.1511	28.4172	31.3534 (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	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	89.2975	98.8651	89.2975	92.2741	89.2975	92.2741	89.2975	89.2975	92.2741	89.2975	92.2741	89.2975 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	172.9469	174.7416	170.2191	160.5914	148.4380	137.0156	129.3847	127.5901	132.1125	141.7403	153.8936	165.3161 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082 (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)												
	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654 (71)
Water heating gains (Table 5)												
	42.4864	41.4165	39.7648	36.6871	34.6575	32.5740	31.5511	32.7997	34.2037	36.4934	39.4683	42.1417 (72)
Total internal gains	357.4554	367.7478	352.0060	342.2771	325.1175	314.5883	302.9579	302.4118	311.3149	320.2557	338.3605	349.4798 (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				2.5100	10.6334		0.6300		0.7000		0.7700	8.1568 (74)
South				8.1400	46.7521		0.6300		0.7000		0.7700	116.3046 (78)
Solar gains	124.4614	206.0650	269.1217	316.7752	343.0772	336.3645	325.9837	306.3922	285.3067	224.0028	147.9231	107.2978 (83)
Total gains	481.9167	573.8128	621.1277	659.0523	668.1947	650.9527	628.9416	608.8041	596.6216	544.2585	486.2836	456.7776 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	41.2525	41.4215	41.5884	42.3908	42.5444	43.2743	43.2743	43.4122	42.9902	42.5444	42.2349	41.9160
alpha	3.7502	3.7614	3.7726	3.8261	3.8363	3.8850	3.8850	3.8941	3.8660	3.8363	3.8157	3.7944
util living area	0.9674	0.9399	0.9022	0.8261	0.7109	0.5427	0.4001	0.4286	0.6209	0.8394	0.9417	0.9724 (86)
MIT	19.5080	19.8130	20.1406	20.5250	20.7935	20.9466	20.9872	20.9832	20.9069	20.5673	19.9928	19.4692 (87)
Th 2	20.0679	20.0714	20.0747	20.0907	20.0937	20.1076	20.1076	20.1102	20.1022	20.0937	20.0876	20.0813 (88)
util rest of house												
	0.9614	0.9294	0.8852	0.7966	0.6637	0.4764	0.3221	0.3499	0.5559	0.8061	0.9297	0.9673 (89)
MIT 2	18.7214	19.0204	19.3381	19.7097	19.9474	20.0783	20.1028	20.1035	20.0469	19.7576	19.2122	18.6936 (90)
Living area fraction												
	fLA = Living area / (4) =											
MIT	19.1704	19.4728	19.7962	20.1751	20.4304	20.5740	20.6076	20.6056	20.5378	20.2198	19.6578	19.1364 (92)
Temperature adjustment												
adjusted MIT	19.1704	19.4728	19.7962	20.1751	20.4304	20.5740	20.6076	20.6056	20.5378	20.2198	19.6578	19.1364 (93)

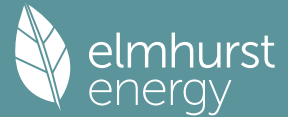
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9542	0.9215	0.8794	0.7996	0.6820	0.5117	0.3662	0.3942	0.5884	0.8112	0.9230	0.9607 (94)
Useful gains	459.8584	528.7758	546.2099	526.9721	455.6885	333.1066	230.3257	240.0108	351.0406	441.4873	448.8596	438.8307 (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	908.7710	886.9509	806.0029	670.5500	517.3351	348.0288	233.4750	244.2316	377.5313	570.0391	749.5909	898.3520 (97)
Space heating kWh	333.9910	240.6937	193.2860	103.3761	45.8650	0.0000	0.0000	0.0000	0.0000	95.6425	216.5265	341.8839 (98a)
Space heating requirement - total per year (kWh/year)												
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)												
Space heating kWh	333.9910	240.6937	193.2860	103.3761	45.8650	0.0000	0.0000	0.0000	0.0000	95.6425	216.5265	341.8839 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												
Space heating per m2	(98c) / (4) =											

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	547.6211	431.1060	441.3510	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8903	0.9362	0.9261	0.0000	0.0000	0.0000	0.0000 (101)

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Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	487.5617	403.6012	408.7399	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	726.5455	702.6291	680.8314	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	172.0684	222.4767	202.4361	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fc = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	43.0171	55.6192	50.6090	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												149.2453	(107)
Energy for space heating												26.1877	(99)
Energy for space cooling												2.4874	(108)
Total												28.6752	(109)
Fabric Energy Efficiency (TFEE)												28.7	(109)

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

1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	60.0000 (1b)	x 3.1500 (2b)	= 189.0000 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.0000		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	189.0000 (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											3.0000	(17)	
Infiltration rate											0.1500	(18)	
Number of sides sheltered											0	(19)	
Shelter factor											(20) = 1 - [0.075 x (19)] =	1.0000 (20)	
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1500 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
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													
	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762	(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	0.2862	0.2825	0.2787	0.2600	0.2562	0.2375	0.2375	0.2337	0.2450	0.2562	0.2637	0.2712	(25)

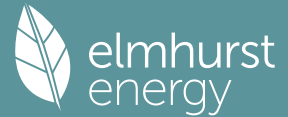
3. Heat losses and heat loss parameter

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								
Glazing			10.6500	0.7752	8.2558			(27)
External Wall North	18.0200	2.5100	15.5100	0.1400	2.1714	70.0000	1085.7000	(29a)
External Wall South	35.1500	8.1400	27.0100	0.1400	3.7814	70.0000	1890.7000	(29a)
Total net area of external elements Aum(A, m2)			53.1700					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	14.2086		(33)
Main dwelling								
Party Wall 1 East			22.4900	0.0000	0.0000	45.0000	1012.0500	(32)
Party Wall 2 West			21.8000	0.0000	0.0000	45.0000	981.0000	(32)
Party Floor 1			60.0000			30.0000	1800.0000	(32d)
Party Ceiling 1			60.0000			30.0000	1800.0000	(32b)
Internal Wall 1			56.2600			9.0000	506.3400	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		9075.7900	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							151.2632	(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		
E7 Party floor between dwellings (in blocks of flats)				41.5000	0.0300	1.2450		
E18 Party wall between dwellings				12.6000	0.0300	0.3780		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							1.6230	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		15.8316	(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
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(38)m	17.8534	17.6195	17.3856	16.2162	15.9823	14.8129	14.8129	14.5790	15.2806	15.9823	16.4501	16.9179 (38)
Heat transfer coeff	33.6850	33.4511	33.2173	32.0478	31.8139	30.6445	30.6445	30.4106	31.1123	31.8139	32.2817	32.7495 (39)
Average = Sum(39)m / 12 =												31.9893
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.5614	0.5575	0.5536	0.5341	0.5302	0.5107	0.5107	0.5068	0.5185	0.5302	0.5380	0.5458 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	0.5332 (40)
												31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9816 (42)
Hot water usage for mixer showers	62.9929	62.0285	60.6072	58.4208	56.4618	53.7212	51.5536	54.0877	55.3622	58.0767	60.9035	62.9361 (42a)
Hot water usage for baths	24.2730	23.9066	23.3854	22.6047	21.9012	20.9327	20.1980	21.0965	21.5680	22.5276	23.5253	24.2538 (42b)
Hot water usage for other uses	34.9239	33.6540	32.3840	31.1140	29.8441	28.5741	28.5741	29.8441	31.1140	32.3840	33.6540	34.9239 (42c)
Average daily hot water use (litres/day)												112.3305 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	122.1899	119.5891	116.3766	112.1396	108.2071	103.2281	100.3257	105.0282	108.0442	112.9883	118.0828	122.1138 (44)
Energy content (annual)	179.8846	158.2406	166.2998	146.4823	139.4358	119.3798	110.8628	123.6201	125.3259	145.5968	159.5928	179.3331 (45)
Distribution loss (46)m = 0.15 x (45)m	26.9827	23.7361	24.9450	21.9723	20.9154	17.9070	16.6294	18.5430	18.7989	21.8395	23.9389	26.9000 (46)
Water storage loss:												
Store volume												110.0000 (47)
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	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099 (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	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099 (64)
Total per year (kWh/year) = Sum(64)m =												2404.8943 (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	104.0331	92.5569	99.5161	91.5003	90.5838	82.4887	81.0833	85.3251	84.4658	92.6324	95.8596	103.8497 (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	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3306	16.2811	13.2407	10.0240	7.4931	6.3260	6.8354	8.8850	11.9254	15.1420	17.6729	18.8401 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	258.1297	260.8083	254.0584	239.6886	221.5493	204.5009	193.1115	190.4330	197.1829	211.5527	229.6920	246.7404 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714 (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)	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654 (71)
Water heating gains (Table 5)	139.8294	137.7335	133.7582	127.0838	121.7525	114.5677	108.9830	114.6843	117.3136	124.5059	133.1383	139.5829 (72)
FGHRS	504.7939	503.3271	489.5614	465.3005	439.2990	413.8987	397.4341	402.5064	414.9260	439.7047	469.0073	493.6675 (73)

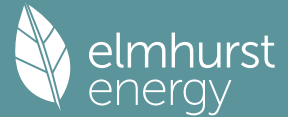
6. Solar gains

[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					2.5100	10.6334		0.3500	0.8500	0.7700		5.5026 (74)	
South					8.1400	46.7521		0.3500	0.8500	0.7700		78.4595 (78)	
Solar gains	83.9620	139.0121	181.5504	213.6975	231.4410	226.9125	219.9096	206.6932	192.4688	151.1130	99.7894	72.3834 (83)	
Total gains	588.7559	642.3392	671.1118	678.9981	670.7399	640.8112	617.3437	609.1995	607.3948	590.8177	568.7967	566.0509 (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	74.8419	75.3652	75.8959	78.6654	79.2437	82.2677	82.2677	82.9005	81.0308	79.2437	78.0954	76.9799
alpha	5.9895	6.0243	6.0597	6.2444	6.2829	6.4845	6.4845	6.5267	6.4021	6.2829	6.2064	6.1320
util living area	0.8367	0.7724	0.6877	0.5636	0.4397	0.3060	0.2184	0.2296	0.3531	0.5535	0.7422	0.8473 (86)

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MIT	20.7848	20.8694	20.9378	20.9841	20.9970	20.9998	21.0000	21.0000	20.9994	20.9880	20.9177	20.7817 (87)
Th 2	20.4648	20.4684	20.4719	20.4896	20.4932	20.5110	20.5110	20.5146	20.5039	20.4932	20.4861	20.4790 (88)
util rest of house												
	0.8214	0.7545	0.6669	0.5412	0.4161	0.2826	0.1941	0.2054	0.3278	0.5279	0.7212	0.8328 (89)
MIT 2	20.2243	20.3256	20.4064	20.4740	20.4905	20.5109	20.5110	20.5146	20.5034	20.4819	20.3990	20.2340 (90)
Living area fraction									fLA = Living area / (4) =			0.5708 (91)
MIT	20.5443	20.6360	20.7098	20.7652	20.7796	20.7900	20.7901	20.7916	20.7866	20.7708	20.6951	20.5466 (92)
Temperature adjustment												0.0000
adjusted MIT	20.5443	20.6360	20.7098	20.7652	20.7796	20.7900	20.7901	20.7916	20.7866	20.7708	20.6951	20.5466 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8237	0.7603	0.6763	0.5533	0.4294	0.2959	0.2080	0.2192	0.3423	0.5420	0.7299	0.8347	(94)
Useful gains	484.9822	488.3541	453.9028	375.7052	288.0302	189.6384	128.4003	133.5475	207.8910	320.1993	415.1639	472.4872	(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													
	547.1884	526.3869	472.0096	380.2526	288.8587	189.6882	128.4042	133.5527	208.0345	323.5722	438.8731	535.3441	(97)
Space heating kWh													
	46.2814	25.5580	13.4714	3.2741	0.6164	0.0000	0.0000	0.0000	0.0000	2.5094	17.0706	46.7655	(98a)
Space heating requirement - total per year (kWh/year)												155.5469	
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													
	46.2814	25.5580	13.4714	3.2741	0.6164	0.0000	0.0000	0.0000	0.0000	2.5094	17.0706	46.7655	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												155.5469	
Space heating per m2											(98c) / (4) =	2.5924	(99)

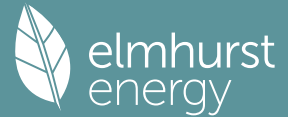
9b. Energy requirements

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												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement												
	46.2814	25.5580	13.4714	3.2741	0.6164	0.0000	0.0000	0.0000	0.0000	2.5094	17.0706	46.7655 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	46.2814	25.5580	13.4714	3.2741	0.6164	0.0000	0.0000	0.0000	0.0000	2.5094	17.0706	46.7655
Space heating requirement												
	46.2814	25.5580	13.4714	3.2741	0.6164	0.0000	0.0000	0.0000	0.0000	2.5094	17.0706	46.7655 (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												
	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00												
310a	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099
Water heating fuel												
	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin												0.0000 (315)
Pumps and Fa	13.7085	12.3818	13.7085	13.2662	13.7085	13.2662	13.7085	13.7085	13.2662	13.7085	13.2662	13.7085 (331)
Lighting	16.0447	12.8716	11.5895	8.4909	6.5586	5.3585	5.9830	7.7770	10.1015	13.2537	14.9700	16.4906 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-19.2912	-28.4286	-42.7919	-50.4751	-56.4945	-53.5475	-52.8952	-48.8798	-42.1472	-33.5180	-21.6400	-16.5347 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												155.5469 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2404.8943 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												1.5555 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)												
mechanical ventilation fans (SFP = 0.7000)												161.4060 (330a)
Total electricity for the above, kWh/year												161.4060 (331)
Electricity for lighting (calculated in Appendix L)												129.4896 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-466.6436 (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												2384.6931 (338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating from Heat pump	155.5469	4.4400	6.9063 (340a)
Space heating total			6.9063 (340)

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Total CO2 associated with community systems			0.0000 (473)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Heat pump	2404.8943	4.4400	106.7773 (342a)
Water heating total			106.7773 (342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (347a)
Pumps, fans and electric keep-hot	161.4060	16.4900	26.6158 (349)
Energy for lighting	129.4896	16.4900	21.3528 (350)
Additional standing charges			92.0000 (351)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-466.6436	16.4900	-76.9495
PV Unit electricity exported	0.0000	5.5900	0.0000
Total			-76.9495 (352)
Total energy cost			176.7027 (355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.6058 (357)
SAP value		90.1794
SAP rating (Section 12)		90 (358)
SAP band		B

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			333.0000 (367)
Space and Water heating from Heat pump	768.9012	0.1593	7.4431 (367)
Electrical energy for heat distribution (space & water)	1.5555	0.0000	3.6340 (372)
Overall CO2 factor for heat network			0.0440 (386)
Total CO2 associated with community systems			112.7627 (373)
Space and water heating			112.7627 (376)
Pumps, fans and electric keep-hot	161.4060	0.1387	22.3890 (378)
Energy for lighting	129.4896	0.1443	18.6893 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-466.6436	0.1336	-62.3502
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-62.3502 (380)
Total CO2, kg/year			91.4908 (383)
CO2 emissions per m2			1.5200 (384)
EI value			98.8324 (384a)
EI rating			99 (385)
EI band			A

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

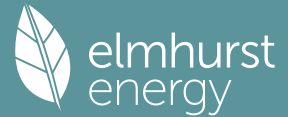
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	60.0000 (1b)	x 3.1500 (2b)	= 189.0000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	189.0000 (5)

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)
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	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.8000	4.5000	4.4000	3.9000	3.9000	3.6000	3.7000	3.5000	3.7000	4.0000	4.1000	4.4000 (22)
Wind factor	1.2000	1.1250	1.1000	0.9750	0.9750	0.9000	0.9250	0.8750	0.9250	1.0000	1.0250	1.1000 (22a)
Adj infilt rate	0.1800	0.1687	0.1650	0.1462	0.1462	0.1350	0.1388	0.1313	0.1388	0.1500	0.1537	0.1650 (22b)
Balanced mechanical ventilation with heat recovery												

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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	0.2750	0.2637	0.2600	0.2412	0.2412	0.2300	0.2337	0.2262	0.2337	0.2450	0.2487	0.2600 (25)
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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								
Glazing			10.6500	0.7752	8.2558			(27)
External Wall North	18.0200	2.5100	15.5100	0.1400	2.1714	70.0000	1085.7000	(29a)
External Wall South	35.1500	8.1400	27.0100	0.1400	3.7814	70.0000	1890.7000	(29a)
Total net area of external elements Aum(A, m2)			53.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		14.2086			(33)
Main dwelling								
Party Wall 1 East			22.4900	0.0000	0.0000	45.0000	1012.0500	(32)
Party Wall 2 West			21.8000	0.0000	0.0000	45.0000	981.0000	(32)
Party Floor 1			60.0000			30.0000	1800.0000	(32d)
Party Ceiling 1			60.0000			30.0000	1800.0000	(32b)
Internal Wall 1			56.2600			9.0000	506.3400	(32c)
Heat capacity Cm = Sum(A x k)								
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								(34)
List of Thermal Bridges								(35)
K1 Element				Length	Psi-value	Total		
E7 Party floor between dwellings (in blocks of flats)				41.5000	0.0300	1.2450		
E18 Party wall between dwellings				12.6000	0.0300	0.3780		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								
Point Thermal bridges							(36a) =	1.6230 (36)
Total fabric heat loss							(33) + (36) + (36a) =	15.8316 (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	17.1517	16.4501	16.2162	15.0468	15.0468	14.3451	14.5790	14.1112	14.5790	15.2806	15.5145	16.2162	(38)
Average = Sum(39)m / 12 =	32.9834	32.2817	32.0478	30.8784	30.8784	30.1767	30.4106	29.9428	30.4106	31.1123	31.3462	32.0478	(39)
												31.2097	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.5497	0.5380	0.5341	0.5146	0.5146	0.5029	0.5068	0.4990	0.5068	0.5185	0.5224	0.5341	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

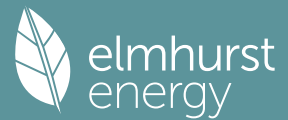
4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.9816 (42)
Hot water usage for mixer showers													
	62.9929	62.0285	60.6072	58.4208	56.4618	53.7212	51.5536	54.0877	55.3622	58.0767	60.9035	62.9361	(42a)
Hot water usage for baths													
	24.2730	23.9066	23.3854	22.6047	21.9012	20.9327	20.1980	21.0965	21.5680	22.5276	23.5253	24.2538	(42b)
Hot water usage for other uses													
	34.9239	33.6540	32.3840	31.1140	29.8441	28.5741	28.5741	29.8441	31.1140	32.3840	33.6540	34.9239	(42c)
Average daily hot water use (litres/day)													112.3305 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	122.1899	119.5891	116.3766	112.1396	108.2071	103.2281	100.3257	105.0282	108.0442	112.9883	118.0828	122.1138	(44)
Energy content (annual)	179.8846	158.2406	166.2998	146.4823	139.4358	119.3798	110.8628	123.6201	125.3259	145.5968	159.5928	179.3331	(45)
Distribution loss (46)m = 0.15 x (45)m													
	26.9827	23.7361	24.9450	21.9723	20.9154	17.9070	16.6294	18.5430	18.7989	21.8395	23.9389	26.9000	(46)
Water storage loss:													
Store volume													110.0000 (47)
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													
	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099	(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													
	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099	(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													
	104.0331	92.5569	99.5161	91.5003	90.5838	82.4887	81.0833	85.3251	84.4658	92.6324	95.8596	103.8497	(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	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	18.3306	16.2811	13.2407	10.0240	7.4931	6.3260	6.8354	8.8850	11.9254	15.1420	17.6729	18.8401	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	258.1297	260.8083	254.0584	239.6886	221.5493	204.5009	193.1115	190.4330	197.1829	211.5527	229.6920	246.7404	(68)
	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	(69)

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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)	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654 (71)
Water heating gains (Table 5)	139.8294	137.7335	133.7582	127.0838	121.7525	114.5677	108.9830	114.6843	117.3136	124.5059	133.1383	139.5829 (72)
Total internal gains	504.7939	503.3271	489.5614	465.3005	439.2990	413.8987	397.4341	402.5064	414.9260	439.7047	469.0073	493.6675 (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	2.5100		12.7054		0.3500		0.8500		0.7700		6.5748 (74)	
South	8.1400		53.5774		0.3500		0.8500		0.7700		89.9137 (78)	
Solar gains	96.4885	141.7867	184.5905	230.4448	242.0170	254.7350	243.5420	229.3662	209.8802	164.7657	115.7229	80.5032 (83)
Total gains	601.2824	645.1138	674.1519	695.7453	681.3159	668.6337	640.9761	631.8726	624.8062	604.4704	584.7303	574.1707 (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	76.4341	78.0954	78.6654	81.6446	81.6446	83.5430	82.9005	84.1956	82.9005	81.0308	80.4262	78.6654
alpha	6.0956	6.2064	6.2444	6.4430	6.4430	6.5695	6.5267	6.6130	6.5267	6.4021	6.3617	6.2444
util living area	0.7974	0.7364	0.6430	0.5071	0.3802	0.2527	0.1708	0.1659	0.2920	0.4764	0.6697	0.8024 (86)
MIT	20.8509	20.9115	20.9629	20.9928	20.9990	21.0000	21.0000	21.0000	20.9999	20.9958	20.9602	20.8583 (87)
Th 2	20.4755	20.4861	20.4896	20.5074	20.5074	20.5181	20.5146	20.5217	20.5146	20.5039	20.5003	20.4896 (88)
util rest of house	0.7801	0.7177	0.6222	0.4860	0.3581	0.2310	0.1478	0.1432	0.2684	0.4516	0.6473	0.7853 (89)
MIT 2	20.3116	20.3906	20.4512	20.5005	20.5066	20.5181	20.5146	20.5217	20.5145	20.5001	20.4595	20.3339 (90)
Living area fraction	20.6195	20.6879	20.7433	20.7815	20.7877	20.7932	20.7917	20.7947	20.7916	20.7830	20.7453	20.6333 (92)
MIT	20.6195	20.6879	20.7433	20.7815	20.7877	20.7932	20.7917	20.7947	20.7916	20.7830	20.7453	20.6333 (93)
Temperature adjustment												0.0000
adjusted MIT	20.6195	20.6879	20.7433	20.7815	20.7877	20.7932	20.7917	20.7947	20.7916	20.7830	20.7453	20.6333 (93)

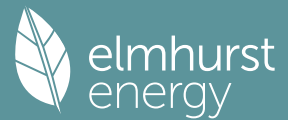
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.7850	0.7251	0.6326	0.4978	0.3707	0.2434	0.1609	0.1561	0.2818	0.4656	0.6584	0.7902 (94)
Useful gains	472.0009	467.7905	426.4814	346.3266	252.5543	162.7364	103.1420	98.6532	176.0920	281.4325	384.9647	453.7274 (95)
Ext temp.	5.0000	5.4000	7.1000	9.5000	12.6000	15.4000	17.4000	17.5000	15.0000	11.7000	8.1000	5.2000 (96)
Heat loss rate W	515.1824	493.5207	437.2371	348.3556	252.8221	162.7478	103.1426	98.6536	176.1246	282.5939	396.3816	494.6026 (97)
Space heating kWh	32.1270	17.2907	8.0023	1.4608	0.1992	0.0000	0.0000	0.0000	0.0000	0.8641	8.2202	30.4111 (98a)
Space heating requirement - total per year (kWh/year)												98.5754
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	32.1270	17.2907	8.0023	1.4608	0.1992	0.0000	0.0000	0.0000	0.0000	0.8641	8.2202	30.4111 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												98.5754
Space heating per m2										(98c) / (4) =		1.6429 (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												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	32.1270	17.2907	8.0023	1.4608	0.1992	0.0000	0.0000	0.0000	0.0000	0.8641	8.2202	30.4111 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	32.1270	17.2907	8.0023	1.4608	0.1992	0.0000	0.0000	0.0000	0.0000	0.8641	8.2202	30.4111
Space heating requirement	32.1270	17.2907	8.0023	1.4608	0.1992	0.0000	0.0000	0.0000	0.0000	0.8641	8.2202	30.4111 (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	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00												
310a	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099
Water heating fuel	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	13.7085	12.3818	13.7085	13.2662	13.7085	13.2662	13.7085	13.7085	13.2662	13.7085	13.2662	13.7085 (331)
Lighting	16.0447	12.8716	11.5895	8.4909	6.5586	5.3585	5.9830	7.7770	10.1015	13.2537	14.9700	16.4906 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-22.1973	-29.6403	-44.3751	-53.8944	-58.6743	-57.5935	-56.5398	-52.7188	-45.4897	-36.5772	-24.9689	-18.5416 (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)												

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(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												98.5754	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2404.8943	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												0.9858	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)													
mechanical ventilation fans (SFP = 0.7000)												161.4060	(330a)
Total electricity for the above, kWh/year												161.4060	(331)
Electricity for lighting (calculated in Appendix L)												129.4896	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-501.2108	(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												2293.1544	(338)

10b. Fuel costs - using BEDF prices (568)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating from Heat pump	98.5754	5.6000	5.5202 (340a)
Space heating total			5.5202 (340)
Total CO2 associated with community systems			0.0000 (473)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Heat pump	2404.8943	5.6000	134.6741 (342a)
Water heating total			134.6741 (342)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (347a)
Pumps, fans and electric keep-hot	161.4060	26.0600	42.0624 (349)
Energy for lighting	129.4896	26.0600	33.7450 (350)
Additional standing charges			99.0000 (351)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-501.2108	26.0600	-130.6155
PV Unit electricity exported	0.0000	5.8100	0.0000
Total			-130.6155 (352)
Total energy cost			184.3861 (355)

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			333.0000 (367)
Space and Water heating from Heat pump	751.7927	0.1601	4.7383 (367)
Electrical energy for heat distribution (space & water)	0.9858	0.0000	3.5439 (372)
Overall CO2 factor for heat network			0.0439 (386)
Total CO2 associated with community systems			109.9678 (373)
Space and water heating			109.9678 (376)
Pumps, fans and electric keep-hot	161.4060	0.1387	22.3890 (378)
Energy for lighting	129.4896	0.1443	18.6893 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-501.2108	0.1337	-67.0104
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-67.0104 (380)
Total CO2, kg/year			84.0358 (383)

13b. Primary energy - Community heating scheme

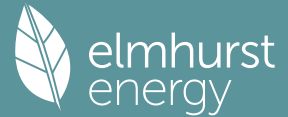
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			333.0000 (467a)
Space and Water heating from Heat pump	751.7927	1.5925	47.1401 (467)
Electrical energy for heat distribution (space & water)	0.9858	0.0000	38.1393 (472)
Overall CO2 factor for heat network			0.4727 (486)
Total CO2 associated with community systems			1183.4621 (473)
Space and water heating			1183.4621 (476)
Pumps, fans and electric keep-hot	161.4060	1.5128	244.1750 (478)
Energy for lighting	129.4896	1.5338	198.6154 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-501.2108	1.4941	-748.8382
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-748.8382 (480)
Total Primary energy kWh/year			877.4143 (483)

SAP 10 EPC IMPROVEMENTS

0302_1B2P_BG

Current energy efficiency rating: B 90
Current environmental impact rating: A 99

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N Solar water heating Not applicable
 U Solar photovoltaic panels Not applicable
 V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
 (none)

Recommended measures Typical annual savings Energy Environmental
 (none) efficiency impact
 Total Savings £0 0.00 kg/m²

Potential energy efficiency rating: B 90
 Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 568 TEST (31 Mar 2025)
 Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, South East England):

	Current	Potential	Saving
Electricity	£76	£76	£0
Community scheme	£239	£239	£0
Space heating	£147	£147	£0
Water heating	£135	£135	£0
Lighting	£34	£34	£0
Generated (PV)	-£131	-£131	£0
Total cost of fuels	£184	£184	£0
Total cost of uses	£185	£185	£0
Delivered energy	38 kWh/m ²	38 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m ²	1 kg/m ²	1 kg/m ²	0 kg/m ²
Primary energy	15 kWh/m ²	15 kWh/m ²	0 kWh/m ²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
 CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	60.0000 (1b)	x 3.1500 (2b)	= 189.0000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 189.0000 (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	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

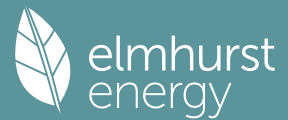
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1500 (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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (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	0.2862	0.2825	0.2787	0.2600	0.2562	0.2375	0.2375	0.2337	0.2450	0.2562	0.2637	0.2712 (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							
Glazing			10.6500	0.7752	8.2558		(27)

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External Wall North	18.0200	2.5100	15.5100	0.1400	2.1714	70.0000	1085.7000 (29a)
External Wall South	35.1500	8.1400	27.0100	0.1400	3.7814	70.0000	1890.7000 (29a)
Total net area of external elements Aum(A, m2)			53.1700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		14.2086		(33)
Main dwelling							
Party Wall 1 East			22.4900	0.0000	0.0000	45.0000	1012.0500 (32)
Party Wall 2 West			21.8000	0.0000	0.0000	45.0000	981.0000 (32)
Party Floor 1			60.0000			30.0000	1800.0000 (32d)
Party Ceiling 1			60.0000			30.0000	1800.0000 (32b)
Internal Wall 1			56.2600			9.0000	506.3400 (32c)

Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) =	9075.7900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								151.2632 (35)
List of Thermal Bridges								
K1 Element					Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)					41.5000	0.0300	1.2450	
E18 Party wall between dwellings					12.6000	0.0300	0.3780	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								1.6230 (36)
Point Thermal bridges							(36a) =	0.0000
Total fabric heat loss							(33) + (36) + (36a) =	15.8316 (37)

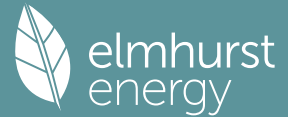
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	17.8534	17.6195	17.3856	16.2162	15.9823	14.8129	14.8129	14.5790	15.2806	15.9823	16.4501	16.9179	(38)
Average = Sum(39)m / 12 =	33.6850	33.4511	33.2173	32.0478	31.8139	30.6445	30.6445	30.4106	31.1123	31.8139	32.2817	32.7495	(39)
												31.9893	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.5614	0.5575	0.5536	0.5341	0.5302	0.5107	0.5107	0.5068	0.5185	0.5302	0.5380	0.5458	(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												1.9816 (42)
Hot water usage for mixer showers												
62.9929	62.0285	60.6072	58.4208	56.4618	53.7212	51.5536	54.0877	55.3622	58.0767	60.9035	62.9361	(42a)
Hot water usage for baths												
24.2730	23.9066	23.3854	22.6047	21.9012	20.9327	20.1980	21.0965	21.5680	22.5276	23.5253	24.2538	(42b)
Hot water usage for other uses												
34.9239	33.6540	32.3840	31.1140	29.8441	28.5741	28.5741	29.8441	31.1140	32.3840	33.6540	34.9239	(42c)
Average daily hot water use (litres/day)												112.3305 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
122.1899	119.5891	116.3766	112.1396	108.2071	103.2281	100.3257	105.0282	108.0442	112.9883	118.0828	122.1138	(44)
Energy conte	179.8846	158.2406	166.2998	146.4823	139.4358	119.3798	110.8628	123.6201	125.3259	145.5968	159.5928	179.3331 (45)
Energy content (annual)										Total = Sum(45)m =		1754.0545
Distribution loss (46)m = 0.15 x (45)m												
26.9827	23.7361	24.9450	21.9723	20.9154	17.9070	16.6294	18.5430	18.7989	21.8395	23.9389	26.9000	(46)
Water storage loss:												
Store volume												110.0000 (47)
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	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	(61)
Total heat required for water heating calculated for each month												
235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099	(62)
WWHRS	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	(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	(63c)
FGHRS	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	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099 (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	104.0331	92.5569	99.5161	91.5003	90.5838	82.4887	81.0833	85.3251	84.4658	92.6324	95.8596	103.8497 (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
118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
18.3306	16.2811	13.2407	10.0240	7.4931	6.3260	6.8354	8.8850	11.9254	15.1420	17.6729	18.8401	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
258.1297	260.8083	254.0584	239.6886	221.5493	204.5009	193.1115	190.4330	197.1829	211.5527	229.6920	246.7404	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	(71)
Water heating gains (Table 5)												
139.8294	137.7335	133.7582	127.0838	121.7525	114.5677	108.9830	114.6843	117.3136	124.5059	133.1383	139.5829	(72)
Total internal gains	504.7939	503.3271	489.5614	465.3005	439.2990	413.8987	397.4341	402.5064	414.9260	439.7047	469.0073	493.6675 (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				2.5100		10.6334		0.3500		0.8500		0.7700		5.5026 (74)	
South				8.1400		46.7521		0.3500		0.8500		0.7700		78.4595 (78)	
Solar gains	83.9620	139.0121	181.5504	213.6975	231.4410	226.9125	219.9096	206.6932	192.4688	151.1130	99.7894	72.3834	(83)		
Total gains	588.7559	642.3392	671.1118	678.9981	670.7399	640.8112	617.3437	609.1995	607.3948	590.8177	568.7967	566.0509	(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	74.8419	75.3652	75.8959	78.6654	79.2437	82.2677	82.2677	82.9005	81.0308	79.2437	78.0954	76.9799			
alpha	5.9895	6.0243	6.0597	6.2444	6.2829	6.4845	6.4845	6.5267	6.4021	6.2829	6.2064	6.1320			
util living area	0.8367	0.7724	0.6877	0.5636	0.4397	0.3060	0.2184	0.2296	0.3531	0.5535	0.7422	0.8473	(86)		
MIT	20.7848	20.8694	20.9378	20.9841	20.9970	20.9998	21.0000	21.0000	20.9994	20.9880	20.9177	20.7817	(87)		
Th 2	20.4648	20.4684	20.4719	20.4896	20.4932	20.5110	20.5110	20.5146	20.5039	20.4932	20.4861	20.4790	(88)		
util rest of house	0.8214	0.7545	0.6669	0.5412	0.4161	0.2826	0.1941	0.2054	0.3278	0.5279	0.7212	0.8328	(89)		
MIT 2	20.2243	20.3256	20.4064	20.4740	20.4905	20.5109	20.5110	20.5146	20.5034	20.4819	20.3990	20.2340	(90)		
Living area fraction	20.5443	20.6360	20.7098	20.7652	20.7796	20.7900	20.7901	20.7916	20.7866	fLA = Living area / (4) =	20.6951	0.5708	(91)		
MIT	20.5443	20.6360	20.7098	20.7652	20.7796	20.7900	20.7901	20.7916	20.7866	20.7708	20.6951	20.5466	(92)		
Temperature adjustment	20.5443	20.6360	20.7098	20.7652	20.7796	20.7900	20.7901	20.7916	20.7866	20.7708	20.6951	0.0000	(93)		
adjusted MIT	20.5443	20.6360	20.7098	20.7652	20.7796	20.7900	20.7901	20.7916	20.7866	20.7708	20.6951	20.5466	(93)		
8. Space heating requirement															
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Utilisation	0.8237	0.7603	0.6763	0.5533	0.4294	0.2959	0.2080	0.2192	0.3423	0.5420	0.7299	0.8347	(94)		
Useful gains	484.9822	488.3541	453.9028	375.7052	288.0302	189.6384	128.4003	133.5475	207.8910	320.1993	415.1639	472.4872	(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	547.1884	526.3869	472.0096	380.2526	288.8587	189.6882	128.4042	133.5527	208.0345	323.5722	438.8731	535.3441	(97)		
Space heating kWh	46.2814	25.5580	13.4714	3.2741	0.6164	0.0000	0.0000	0.0000	0.0000	2.5094	17.0706	46.7655	(98a)		
Space heating requirement - total per year (kWh/year)												155.5469			
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	46.2814	25.5580	13.4714	3.2741	0.6164	0.0000	0.0000	0.0000	0.0000	2.5094	17.0706	46.7655	(98c)		
Space heating requirement after solar contribution - total per year (kWh/year)												155.5469			
Space heating per m2										(98c) / (4) =		2.5924	(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														1.0000 (306)	
Efficiency of secondary/supplementary heating system, %														0.0000 (208)	
Space heating:															
Space heating requirement															
	46.2814	25.5580	13.4714	3.2741	0.6164	0.0000	0.0000	0.0000	0.0000	2.5094	17.0706	46.7655	(98)		
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00															
307a	46.2814	25.5580	13.4714	3.2741	0.6164	0.0000	0.0000	0.0000	0.0000	2.5094	17.0706	46.7655			
Space heating requirement	46.2814	25.5580	13.4714	3.2741	0.6164	0.0000	0.0000	0.0000	0.0000	2.5094	17.0706	46.7655	(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															
	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099	(64)		
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00															
310a	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099			
Water heating fuel	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099	(310)		
Cooling System Energy Efficiency Ratio												0.0000	(314)		
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)		
Pumps and Fa	13.7085	12.3818	13.7085	13.2662	13.7085	13.2662	13.7085	13.7085	13.2662	13.7085	13.2662	13.7085	(331)		
Lighting	16.0447	12.8716	11.5895	8.4909	6.5586	5.3585	5.9830	7.7770	10.1015	13.2537	14.9700	16.4906	(332)		
Electricity generated by PVs (Appendix M) (negative quantity)	-19.2912	-28.4286	-42.7919	-50.4751	-56.4945	-53.5475	-52.8952	-48.8798	-42.1472	-33.5180	-21.6400	-16.5347	(333a)		
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)		
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)		
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)		
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)		
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)		
Annual totals kWh/year															
Space heating fuel - community heating													155.5469 (307)		
Space heating fuel - secondary													0.0000 (309)		
Water heating fuel - community heating													2404.8943 (310)		
Efficiency of water heater													0.0000 (311)		
Electricity used for heat distribution													1.5555 (313)		
Space cooling fuel													0.0000 (321)		
Electricity for pumps and fans:															
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)															

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mechanical ventilation fans (SFP = 0.7000)	161.4060 (330a)
Total electricity for the above, kWh/year	161.4060 (331)
Electricity for lighting (calculated in Appendix L)	129.4896 (332)

Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-466.6436 (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	2384.6931 (338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating from Heat pump	155.5469	4.4400	6.9063 (340a)
Space heating total			6.9063 (340)
Total CO2 associated with community systems			0.0000 (473)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Heat pump	2404.8943	4.4400	106.7773 (342a)
Water heating total			106.7773 (342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (347a)
Pumps, fans and electric keep-hot	161.4060	16.4900	26.6158 (349)
Energy for lighting	129.4896	16.4900	21.3528 (350)
Additional standing charges			92.0000 (351)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-466.6436	16.4900	-76.9495
PV Unit electricity exported	0.0000	5.5900	0.0000
Total			-76.9495 (352)
Total energy cost			176.7027 (355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600 (356)
Energy cost factor (ECF)	0.6058 (357)
SAP value	90.1794
SAP rating (Section 12)	90 (358)
SAP band	B

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			333.0000 (367)
Space and Water heating from Heat pump	768.9012	0.1593	7.4431 (367)
Electrical energy for heat distribution (space & water)	1.5555	0.0000	3.6340 (372)
Overall CO2 factor for heat network			0.0440 (386)
Total CO2 associated with community systems			112.7627 (373)
Space and water heating			112.7627 (376)
Pumps, fans and electric keep-hot	161.4060	0.1387	22.3890 (378)
Energy for lighting	129.4896	0.1443	18.6893 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-466.6436	0.1336	-62.3502
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-62.3502 (380)
Total CO2, kg/year			91.4908 (383)
CO2 emissions per m2			1.5200 (384)
EI value			98.8324 (384a)
EI rating			99 (385)
EI band			A

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

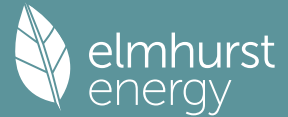
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	60.0000 (1b)	x 3.1500 (2b)	= 189.0000 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.0000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 189.0000 (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)

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Number of blocked chimneys
Number of intermittent extract fans
Number of passive vents
Number of flueless gas fires

0 * 20 = 0.0000 (6f)
0 * 10 = 0.0000 (7a)
0 * 10 = 0.0000 (7b)
0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =
Pressure Test
Pressure Test Method
Measured/design AF50
Infiltration rate
Number of sides sheltered

Air changes per hour
0.0000 / (5) = 0.0000 (8)
Yes
Blower Door
3.0000 (17)
0.1500 (18)
0 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1500 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.8000	4.5000	4.4000	3.9000	3.9000	3.6000	3.7000	3.5000	3.7000	4.0000	4.1000	4.4000	(22)
Wind factor	1.2000	1.1250	1.1000	0.9750	0.9750	0.9000	0.9250	0.8750	0.9250	1.0000	1.0250	1.1000	(22a)
Adj infilt rate	0.1800	0.1687	0.1650	0.1462	0.1462	0.1350	0.1388	0.1313	0.1388	0.1500	0.1537	0.1650	(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	0.2750	0.2637	0.2600	0.2412	0.2412	0.2300	0.2337	0.2262	0.2337	0.2450	0.2487	0.2600	(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								
Glazing			10.6500	0.7752	8.2558			(27)
External Wall North	18.0200	2.5100	15.5100	0.1400	2.1714	70.0000	1085.7000	(29a)
External Wall South	35.1500	8.1400	27.0100	0.1400	3.7814	70.0000	1890.7000	(29a)
Total net area of external elements Aum(A, m2)			53.1700					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	14.2086		(33)
Main dwelling								
Party Wall 1 East			22.4900	0.0000	0.0000	45.0000	1012.0500	(32)
Party Wall 2 West			21.8000	0.0000	0.0000	45.0000	981.0000	(32)
Party Floor 1			60.0000			30.0000	1800.0000	(32d)
Party Ceiling 1			60.0000			30.0000	1800.0000	(32b)
Internal Wall 1			56.2600			9.0000	506.3400	(32c)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K (28)...(30) + (32) + (32a)...(32e) = 9075.7900 (34)
List of Thermal Bridges 151.2632 (35)

List of Thermal Bridges	Length	Psi-value	Total	
K1 Element				
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450	
E18 Party wall between dwellings	12.6000	0.0300	0.3780	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				1.6230 (36)
Point Thermal bridges				0.0000
Total fabric heat loss				(33) + (36) + (36a) = 15.8316 (37)

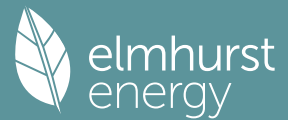
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	17.1517	16.4501	16.2162	15.0468	15.0468	14.3451	14.5790	14.1112	14.5790	15.2806	15.5145	16.2162	(38)
Average = Sum(39)m / 12 =	32.9834	32.2817	32.0478	30.8784	30.8784	30.1767	30.4106	29.9428	30.4106	31.1123	31.3462	32.0478	(39)
													31.2097

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.5497	0.5380	0.5341	0.5146	0.5146	0.5029	0.5068	0.4990	0.5068	0.5185	0.5224	0.5341	(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													1.9816 (42)
Hot water usage for mixer showers													
62.9929	62.0285	60.6072	58.4208	56.4618	53.7212	51.5536	54.0877	55.3622	58.0767	60.9035	62.9361	62.9361	(42a)
Hot water usage for baths													
24.2730	23.9066	23.3854	22.6047	21.9012	20.9327	20.1980	21.0965	21.5680	22.5276	23.5253	24.2538	24.2538	(42b)
Hot water usage for other uses													
34.9239	33.6540	32.3840	31.1140	29.8441	28.5741	28.5741	29.8441	31.1140	32.3840	33.6540	34.9239	34.9239	(42c)
Average daily hot water use (litres/day)													112.3305 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
122.1899	119.5891	116.3766	112.1396	108.2071	103.2281	100.3257	105.0282	108.0442	112.9883	118.0828	122.1138	122.1138	(44)
Energy conte	179.8846	158.2406	166.2998	146.4823	139.4358	119.3798	110.8628	123.6201	125.3259	145.5968	159.5928	179.3331	(45)
Energy content (annual)													Total = Sum(45)m = 1754.0545
Distribution loss (46)m = 0.15 x (45)m													
26.9827	23.7361	24.9450	21.9723	20.9154	17.9070	16.6294	18.5430	18.7989	21.8395	23.9389	26.9000	26.9000	(46)
Water storage loss:													
Store volume													110.0000 (47)
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	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099	(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)

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Output from w/h	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099 (64)
	Total per year (kWh/year) = Sum(64)m = 2404.8943 (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	104.0331	92.5569	99.5161	91.5003	90.5838	82.4887	81.0833	85.3251	84.4658	92.6324	95.8596	103.8497 (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
	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981	118.8981 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	18.3306	16.2811	13.2407	10.0240	7.4931	6.3260	6.8354	8.8850	11.9254	15.1420	17.6729	18.8401 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	258.1297	260.8083	254.0584	239.6886	221.5493	204.5009	193.1115	190.4330	197.1829	211.5527	229.6920	246.7404 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714	48.8714 (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)												
	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654 (71)
Water heating gains (Table 5)												
	139.8294	137.7335	133.7582	127.0838	121.7525	114.5677	108.9830	114.6843	117.3136	124.5059	133.1383	139.5829 (72)
Total internal gains	504.7939	503.3271	489.5614	465.3005	439.2990	413.8987	397.4341	402.5064	414.9260	439.7047	469.0073	493.6675 (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					2.5100	12.7054	0.3500	0.8500	0.7700			6.5748 (74)
South					8.1400	53.5774	0.3500	0.8500	0.7700			89.9137 (78)
Solar gains	96.4885	141.7867	184.5905	230.4448	242.0170	254.7350	243.5420	229.3662	209.8802	164.7657	115.7229	80.5032 (83)
Total gains	601.2824	645.1138	674.1519	695.7453	681.3159	668.6337	640.9761	631.8726	624.8062	604.4704	584.7303	574.1707 (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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	76.4341	78.0954	78.6654	81.6446	81.6446	83.5430	82.9005	84.1956	82.9005	81.0308	80.4262	78.6654
alpha	6.0956	6.2064	6.2444	6.4430	6.4430	6.5695	6.5267	6.6130	6.5267	6.4021	6.3617	6.2444
util living area	0.7974	0.7364	0.6430	0.5071	0.3802	0.2527	0.1708	0.1659	0.2920	0.4764	0.6697	0.8024 (86)
MIT	20.8509	20.9115	20.9629	20.9928	20.9990	21.0000	21.0000	21.0000	20.9999	20.9958	20.9602	20.8583 (87)
Th 2	20.4755	20.4861	20.4896	20.5074	20.5074	20.5181	20.5146	20.5217	20.5146	20.5039	20.5003	20.4896 (88)
util rest of house	0.7801	0.7177	0.6222	0.4860	0.3581	0.2310	0.1478	0.1432	0.2684	0.4516	0.6473	0.7853 (89)
MIT 2	20.3116	20.3906	20.4512	20.5005	20.5066	20.5181	20.5146	20.5217	20.5145	20.5001	20.4595	20.3339 (90)
Living area fraction									fLA = Living area / (4) =			0.5708 (91)
MIT	20.6195	20.6879	20.7433	20.7815	20.7877	20.7932	20.7917	20.7947	20.7916	20.7830	20.7453	20.6333 (92)
Temperature adjustment												0.0000
adjusted MIT	20.6195	20.6879	20.7433	20.7815	20.7877	20.7932	20.7917	20.7947	20.7916	20.7830	20.7453	20.6333 (93)

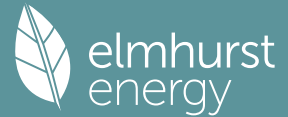
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.7850	0.7251	0.6326	0.4978	0.3707	0.2434	0.1609	0.1561	0.2818	0.4656	0.6584	0.7902 (94)
Useful gains	472.0009	467.7905	426.4814	346.3266	252.5543	162.7364	103.1420	98.6532	176.0920	281.4325	384.9647	453.7274 (95)
Ext temp.	5.0000	5.4000	7.1000	9.5000	12.6000	15.4000	17.4000	17.5000	15.0000	11.7000	8.1000	5.2000 (96)
Heat loss rate W	515.1824	493.5207	437.2371	348.3556	252.8221	162.7478	103.1426	98.6536	176.1246	282.5939	396.3816	494.6026 (97)
Space heating kWh	32.1270	17.2907	8.0023	1.4608	0.1992	0.0000	0.0000	0.0000	0.0000	0.8641	8.2202	30.4111 (98a)
Space heating requirement - total per year (kWh/year)												98.5754
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	32.1270	17.2907	8.0023	1.4608	0.1992	0.0000	0.0000	0.0000	0.0000	0.8641	8.2202	30.4111 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												98.5754
Space heating per m2										(98c) / (4) =		1.6429 (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												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	32.1270	17.2907	8.0023	1.4608	0.1992	0.0000	0.0000	0.0000	0.0000	0.8641	8.2202	30.4111 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	32.1270	17.2907	8.0023	1.4608	0.1992	0.0000	0.0000	0.0000	0.0000	0.8641	8.2202	30.4111
Space heating requirement												

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Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	32.1270	17.2907	8.0023	1.4608	0.1992	0.0000	0.0000	0.0000	0.0000	0.8641	8.2202	30.4111 (307)
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 (308)
Water heating	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Annual water heating requirement	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099
310a	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099
Water heating fuel	235.1614	208.1680	221.5766	199.9760	194.7126	172.8735	166.1396	178.8969	178.8196	200.8736	213.0865	234.6099 (310)
Cooling System Energy Efficiency Ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	13.7085	12.3818	13.7085	13.2662	13.7085	13.2662	13.7085	13.7085	13.2662	13.7085	13.2662	13.7085 (331)
Lighting	16.0447	12.8716	11.5895	8.4909	6.5586	5.3585	5.9830	7.7770	10.1015	13.2537	14.9700	16.4906 (332)
Electricity generated by PVs (Appendix M) (negative quantity)	-22.1973	-29.6403	-44.3751	-53.8944	-58.6743	-57.5935	-56.5398	-52.7188	-45.4897	-36.5772	-24.9689	-18.5416 (333a)
(333a)m	-22.1973	-29.6403	-44.3751	-53.8944	-58.6743	-57.5935	-56.5398	-52.7188	-45.4897	-36.5772	-24.9689	-18.5416 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												98.5754 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2404.8943 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												0.9858 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)												
mechanical ventilation fans (SFP = 0.7000)												161.4060 (330a)
Total electricity for the above, kWh/year												161.4060 (331)
Electricity for lighting (calculated in Appendix L)												129.4896 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-501.2108 (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												2293.1544 (338)

10b. Fuel costs - using BEDF prices (568)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating from Heat pump	98.5754	5.6000	5.5202 (340a)
Space heating total			5.5202 (340)
Total CO2 associated with community systems			0.0000 (473)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Heat pump	2404.8943	5.6000	134.6741 (342a)
Water heating total			134.6741 (342)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (347a)
Pumps, fans and electric keep-hot	161.4060	26.0600	42.0624 (349)
Energy for lighting	129.4896	26.0600	33.7450 (350)
Additional standing charges			99.0000 (351)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-501.2108	26.0600	-130.6155
PV Unit electricity exported	0.0000	5.8100	0.0000
Total			-130.6155 (352)
Total energy cost			184.3861 (355)

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			333.0000 (367)
Space and Water heating from Heat pump	751.7927	0.1601	4.7383 (367)
Electrical energy for heat distribution (space & water)	0.9858	0.0000	3.5439 (372)
Overall CO2 factor for heat network			0.0439 (386)
Total CO2 associated with community systems			109.9678 (373)
Space and water heating			109.9678 (376)
Pumps, fans and electric keep-hot	161.4060	0.1387	22.3890 (378)
Energy for lighting	129.4896	0.1443	18.6893 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-501.2108	0.1337	-67.0104
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-67.0104 (380)
Total CO2, kg/year			84.0358 (383)

13b. Primary energy - Community heating scheme

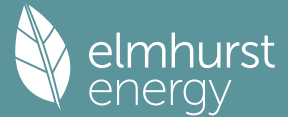
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			333.0000 (467a)
Space and Water heating from Heat pump	751.7927	1.5925	47.1401 (467)
Electrical energy for heat distribution (space & water)	0.9858	0.0000	38.1393 (472)
Overall CO2 factor for heat network			0.4727 (486)
Total CO2 associated with community systems			1183.4621 (473)
Space and water heating			1183.4621 (476)

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Pumps, fans and electric keep-hot	161.4060	1.5128	244.1750 (478)
Energy for lighting	129.4896	1.5338	198.6154 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-501.2108	1.4941	-748.8382
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-748.8382 (480)
Total Primary energy kWh/year			877.4143 (483)

Full SAP Calculation Printout



Property Reference	Be Green				Issued on Date	08/04/2025
Assessment Reference	0305_3B5P_BG		Prop Type Ref			
Property						
SAP Rating	91 B	DER	1.40	TER	10.53	
Environmental	99 A	% DER < TER				86.70
CO ₂ Emissions (t/year)	0.12	DFEE	21.32	TFEE	26.18	
Compliance Check	See BREL	% DFEE < TFEE				18.57
% DPER < TPER	74.09	DPER	14.62	TPER	56.42	
Assessor Details	Alfie Gamble-Thornton				Assessor ID	CM02-0001
Client	Fifth State, Fifth State					

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	99.0000 (1b)	3.1500 (2b)	311.8500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	311.8500 (5)

2. Ventilation rate

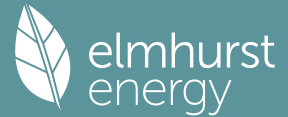
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (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	0.2862	0.2825	0.2787	0.2600	0.2562	0.2375	0.2375	0.2337	0.2450	0.2562	0.2637	0.2712 (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							
Glazing			12.4300	0.7752	9.6357		(27)
External Wall North	32.1000	4.0600	28.0400	0.1400	3.9256	70.0000	1962.8000 (29a)
External Wall South	33.8300	8.3700	25.4600	0.1400	3.5644	70.0000	1782.2000 (29a)
Total net area of external elements Aum(A, m ²)			65.9300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	17.1257		(33)
Main dwelling							
Party Wall 1 East			33.1100	0.0000	0.0000	45.0000	1489.9500 (32)
Party Wall 2 West			32.6000	0.0000	0.0000	45.0000	1467.0000 (32)
Party Floor 1			99.0000			30.0000	2970.0000 (32d)
Party Ceiling 1			99.0000			20.0000	1980.0000 (32b)
Internal Wall 1			142.4400			9.0000	1281.9600 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	12933.9100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							130.6456 (35)
List of Thermal Bridges							

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K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450
E18 Party wall between dwellings	12.6000	0.0300	0.3780
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			1.6230 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	18.7487 (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
	29.4581	29.0722	28.6863	26.7567	26.3708	24.4412	24.4412	24.0553	25.2131	26.3708	27.1426	27.9145 (38)
Heat transfer coeff												
	48.2068	47.8209	47.4350	45.5054	45.1195	43.1899	43.1899	42.8040	43.9617	45.1195	45.8913	46.6631 (39)
Average = Sum(39)m / 12 =												45.4089
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.4869	0.4830	0.4791	0.4597	0.4558	0.4363	0.4363	0.4324	0.4441	0.4558	0.4635	0.4713 (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													2.7301 (42)
Hot water usage for mixer showers													
76.7540	75.5789	73.8471	71.1830	68.7961	65.4568	62.8156	65.9033	67.4563	70.7637	74.2081	76.6848	(42a)	
Hot water usage for baths													
29.5492	29.1032	28.4686	27.5183	26.6619	25.4829	24.5884	25.6822	26.2562	27.4244	28.6390	29.5258	(42b)	
Hot water usage for other uses													
42.5887	41.0400	39.4913	37.9426	36.3940	34.8453	34.8453	36.3940	37.9426	39.4913	41.0400	42.5887	(42c)	
Average daily hot water use (litres/day)													136.8774 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
148.8919	145.7221	141.8070	136.6440	131.8519	125.7850	122.2493	127.9795	131.6551	137.6795	143.8871	148.7993	(44)	
Energy conte	219.1946	192.8198	202.6394	178.4912	169.9046	145.4661	135.0891	150.6342	152.7134	177.4139	194.4682	218.5226	(45)
Energy content (annual)										Total = Sum(45)m =		2137.3570	
Distribution loss (46)m = 0.15 x (45)m													
32.8792	28.9230	30.3959	26.7737	25.4857	21.8199	20.2634	22.5951	22.9070	26.6121	29.1702	32.7784	(46)	
Water storage loss:													
Store volume													110.0000 (47)
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													
274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994	(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	274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994	(64)
12Total per year (kWh/year)													2788.1968 (64)
Electric shower(s)													2788 (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													
117.1037	104.0545	111.5990	102.1433	100.7147	91.1624	89.1386	94.3073	93.5721	103.2116	107.4556	116.8802	(65)	

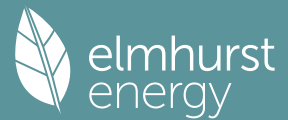
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
135.3430	149.8440	135.3430	139.8544	135.3430	139.8544	135.3430	135.3430	139.8544	135.3430	139.8544	135.3430	135.3430	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
254.7009	257.3439	250.6836	236.5047	218.6064	201.7844	190.5464	187.9034	194.5636	208.7426	226.6409	243.4628	243.4628	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	(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)													
-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	(71)
Water heating gains (Table 5)													
157.3974	154.8430	149.9987	141.8656	135.3692	126.6145	119.8099	126.7571	129.9613	138.7252	149.2439	157.0971	157.0971	(72)
Total internal gains													
611.3924	625.9821	599.9765	582.1759	553.2697	532.2045	509.6504	513.9546	528.3305	546.7619	579.6904	599.8540	599.8540	(73)

6. Solar gains

[Jan]												
				Area	Solar flux		g		FF		Access	Gains
				m2	Table 6a	Table 6b	Specific data	Specific data	Specific data	factor	W	
					W/m2		or Table 6b	or Table 6c		Table 6d		
North				4.0600	10.6334		0.3500		0.8500	0.7700	8.9006 (74)	
South				8.3700	46.7521		0.3500		0.8500	0.7700	80.6764 (78)	
Solar gains	89.5770	149.1366	197.2098	236.6489	260.7641	257.7147	248.8950	230.5999	210.5671	162.7591	106.6090	77.1318 (83)
Total gains	700.9694	775.1187	797.1862	818.8248	814.0338	789.9191	758.5454	744.5545	738.8976	709.5210	686.2994	676.9858 (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, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	74.5279	75.1294	75.7406	78.9522	79.6275	83.1850	83.1850	83.9350	81.7246	79.6275	78.2883	76.9934	
alpha	5.9685	6.0086	6.0494	6.2635	6.3085	6.5457	6.5457	6.5957	6.4483	6.3085	6.2192	6.1329	
util living area	0.9086	0.8544	0.7878	0.6530	0.5116	0.3497	0.2505	0.2644	0.4097	0.6440	0.8281	0.9145 (86)	
MIT	20.6371	20.7674	20.8707	20.9653	20.9932	20.9996	21.0000	21.0000	20.9987	20.9731	20.8486	20.6422 (87)	
Th 2	20.5328	20.5364	20.5400	20.5580	20.5616	20.5796	20.5796	20.5832	20.5724	20.5616	20.5544	20.5472 (88)	
util rest of house	0.8991	0.8415	0.7709	0.6322	0.4883	0.3268	0.2266	0.2405	0.3846	0.6200	0.8121	0.9056 (89)	
MIT 2	20.1112	20.2716	20.3973	20.5220	20.5551	20.5793	20.5796	20.5832	20.5713	20.5347	20.3865	20.1302 (90)	
Living area fraction									fLA = Living area / (4) =				0.2126 (91)
MIT	20.2230	20.3770	20.4979	20.6162	20.6482	20.6686	20.6690	20.6718	20.6622	20.6279	20.4847	20.2391 (92)	
Temperature adjustment												0.0000	
adjusted MIT	20.2230	20.3770	20.4979	20.6162	20.6482	20.6686	20.6690	20.6718	20.6622	20.6279	20.4847	20.2391 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8923	0.8368	0.7693	0.6349	0.4930	0.3316	0.2317	0.2456	0.3899	0.6236	0.8095	0.8991 (94)
Useful gains	625.4943	648.5991	613.3136	519.9060	401.2855	261.9761	175.7287	182.8369	288.0770	442.4881	555.5303	608.6497 (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	767.5974	740.1230	663.9908	533.1516	403.7399	262.1041	175.7381	182.8500	288.4860	452.4550	614.2424	748.4340 (97)
Space heating kWh	105.7247	61.5041	37.7039	9.5369	1.8261	0.0000	0.0000	0.0000	0.0000	7.4153	42.2727	103.9995 (98a)
Space heating requirement - total per year (kWh/year)												369.9831
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	105.7247	61.5041	37.7039	9.5369	1.8261	0.0000	0.0000	0.0000	0.0000	7.4153	42.2727	103.9995 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												369.9831
Space heating per m2										(98c) / (4) =		3.7372 (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												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	105.7247	61.5041	37.7039	9.5369	1.8261	0.0000	0.0000	0.0000	0.0000	7.4153	42.2727	103.9995 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	105.7247	61.5041	37.7039	9.5369	1.8261	0.0000	0.0000	0.0000	0.0000	7.4153	42.2727	103.9995
Space heating requirement	105.7247	61.5041	37.7039	9.5369	1.8261	0.0000	0.0000	0.0000	0.0000	7.4153	42.2727	103.9995 (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	274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00												
310a	274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994
Water heating fuel	274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994 (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	23.9761	21.6558	23.9761	23.2027	23.9761	23.2027	23.9761	23.9761	23.2027	23.9761	23.2027	23.9761 (331)
Lighting	24.8645	19.9472	17.9602	13.1584	10.1640	8.3040	9.2719	12.0520	15.6543	20.5393	23.1991	25.5555 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-20.4894	-30.8687	-47.4902	-57.2878	-65.2320	-62.2155	-61.4427	-56.2285	-47.6796	-36.9161	-23.2123	-17.4869 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												369.9831 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2788.1968 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												3.6998 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7420)												
mechanical ventilation fans (SFP = 0.7420)												282.2991 (330a)
Total electricity for the above, kWh/year												282.2991 (331)
Electricity for lighting (calculated in Appendix L)												200.6704 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-526.5497 (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												3114.5996 (338)

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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			333.0000 (367)
Space and Water heating from Heat pump	948.4024	0.1589	17.6549 (367)
Electrical energy for heat distribution (space & water)	3.6998	0.0000	4.5167 (372)
Overall CO2 factor for heat network			0.0444 (386)
Total CO2 associated with community systems			140.1536 (373)
Space and water heating			140.1536 (376)
Pumps, fans and electric keep-hot	282.2991	0.1387	39.1584 (378)
Energy for lighting	200.6704	0.1443	28.9629 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-526.5497	0.1332	-70.1241
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-70.1241 (380)
Total CO2, kg/year			138.1508 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.4000 (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			333.0000 (467a)
Space and Water heating from Heat pump	948.4024	1.5882	176.4571 (467)
Electrical energy for heat distribution (space & water)	3.6998	0.0000	48.2852 (472)
Overall CO2 factor for heat network			0.4744 (486)
Total CO2 associated with community systems			1498.2927 (473)
Space and water heating			1498.2927 (476)
Pumps, fans and electric keep-hot	282.2991	1.5128	427.0621 (478)
Energy for lighting	200.6704	1.5338	307.7949 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-526.5497	1.4921	-785.6738
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-785.6738 (480)
Total Primary energy kWh/year			1447.4759 (483)
Dwelling Primary energy Rate (DPER)			14.6200 (484)

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)
Main dwelling	99.0000	3.1500	311.8500
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.0000		
Dwelling volume			

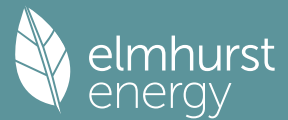
2. Ventilation rate

	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	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	30.0000 / (5) = 0.0962 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3462 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3462 (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	0.4414	0.4328	0.4241	0.3808	0.3722	0.3289	0.3289	0.3202	0.3462	0.3722	0.3895	0.4068 (22b)
Effective ac	0.5974	0.5936	0.5899	0.5725	0.5693	0.5541	0.5541	0.5513	0.5599	0.5693	0.5758	0.5827 (25)

3. Heat losses and heat loss parameter

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Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Main dwelling													
TER Opening Type			12.4300	1.1450	14.2328			(27)					
External Wall North	32.1000	4.0600	28.0400	0.1800	5.0472			(29a)					
External Wall South	33.8300	8.3700	25.4600	0.1800	4.5828			(29a)					
Total net area of external elements Aum(A, m2)			65.9300					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...	(30) + (32) =	23.8628			(33)					
Main dwelling													
Party Wall 1 East			33.1100	0.0000	0.0000			(32)					
Party Wall 2 West			32.6000	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							140.6456	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value		Total						
E7 Party floor between dwellings (in blocks of flats)				41.5000	0.0700		2.9050						
E18 Party wall between dwellings				12.6000	0.0600		0.7560						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)													
Point Thermal bridges						(36a) =	3.6610	(36)					
Total fabric heat loss						(33) + (36) + (36a) =	27.5238	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 61.4807	Feb 61.0914	Mar 60.7098	Apr 58.9175	May 58.5822	Jun 57.0211	Jul 57.0211	Aug 56.7320	Sep 57.6224	Oct 58.5822	Nov 59.2605	Dec 59.9698	(38)
Heat transfer coeff	89.0045	88.6152	88.2336	86.4413	86.1060	84.5449	84.5449	84.2558	85.1462	86.1060	86.7844	87.4936	(39)
Average = Sum(39)m / 12 =												86.4397	
HLP	Jan 0.8990	Feb 0.8951	Mar 0.8912	Apr 0.8731	May 0.8698	Jun 0.8540	Jul 0.8540	Aug 0.8511	Sep 0.8601	Oct 0.8698	Nov 0.8766	Dec 0.8838	(40)
HLP (average)												0.8731	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7301 (42)
Hot water usage for mixer showers													
69.9941	68.9423	67.4095	64.4768	62.3125	59.8989	58.5270	60.0482	61.7157	64.3072	67.3029	69.7260	69.7260	(42a)
Hot water usage for baths													
30.2230	29.7741	29.1421	27.9766	27.1039	26.1363	25.6136	26.2413	26.9247	27.9601	29.1495	30.1208	30.1208	(42b)
Hot water usage for other uses													
42.5887	41.0400	39.4913	37.9426	36.3940	34.8453	34.8453	36.3940	37.9426	39.4913	41.0400	42.5887	42.5887	(42c)
Average daily hot water use (litres/day)												131.2707	(43)
Daily hot water use	Jan 142.8058	Feb 139.7564	Mar 136.0429	Apr 130.3960	May 125.8104	Jun 120.8805	Jul 118.9860	Aug 122.6835	Sep 126.5831	Oct 131.7586	Nov 137.4924	Dec 142.4355	(44)
Energy conte	226.1695	199.0113	209.0928	178.5056	169.3650	148.6367	143.9032	151.9078	156.0896	178.7952	195.8832	223.0195	(45)
Energy content (annual)										Total = Sum(45)m =		2180.3794	
Distribution loss (46)m = 0.15 x (45)m													
33.9254	29.8517	31.3639	26.7758	25.4047	22.2955	21.5855	22.7862	23.4134	26.8193	29.3825	33.4529	33.4529	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	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	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													
272.7644	241.0970	255.6877	223.5975	215.9599	193.7285	190.4981	198.5027	201.1814	225.3901	240.9750	269.6144	269.6144	(62)
WWHRS	-31.9984	-28.2996	-29.6338	-24.5379	-22.8685	-19.5687	-18.3425	-19.5055	-20.2465	-23.8684	-27.0400	-31.4058	(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	240.7660	212.7973	226.0540	199.0596	193.0914	174.1598	172.1556	178.9972	180.9349	201.5217	213.9350	238.2086	(64)
12Total per year (kWh/year)												2431.6811	(64)
Electric shower(s)												2432	(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	112.4773	99.8398	106.7993	95.4266	93.5898	85.4952	85.1237	87.7853	87.9733	96.7253	101.2046	111.4299	(65)

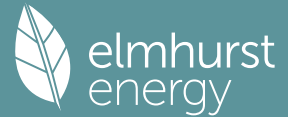
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	Jan 136.5037	Feb 136.5037	Mar 136.5037	Apr 136.5037	May 136.5037	Jun 136.5037	Jul 136.5037	Aug 136.5037	Sep 136.5037	Oct 136.5037	Nov 136.5037	Dec 136.5037	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
141.1704	156.2958	141.1704	145.8761	141.1704	145.8761	141.1704	141.1704	141.1704	145.8761	141.1704	145.8761	141.1704	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
254.7009	257.3439	250.6836	236.5047	218.6064	201.7844	190.5464	187.9034	194.5636	208.7426	226.6409	243.4628	243.4628	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	(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)													
-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	(71)
Water heating gains (Table 5)													
151.1792	148.5712	143.5474	132.5369	125.7927	118.7433	114.4136	117.9909	122.1851	130.0072	140.5620	149.7714	149.7714	(72)
Total internal gains	614.0016	629.1620	602.3526	581.8689	552.5206	530.3549	510.0815	511.0158	526.5759	546.8713	580.0301	601.3558	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W
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	W/m2		or Table 6b		or Table 6c		Table 6d			
North	4.0600		10.6334		0.6300		0.7700		13.1938 (74)	
South	8.3700		46.7521		0.6300		0.7700		119.5909 (78)	

Solar gains	132.7847	221.0731	292.3345	350.7972	386.5444	382.0241	368.9503	341.8304	312.1347	241.2664	158.0322	114.3365 (83)
Total gains	746.7863	850.2351	894.6871	932.6661	939.0651	912.3790	879.0318	852.8462	838.7107	788.1376	738.0623	715.6923 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.4557	43.6466	43.8354	44.7443	44.9185	45.7479	45.7479	45.9049	45.4248	44.9185	44.5674	44.2061	
alpha	3.8970	3.9098	3.9224	3.9830	3.9946	4.0499	4.0499	4.0603	4.0283	3.9946	3.9712	3.9471	
util living area	0.9648	0.9420	0.9107	0.8423	0.7316	0.5617	0.4156	0.4442	0.6405	0.8474	0.9396	0.9692 (86)	
MIT	19.6371	19.8852	20.1713	20.5331	20.7958	20.9484	20.9880	20.9842	20.9093	20.5913	20.0812	19.6123 (87)	
Th 2	20.1683	20.1717	20.1749	20.1904	20.1933	20.2068	20.2068	20.2093	20.2016	20.1933	20.1874	20.1813 (88)	
util rest of house	0.9589	0.9327	0.8962	0.8170	0.6898	0.5013	0.3438	0.3719	0.5818	0.8181	0.9284	0.9640 (89)	
MIT 2	18.5784	18.8909	19.2485	19.6981	20.0008	20.1682	20.2004	20.2005	20.1287	19.7757	19.1516	18.5564 (90)	
Living area fraction									fLA = Living area / (4) =				0.2126 (91)
MIT	18.8035	19.1023	19.4448	19.8756	20.1698	20.3341	20.3679	20.3671	20.2947	19.9492	19.3493	18.7809 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.8035	19.1023	19.4448	19.8756	20.1698	20.3341	20.3679	20.3671	20.2947	19.9492	19.3493	18.7809 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9464	0.9180	0.8811	0.8061	0.6885	0.5113	0.3586	0.3866	0.5890	0.8082	0.9142	0.9524 (94)
Useful gains	706.7419	780.5484	788.3363	751.8120	646.5443	466.4902	315.2043	329.6792	493.9849	636.9460	674.7587	681.6549 (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	1290.8777	1258.5387	1142.1629	948.7470	729.3035	484.7889	318.5545	334.2513	527.4525	805.0179	1063.0455	1275.7393 (97)
Space heating kWh	434.5970	321.2094	263.2470	141.7932	61.5728	0.0000	0.0000	0.0000	0.0000	125.0455	279.5665	441.9988 (98a)
Space heating requirement - total per year (kWh/year)												2069.0302
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	434.5970	321.2094	263.2470	141.7932	61.5728	0.0000	0.0000	0.0000	0.0000	125.0455	279.5665	441.9988 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2069.0302
Space heating per m2										(98c) / (4) =		20.8993 (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	434.5970	321.2094	263.2470	141.7932	61.5728	0.0000	0.0000	0.0000	0.0000	125.0455	279.5665	441.9988 (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)	470.8527	348.0059	285.2080	153.6221	66.7095	0.0000	0.0000	0.0000	0.0000	135.4772	302.8889	478.8719 (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	240.7660	212.7973	226.0540	199.0596	193.0914	174.1598	172.1556	178.9972	180.9349	201.5217	213.9350	238.2086 (64)
Efficiency of water heater (217)m	85.3677	84.9807	84.4023	83.3126	81.8046	79.8000	79.8000	79.8000	79.8000	83.0219	84.6608	79.8000 (216)
Fuel for water heating, kWh/month	282.0342	250.4066	267.8293	238.9309	236.0398	218.2454	215.7338	224.3073	226.7354	242.7330	252.6966	85.4260 (217)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	29.3324	23.5316	21.1876	15.5229	11.9903	9.7962	10.9380	14.2176	18.4673	24.2301	27.3678	30.1477 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-16.1810	-24.5488	-37.9298	-45.9326	-52.4579	-50.0309	-49.4148	-45.1813	-38.2646	-29.4630	-18.3927	-13.7940 (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	-4.5269	-9.8331	-20.1463	-31.1747	-42.1485	-42.7085	-42.2152	-35.3168	-25.3299	-14.3612	-6.1361	-3.5576 (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												2241.6362 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.8000

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Water heating fuel used	2934.5403 (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)	236.7295 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-699.0461 (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	4799.8598 (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	2241.6362	0.2100	470.7436 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2934.5403	0.2100	616.2535 (264)
Space and water heating			1086.9971 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	236.7295	0.1443	34.1674 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-421.5914	0.1331	-56.1114
PV Unit electricity exported	-277.4547	0.1250	-34.6894
Total			-90.8008 (269)
Total CO2, kg/year			1042.2929 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.5300 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2241.6362	1.1300	2533.0489 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2934.5403	1.1300	3316.0305 (278)
Space and water heating			5849.0794 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	236.7295	1.5338	363.1036 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-421.5914	1.4918	-628.9337
PV Unit electricity exported	-277.4547	0.4589	-127.3219
Total			-756.2556 (283)
Total Primary energy kWh/year			5586.0283 (286)
Target Primary Energy Rate (TPER)			56.4200 (287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	99.0000 (1b)	x 3.1500 (2b)	= 311.8500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	311.8500 (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) = 0.0962 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2462 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2462 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3139	0.3078	0.3016	0.2708	0.2647	0.2339	0.2339	0.2277	0.2462	0.2647	0.2770	0.2893 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5493	0.5474	0.5455	0.5367	0.5350	0.5274	0.5274	0.5259	0.5303	0.5350	0.5384	0.5418 (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							
Glazing			12.4300	0.7752	9.6357		(27)
External Wall North	32.1000	4.0600	28.0400	0.1400	3.9256	70.0000	1962.8000 (29a)
External Wall South	33.8300	8.3700	25.4600	0.1400	3.5644	70.0000	1782.2000 (29a)
Total net area of external elements Aum(A, m ²)			65.9300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	17.1257		(33)
Main dwelling							
Party Wall 1 East			33.1100	0.0000	0.0000	45.0000	1489.9500 (32)
Party Wall 2 West			32.6000	0.0000	0.0000	45.0000	1467.0000 (32)
Party Floor 1			99.0000			30.0000	2970.0000 (32d)
Party Ceiling 1			99.0000			30.0000	2970.0000 (32b)
Internal Wall 1			142.4400			9.0000	1281.9600 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13923.9100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							140.6456 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)				41.5000	0.0300	1.2450	
E18 Party wall between dwellings				12.6000	0.0300	0.3780	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							1.6230 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	18.7487 (37)

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

(38)m	Jan 56.5255	Feb 56.3286	Mar 56.1356	Apr 55.2292	May 55.0596	Jun 54.2701	Jul 54.2701	Aug 54.1239	Sep 54.5742	Oct 55.0596	Nov 55.4027	Dec 55.7613 (38)
Heat transfer coeff	75.2741	75.0772	74.8843	73.9778	73.8082	73.0187	73.0187	72.8725	73.3228	73.8082	74.1513	74.5100 (39)
Average = Sum(39)m / 12 =												73.9770

HLP	Jan 0.7603	Feb 0.7584	Mar 0.7564	Apr 0.7473	May 0.7455	Jun 0.7376	Jul 0.7376	Aug 0.7361	Sep 0.7406	Oct 0.7455	Nov 0.7490	Dec 0.7526 (40)
HLP (average)												0.7472
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

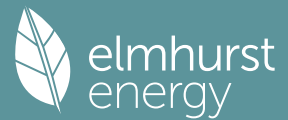
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7301 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths	29.5492	29.1032	28.4686	27.5183	26.6619	25.4829	24.5884	25.6822	26.2562	27.4244	28.6390	29.5258 (42b)
Hot water usage for other uses	42.5887	41.0400	39.4913	37.9426	36.3940	34.8453	34.8453	36.3940	37.9426	39.4913	41.0400	42.5887 (42c)
Average daily hot water use (litres/day)												66.1161 (43)
Daily hot water use	Jan 72.1379	Feb 70.1432	Mar 67.9599	Apr 65.4609	May 63.0558	Jun 60.3281	Jul 59.4337	Aug 62.0761	Sep 64.1988	Oct 66.9157	Nov 69.6790	Dec 72.1145 (44)
Energy conte	106.1995	92.8136	97.1134	85.5084	81.2538	69.7675	65.6760	73.0648	74.4675	86.2277	94.1735	105.9054 (45)
Energy content (annual)										Total = Sum(45)m =		1032.1709
Distribution loss (46)m = 0.15 x (45)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 (46)
Water storage 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	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	90.2696	78.8916	82.5464	72.6821	69.0657	59.3024	55.8246	62.1050	63.2973	73.2935	80.0474	90.0196 (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	90.2696	78.8916	82.5464	72.6821	69.0657	59.3024	55.8246	62.1050	63.2973	73.2935	80.0474	90.0196 (64)
12Total per year (kWh/year)									Total per year (kWh/year) = Sum(64)m =			877.3452 (64)
Electric shower(s)	56.0536	49.9443	54.5372	52.0442	53.0208	50.5767	52.2626	53.0208	52.0442	54.5372	53.5117	56.0536 (64a)
Heat gains from water heating, kWh/month	36.5808	32.2090	34.2709	31.1816	30.5216	27.4698	27.0218	28.7815	28.8354	31.9577	33.3898	36.5183 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan 136.5037	Feb 136.5037	Mar 136.5037	Apr 136.5037	May 136.5037	Jun 136.5037	Jul 136.5037	Aug 136.5037	Sep 136.5037	Oct 136.5037	Nov 136.5037	Dec 136.5037 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	135.3430	149.8440	135.3430	139.8544	135.3430	139.8544	135.3430	135.3430	139.8544	135.3430	139.8544	135.3430 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	254.7009	257.3439	250.6836	236.5047	218.6064	201.7844	190.5464	187.9034	194.5636	208.7426	226.6409	243.4628 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504 (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)												

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	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030 (71)
Water heating gains (Table 5)	49.1677	47.9300	46.0630	43.3077	41.0237	38.1524	36.3196	38.6848	40.0491	42.9539	46.3747	49.0838 (72)
Total internal gains	503.1628	519.0691	496.0408	483.6180	458.9242	443.7424	426.1601	425.8822	438.4183	450.9906	476.8212	491.8407 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c				Access factor Table 6d			Gains W
North				4.0600	10.6334	0.3500	0.8500				0.7700			8.9006 (74)
South				8.3700	46.7521	0.3500	0.8500				0.7700			80.6764 (78)
Solar gains	89.5770	149.1366	197.2098	236.6489	260.7641	257.7147	248.8950	230.5999	210.5671	162.7591	106.6090	77.1318 (83)		
Total gains	592.7397	668.2057	693.2505	720.2669	719.6883	701.4571	675.0551	656.4821	648.9854	613.7496	583.4302	568.9725 (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	51.3822	51.5170	51.6497	52.2826	52.4027	52.9693	52.9693	53.0756	52.7496	52.4027	52.1603	51.9092
alpha	4.4255	4.4345	4.4433	4.4855	4.4935	4.5313	4.5313	4.5384	4.5166	4.4935	4.4774	4.4606
util living area	0.9807	0.9664	0.9461	0.8942	0.7981	0.6267	0.4672	0.4985	0.7048	0.8963	0.9645	0.9836 (86)
MIT	19.7454	19.9541	20.2008	20.5320	20.7910	20.9482	20.9889	20.9851	20.9094	20.5943	20.1280	19.7119 (87)
Th 2	20.2878	20.2896	20.2913	20.2993	20.3008	20.3078	20.3078	20.3091	20.3051	20.3008	20.2977	20.2946 (88)
util rest of house	0.9774	0.9608	0.9369	0.8758	0.7632	0.5700	0.3972	0.4283	0.6520	0.8749	0.9577	0.9808 (89)
MIT 2	19.1291	19.3359	19.5788	19.9032	20.1413	20.2761	20.3029	20.3022	20.2456	19.9668	19.5154	19.1013 (90)
Living area fraction									fLA = Living area /	(4) =		0.2126 (91)
MIT	19.2602	19.4673	19.7111	20.0369	20.2794	20.4190	20.4488	20.4474	20.3868	20.1003	19.6457	19.2312 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2602	19.4673	19.7111	20.0369	20.2794	20.4190	20.4488	20.4474	20.3868	20.1003	19.6457	19.2312 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9715	0.9530	0.9280	0.8681	0.7621	0.5795	0.4117	0.4426	0.6586	0.8679	0.9499	0.9754 (94)
Useful gains	575.8192	636.8051	643.3160	625.2281	548.4661	406.4658	277.9152	290.5896	427.3925	532.6828	554.2289	554.9769 (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	1126.1136	1093.6738	989.3013	823.8800	633.2325	424.8968	281.0329	294.9433	460.9626	701.1970	930.2777	1119.9719 (97)
Space heating kWh	409.4190	307.0157	257.4130	143.0294	63.0662	0.0000	0.0000	0.0000	0.0000	125.3746	270.7552	420.3563 (98a)
Space heating requirement - total per year (kWh/year)												1996.4293
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	409.4190	307.0157	257.4130	143.0294	63.0662	0.0000	0.0000	0.0000	0.0000	125.3746	270.7552	420.3563 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1996.4293
Space heating per m ²										(98c) / (4) =		20.1660 (99)

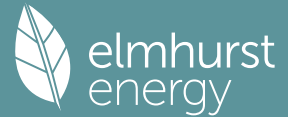
8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Heat loss rate W												
	0.0000	0.0000	0.0000	0.0000	0.0000	686.3762	540.3387	553.8314	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8588	0.9190	0.9062	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	589.4706	496.5968	501.8849	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	761.1022	733.1411	714.0141	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	123.5747	175.9890	157.8242	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fC = cooled area / (4) =			0.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	30.8937	43.9972	39.4560	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												114.3470 (107)
Energy for space heating												20.1660 (99)
Energy for space cooling												1.1550 (108)
Total												21.3210 (109)
Fabric Energy Efficiency (DFEE)												21.3 (109)

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

1. Overall dwelling characteristics

Full SAP Calculation Printout



Main dwelling		Area (m ²)	Storey height (m)	Volume (m ³)	
Ground floor		99.0000 (1b)	x 3.1500 (2b)	= 311.8500 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.0000				(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	311.8500 (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													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) =												Air changes per hour 30.0000 / (5) = 0.0962 (8)
Pressure test													Yes
Pressure Test Method													Blower Door
Measured/design AP50													5.0000 (17)
Infiltration rate													0.3462 (18)
Number of sides sheltered													0 (19)
Shelter factor													(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor													(21) = (18) x (20) = 0.3462 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	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	0.4414	0.4328	0.4241	0.3808	0.3722	0.3289	0.3289	0.3202	0.3462	0.3722	0.3895	0.4068	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													0.0000 (23c)
Effective ac	0.5974	0.5936	0.5899	0.5725	0.5693	0.5541	0.5541	0.5513	0.5599	0.5693	0.5758	0.5827	(25)

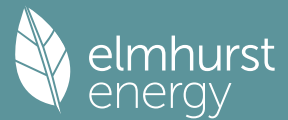
3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K						
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K						
TER Opening Type			12.4300	1.1450	14.2328			(27)					
External Wall North	32.1000	4.0600	28.0400	0.1800	5.0472			(29a)					
External Wall South	33.8300	8.3700	25.4600	0.1800	4.5828			(29a)					
Total net area of external elements Aum(A, m2)			65.9300					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	23.8628			(33)					
Main dwelling													
Party Wall 1 East			33.1100	0.0000	0.0000			(32)					
Party Wall 2 West			32.6000	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								140.6456 (35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
E7 Party floor between dwellings (in blocks of flats)				41.5000	0.0700	2.9050							
E18 Party wall between dwellings				12.6000	0.0600	0.7560							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								3.6610 (36)					
Point Thermal bridges						(36a) =		0.0000					
Total fabric heat loss					(33) + (36) + (36a) =			27.5238 (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	
	61.4807	61.0914	60.7098	58.9175	58.5822	57.0211	57.0211	56.7320	57.6224	58.5822	59.2605	59.9698	(38)
Heat transfer coeff	89.0045	88.6152	88.2336	86.4413	86.1060	84.5449	84.5449	84.2558	85.1462	86.1060	86.7844	87.4936	(39)
Average = Sum(39)m / 12 =													86.4397
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.8990	0.8951	0.8912	0.8731	0.8698	0.8540	0.8540	0.8511	0.8601	0.8698	0.8766	0.8838	(40)
HLP (average)													0.8731
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7301 (42)
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	30.2230	29.7741	29.1421	27.9766	27.1039	26.1363	25.6136	26.2413	26.9247	27.9601	29.1495	30.1208	(42b)
Hot water usage for other uses													
	42.5887	41.0400	39.4913	37.9426	36.3940	34.8453	34.8453	36.3940	37.9426	39.4913	41.0400	42.5887	(42c)
Average daily hot water use (litres/day)													66.7385 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	72.8117	70.8141	68.6334	65.9193	63.4979	60.9816	60.4589	62.6352	64.8673	67.4514	70.1896	72.7095	(44)
Energy conte	115.3159	100.8384	105.4870	90.2402	85.4804	74.9840	73.1198	77.5555	79.9879	91.5310	99.9979	113.8455	(45)
Energy content (annual)													Total = Sum(45)m = 1108.3834
Distribution loss (46)m = 0.15 x (45)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	(46)
Water storage 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	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)

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Total heat required for water heating calculated for each month												
	98.0185	85.7126	89.6639	76.7042	72.6583	63.7364	62.1518	65.9222	67.9897	77.8013	84.9982	96.7687 (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	98.0185	85.7126	89.6639	76.7042	72.6583	63.7364	62.1518	65.9222	67.9897	77.8013	84.9982	96.7687 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											942.1259 (64)
Electric shower(s)	56.0536	49.9443	54.5372	52.0442	53.0208	50.5767	52.2626	53.0208	52.0442	54.5372	53.5117	56.0536 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											637.6069 (64a)
Heat gains from water heating, kWh/month	38.5180	33.9142	36.0503	32.1871	31.4198	28.5783	28.6036	29.7357	30.0085	33.0846	34.6275	38.2056 (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	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	141.1704	156.2958	141.1704	145.8761	141.1704	145.8761	141.1704	141.1704	145.8761	141.1704	145.8761	141.1704 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	254.7009	257.3439	250.6836	236.5047	218.6064	201.7844	190.5464	187.9034	194.5636	208.7426	226.6409	243.4628 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504 (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)	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030 (71)
Water heating gains (Table 5)	51.7716	50.4676	48.4547	44.7043	42.2309	39.6920	38.4457	39.9674	41.6784	44.4686	48.0937	51.3516 (72)
Total internal gains	511.5940	528.0585	504.2599	491.0362	465.9588	451.3037	434.1136	432.9923	446.0693	458.3327	484.5618	499.9360 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
North					4.0600	10.6334	0.6300	0.7000			0.7700			13.1938 (74)
South					8.3700	46.7521	0.6300	0.7000			0.7700			119.5909 (78)
Solar gains	132.7847	221.0731	292.3345	350.7972	386.5444	382.0241	368.9503	341.8304	312.1347	241.2664	158.0322			114.3365 (83)
Total gains	644.3787	749.1315	796.5943	841.8334	852.5032	833.3278	803.0639	774.8227	758.2040	699.5990	642.5941			614.2725 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												
Utilisation factor for gains for living area, nil,m (see Table 9a)												21.0000 (85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	43.4557	43.6466	43.8354	44.7443	44.9185	45.7479	45.7479	45.9049	45.4248	44.9185	44.5674	44.2061
alpha	3.8970	3.9098	3.9224	3.9830	3.9946	4.0499	4.0499	4.0603	4.0283	3.9946	3.9712	3.9471
util living area	0.9778	0.9600	0.9348	0.8757	0.7740	0.6047	0.4520	0.4847	0.6885	0.8848	0.9599	0.9812 (86)
MIT	19.4763	19.7395	20.0463	20.4462	20.7470	20.9329	20.9837	20.9784	20.8821	20.5037	19.9440	19.4498 (87)
Th 2	20.1683	20.1717	20.1749	20.1904	20.1933	20.2068	20.2068	20.2093	20.2016	20.1933	20.1874	20.1813 (88)
util rest of house	0.9739	0.9532	0.9234	0.8537	0.7343	0.5423	0.3750	0.4074	0.6299	0.8602	0.9519	0.9778 (89)
MIT 2	18.7718	19.0329	19.3348	19.7290	20.0042	20.1670	20.2000	20.1997	20.1261	19.7907	19.2485	18.7555 (90)
Living area fraction	FLA = Living area / (4) =											
MIT	18.9216	19.1831	19.4861	19.8815	20.1622	20.3298	20.3666	20.3653	20.2868	19.9423	19.3964	18.9031 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9216	19.1831	19.4861	19.8815	20.1622	20.3298	20.3666	20.3653	20.2868	19.9423	19.3964	18.9031 (93)

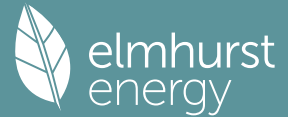
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9663	0.9432	0.9121	0.8442	0.7327	0.5524	0.3908	0.4230	0.6365	0.8514	0.9423	0.9710 (94)
Useful gains	622.6619	706.5507	726.5520	710.7124	624.5987	460.3257	313.8680	327.7627	482.6276	595.6485	605.5063	596.4610 (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	1301.3874	1265.7014	1145.8119	949.2534	728.6420	484.4260	318.4484	334.0967	526.7843	804.4291	1067.1368	1286.4254 (97)
Space heating kWh	504.9718	375.7493	311.9294	171.7495	77.4082	0.0000	0.0000	0.0000	0.0000	155.3328	332.3740	513.3334 (98a)
Space heating requirement - total per year (kWh/year)												2442.8484
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	504.9718	375.7493	311.9294	171.7495	77.4082	0.0000	0.0000	0.0000	0.0000	155.3328	332.3740	513.3334 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2442.8484
Space heating per m2												(98c) / (4) =

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	794.7223	625.6324	640.3444	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8517	0.9106	0.8962	0.0000	0.0000	0.0000	0.0000 (101)

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Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	676.8481	569.6818	573.8661	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	908.4483	876.1424	846.0226	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	166.7522	228.0067	202.4844	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	41.6880	57.0017	50.6211	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												149.3108 (107)
Energy for space heating												24.6752 (99)
Energy for space cooling												1.5082 (108)
Total												26.1834 (109)
Fabric Energy Efficiency (TFEE)												26.2 (109)

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

1. Overall dwelling characteristics

Main dwelling		Area (m2)	Storey height (m)	Volume (m3)	
Ground floor		99.0000 (1b)	x 3.1500 (2b)	= 311.8500 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.0000				(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	311.8500 (5)	

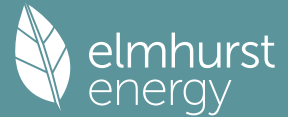
2. Ventilation rate

											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											3.0000	(17)	
Infiltration rate											0.1500	(18)	
Number of sides sheltered											0	(19)	
Shelter factor											(20) = 1 - [0.075 x (19)] =	1.0000 (20)	
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1500 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)	
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													
	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (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	0.2862	0.2825	0.2787	0.2600	0.2562	0.2375	0.2375	0.2337	0.2450	0.2562	0.2637	0.2712 (25)	

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K					
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K					
Glazing			12.4300	0.7752	9.6357			(27)				
External Wall North	32.1000	4.0600	28.0400	0.1400	3.9256	70.0000	1962.8000	(29a)				
External Wall South	33.8300	8.3700	25.4600	0.1400	3.5644	70.0000	1782.2000	(29a)				
Total net area of external elements Aum(A, m2)			65.9300					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	17.1257			(33)				
Main dwelling												
Party Wall 1 East			33.1100	0.0000	0.0000	45.0000	1489.9500	(32)				
Party Wall 2 West			32.6000	0.0000	0.0000	45.0000	1467.0000	(32)				
Party Floor 1			99.0000			30.0000	2970.0000	(32d)				
Party Ceiling 1			99.0000			30.0000	2970.0000	(32b)				
Internal Wall 1			142.4400			9.0000	1281.9600	(32c)				
Heat capacity Cm = Sum(A x k)												
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K					(28)...(30) + (32) + (32a)...(32e) =		13923.9100	(34)				
List of Thermal Bridges							140.6456	(35)				
K1 Element					Length	Psi-value	Total					
E7 Party floor between dwellings (in blocks of flats)					41.5000	0.0300	1.2450					
E18 Party wall between dwellings					12.6000	0.0300	0.3780					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							1.6230	(36)				
Point Thermal bridges							(36a) =	0.0000				
Total fabric heat loss							(33) + (36) + (36a) =	18.7487 (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

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(38)m	29.4581	29.0722	28.6863	26.7567	26.3708	24.4412	24.4412	24.0553	25.2131	26.3708	27.1426	27.9145 (38)
Heat transfer coeff	48.2068	47.8209	47.4350	45.5054	45.1195	43.1899	43.1899	42.8040	43.9617	45.1195	45.8913	46.6631 (39)
Average = Sum(39)m / 12 =												45.4089
HLP	Jan 0.4869	Feb 0.4830	Mar 0.4791	Apr 0.4597	May 0.4558	Jun 0.4363	Jul 0.4363	Aug 0.4324	Sep 0.4441	Oct 0.4558	Nov 0.4635	Dec 0.4713 (40)
HLP (average)												0.4587
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7301 (42)
Hot water usage for mixer showers												
76.7540	75.5789	73.8471	71.1830	68.7961	65.4568	62.8156	65.9033	67.4563	70.7637	74.2081	76.6848 (42a)	
Hot water usage for baths												
29.5492	29.1032	28.4686	27.5183	26.6619	25.4829	24.5884	25.6822	26.2562	27.4244	28.6390	29.5258 (42b)	
Hot water usage for other uses												
42.5887	41.0400	39.4913	37.9426	36.3940	34.8453	34.8453	36.3940	37.9426	39.4913	41.0400	42.5887 (42c)	
Average daily hot water use (litres/day)												136.8774 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
148.8919	145.7221	141.8070	136.6440	131.8519	125.7850	122.2493	127.9795	131.6551	137.6795	143.8871	148.7993 (44)	
Energy content	219.1946	192.8198	202.6394	178.4912	169.9046	145.4661	135.0891	150.6342	152.7134	177.4139	194.4682	218.5226 (45)
Energy content (annual)										Total = Sum(45)m =		2137.3570
Distribution loss (46)m = 0.15 x (45)m												
32.8792	28.9230	30.3959	26.7737	25.4857	21.8199	20.2634	22.5951	22.9070	26.6121	29.1702	32.7784 (46)	
Water storage loss:												
Store volume												110.0000 (47)
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 (61)	
Total heat required for water heating calculated for each month												
274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994 (62)	
WWHRS	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 (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 (63c)	
FGHRS	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												
274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994 (64)	
									Total per year (kWh/year) = Sum(64)m =			2788.1968 (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												
117.1037	104.0545	111.5990	102.1433	100.7147	91.1624	89.1386	94.3073	93.5721	103.2116	107.4556	116.8802 (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	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.4070	25.2308	20.5191	15.5343	11.6120	9.8034	10.5929	13.7690	18.4808	23.4656	27.3878	29.1965 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	380.1506	384.0954	374.1547	352.9921	326.2782	301.1708	284.3976	280.4528	290.3935	311.5561	338.2700	363.3774 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105 (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)	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030 (71)
Water heating gains (Table 5)	157.3974	154.8430	149.9987	141.8656	135.3692	126.6145	119.8099	126.7571	129.9613	138.7252	149.2439	157.0971 (72)
Total internal gains	674.6670	672.8812	653.3845	619.1040	581.9714	546.3007	523.5123	529.6909	547.5476	582.4589	623.6138	658.3829 (73)

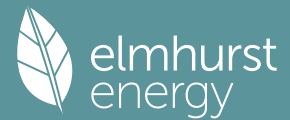
6. Solar gains

[Jan]												Gains
			Area	Solar flux		g		FF		Access	Gains	
			m2	Table 6a		Specific data		Specific data		factor	W	
				W/m2		or Table 6b		or Table 6c		Table 6d		
North			4.0600	10.6334		0.3500		0.8500		0.7700	8.9006 (74)	
South			8.3700	46.7521		0.3500		0.8500		0.7700	80.6764 (78)	
Solar gains	89.5770	149.1366	197.2098	236.6489	260.7641	257.7147	248.8950	230.5999	210.5671	162.7591	106.6090	77.1318 (83)
Total gains	764.2439	822.0178	850.5942	855.7529	842.7355	804.0153	772.4074	760.2908	758.1147	745.2179	730.2228	735.5147 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.2325	80.8800	81.5380	84.9955	85.7225	89.5522	89.5522	90.3596	87.9800	85.7225	84.2807	82.8867
alpha	6.3488	6.3920	6.4359	6.6664	6.7148	6.9701	6.9701	7.0240	6.8653	6.7148	6.6187	6.5258
util living area												
	0.8853	0.8348	0.7589	0.6309	0.4956	0.3437	0.2460	0.2590	0.3997	0.6189	0.8033	0.8931 (86)

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MIT	20.7393	20.8299	20.9140	20.9780	20.9960	20.9998	21.0000	21.0000	20.9993	20.9836	20.8951	20.7407 (87)
Th 2	20.5328	20.5364	20.5400	20.5580	20.5616	20.5796	20.5796	20.5832	20.5724	20.5616	20.5544	20.5472 (88)
util rest of house	0.8739	0.8205	0.7410	0.6099	0.4728	0.3211	0.2225	0.2355	0.3750	0.5949	0.7859	0.8824 (89)
MIT 2	20.2342	20.3453	20.4467	20.5355	20.5578	20.5794	20.5796	20.5832	20.5718	20.5455	20.4400	20.2492 (90)
Living area fraction									fLA = Living area / (4) =			0.2126 (91)
MIT	20.3416	20.4484	20.5461	20.6296	20.6510	20.6688	20.6690	20.6718	20.6627	20.6386	20.5368	20.3537 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3416	20.4484	20.5461	20.6296	20.6510	20.6688	20.6690	20.6718	20.6627	20.6386	20.5368	20.3537 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8690	0.8177	0.7412	0.6134	0.4774	0.3259	0.2275	0.2405	0.3802	0.5992	0.7852	0.8775 (94)	
Useful gains	664.1023	672.1634	630.4684	524.8872	402.3534	262.0397	175.7342	182.8446	288.2726	446.5268	573.3768	645.4256 (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	773.3140	743.5361	666.2741	533.7593	403.8645	262.1112	175.7387	182.8509	288.5080	452.9378	616.6316	753.7809 (97)	
Space heating kWh	81.2535	47.9625	26.6394	6.3879	1.1242	0.0000	0.0000	0.0000	0.0000	4.7698	31.1434	80.6163 (98a)	
Space heating requirement - total per year (kWh/year)												279.8971	
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	81.2535	47.9625	26.6394	6.3879	1.1242	0.0000	0.0000	0.0000	0.0000	4.7698	31.1434	80.6163 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												279.8971	
Space heating per m2										(98c) / (4) =		2.8272 (99)	

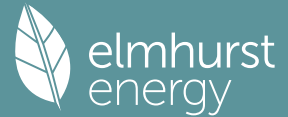
9b. Energy requirements

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													1.0000 (306)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating:													
Space heating requirement	81.2535	47.9625	26.6394	6.3879	1.1242	0.0000	0.0000	0.0000	0.0000	4.7698	31.1434	80.6163 (98)	
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													
307a	81.2535	47.9625	26.6394	6.3879	1.1242	0.0000	0.0000	0.0000	0.0000	4.7698	31.1434	80.6163	
Space heating requirement	81.2535	47.9625	26.6394	6.3879	1.1242	0.0000	0.0000	0.0000	0.0000	4.7698	31.1434	80.6163 (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	274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994 (64)	
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310a	274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994	
Water heating fuel	274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994 (310)	
Cooling System Energy Efficiency Ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	23.9761	21.6558	23.9761	23.2027	23.9761	23.2027	23.9761	23.9761	23.2027	23.9761	23.2027	23.9761 (331)	
Lighting	24.8645	19.9472	17.9602	13.1584	10.1640	8.3040	9.2719	12.0520	15.6543	20.5393	23.1991	25.5555 (332)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-20.4894	-30.8687	-47.4902	-57.2878	-65.2320	-62.2155	-61.4427	-56.2285	-47.6796	-36.9161	-23.2123	-17.4869 (333a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)	
Annual totals kWh/year													
Space heating fuel - community heating												279.8971 (307)	
Space heating fuel - secondary												0.0000 (309)	
Water heating fuel - community heating												2788.1968 (310)	
Efficiency of water heater												0.0000 (311)	
Electricity used for heat distribution												2.7990 (313)	
Space cooling fuel												0.0000 (321)	
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7420)													
mechanical ventilation fans (SFP = 0.7420)												282.2991 (330a)	
Total electricity for the above, kWh/year												282.2991 (331)	
Electricity for lighting (calculated in Appendix L)												200.6704 (332)	
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-526.5497 (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												3024.5136 (338)	

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	279.8971	4.4400	12.4274 (340a)	
Space heating total			12.4274 (340)	

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Total CO2 associated with community systems			0.0000 (473)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Heat pump	2788.1968	4.4400	123.7959 (342a)
Water heating total			123.7959 (342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (347a)
Pumps, fans and electric keep-hot	282.2991	16.4900	46.5511 (349)
Energy for lighting	200.6704	16.4900	33.0905 (350)
Additional standing charges			92.0000 (351)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-526.5497	16.4900	-86.8281
PV Unit electricity exported	0.0000	5.5900	0.0000
Total			-86.8281 (352)
Total energy cost			221.0370 (355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.5526 (357)
SAP value		91.0425
SAP rating (Section 12)		91 (358)
SAP band		B

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			333.0000 (367)
Space and Water heating from Heat pump	921.3495	0.1592	13.3777 (367)
Electrical energy for heat distribution (space & water)	2.7990	0.0000	4.3743 (372)
Overall CO2 factor for heat network			0.0442 (386)
Total CO2 associated with community systems			135.7340 (373)
Space and water heating			135.7340 (376)
Pumps, fans and electric keep-hot	282.2991	0.1387	39.1584 (378)
Energy for lighting	200.6704	0.1443	28.9629 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-526.5497	0.1332	-70.1241
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-70.1241 (380)
Total CO2, kg/year			133.7312 (383)
CO2 emissions per m2			1.3500 (384)
EI value			98.7556 (384a)
EI rating			99 (385)
EI band			A

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

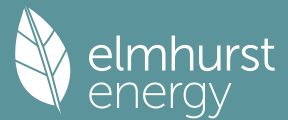
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	99.0000 (1b)	x 3.1500 (2b)	= 311.8500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	311.8500 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.8000	4.5000	4.4000	3.9000	3.9000	3.6000	3.7000	3.5000	3.7000	4.0000	4.1000	4.4000 (22)
Wind factor	1.2000	1.1250	1.1000	0.9750	0.9750	0.9000	0.9250	0.8750	0.9250	1.0000	1.0250	1.1000 (22a)
Adj infilt rate	0.1800	0.1687	0.1650	0.1462	0.1462	0.1350	0.1388	0.1313	0.1388	0.1500	0.1537	0.1650 (22b)
Balanced mechanical ventilation with heat recovery												

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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	0.2750	0.2637	0.2600	0.2412	0.2412	0.2300	0.2337	0.2262	0.2337	0.2450	0.2487	0.2600 (25)
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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								
Glazing			12.4300	0.7752	9.6357			(27)
External Wall North	32.1000	4.0600	28.0400	0.1400	3.9256	70.0000	1962.8000	(29a)
External Wall South	33.8300	8.3700	25.4600	0.1400	3.5644	70.0000	1782.2000	(29a)
Total net area of external elements Aum(A, m2)			65.9300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		17.1257			(33)
Main dwelling								
Party Wall 1 East			33.1100	0.0000	0.0000	45.0000	1489.9500	(32)
Party Wall 2 West			32.6000	0.0000	0.0000	45.0000	1467.0000	(32)
Party Floor 1			99.0000			30.0000	2970.0000	(32d)
Party Ceiling 1			99.0000			30.0000	2970.0000	(32b)
Internal Wall 1			142.4400			9.0000	1281.9600	(32c)
Heat capacity Cm = Sum(A x k)								
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								(34)
List of Thermal Bridges								(35)
K1 Element				Length	Psi-value		Total	
E7 Party floor between dwellings (in blocks of flats)				41.5000	0.0300		1.2450	
E18 Party wall between dwellings				12.6000	0.0300		0.3780	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								1.6230 (36)
Point Thermal bridges							(36a) =	0.0000
Total fabric heat loss							(33) + (36) + (36a) =	18.7487 (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	28.3004	27.1426	26.7567	24.8272	24.8272	23.6694	24.0553	23.2835	24.0553	25.2131	25.5990	26.7567	(38)
Average = Sum(39)m / 12 =	47.0490	45.8913	45.5054	43.5758	43.5758	42.4181	42.8040	42.0322	42.8040	43.9617	44.3476	45.5054	(39)
												44.1225	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.4752	0.4635	0.4597	0.4402	0.4402	0.4285	0.4324	0.4246	0.4324	0.4441	0.4480	0.4597	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

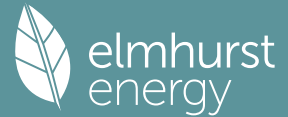
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7301 (42)
Hot water usage for mixer showers													
	76.7540	75.5789	73.8471	71.1830	68.7961	65.4568	62.8156	65.9033	67.4563	70.7637	74.2081	76.6848	(42a)
Hot water usage for baths													
	29.5492	29.1032	28.4686	27.5183	26.6619	25.4829	24.5884	25.6822	26.2562	27.4244	28.6390	29.5258	(42b)
Hot water usage for other uses													
	42.5887	41.0400	39.4913	37.9426	36.3940	34.8453	34.8453	36.3940	37.9426	39.4913	41.0400	42.5887	(42c)
Average daily hot water use (litres/day)													136.8774 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	148.8919	145.7221	141.8070	136.6440	131.8519	125.7850	122.2493	127.9795	131.6551	137.6795	143.8871	148.7993	(44)
Energy content (annual)	219.1946	192.8198	202.6394	178.4912	169.9046	145.4661	135.0891	150.6342	152.7134	177.4139	194.4682	218.5226	(45)
Distribution loss (46)m = 0.15 x (45)m													
	32.8792	28.9230	30.3959	26.7737	25.4857	21.8199	20.2634	22.5951	22.9070	26.6121	29.1702	32.7784	(46)
Water storage loss:													
Store volume													110.0000 (47)
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													
	274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994	(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													
	274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994	(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													
	117.1037	104.0545	111.5990	102.1433	100.7147	91.1624	89.1386	94.3073	93.5721	103.2116	107.4556	116.8802	(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	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	28.4070	25.2308	20.5191	15.5343	11.6120	9.8034	10.5929	13.7690	18.4808	23.4656	27.3878	29.1965	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	380.1506	384.0954	374.1547	352.9921	326.2782	301.1708	284.3976	280.4528	290.3935	311.5561	338.2700	363.3774	(68)
	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	(69)

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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)	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030 (71)
Water heating gains (Table 5)	157.3974	154.8430	149.9987	141.8656	135.3692	126.6145	119.8099	126.7571	129.9613	138.7252	149.2439	157.0971 (72)
Total internal gains	674.6670	672.8812	653.3845	619.1040	581.9714	546.3007	523.5123	529.6909	547.5476	582.4589	623.6138	658.3829 (73)

6. Solar gains

[Jan]	Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North	4.0600		12.7054		0.3500		0.8500		0.7700		10.6349 (74)	
South	8.3700		53.5774		0.3500		0.8500		0.7700		92.4543 (78)	
Solar gains	103.0892	152.4501	201.2176	256.3577	273.9162	290.5332	276.8490	257.0869	230.5425	177.9406	123.8346	85.8916 (83)
Total gains	777.7561	825.3313	854.6021	875.4617	855.8876	836.8339	800.3613	786.7778	778.0901	760.3995	747.4484	744.2745 (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	82.2068	84.2807	84.9955	88.7592	88.7592	91.1817	90.3596	92.0189	90.3596	87.9800	87.2144	84.9955
alpha	6.4805	6.6187	6.6664	6.9173	6.9173	7.0788	7.0240	7.1346	7.0240	6.8653	6.8143	6.6664
util living area	0.8518	0.7996	0.7114	0.5672	0.4270	0.2838	0.1925	0.1870	0.3300	0.5341	0.7322	0.8541 (86)
MIT	20.8159	20.8855	20.9497	20.9906	20.9988	21.0000	21.0000	21.0000	20.9999	20.9945	20.9490	20.8292 (87)
Th 2	20.5436	20.5544	20.5580	20.5760	20.5760	20.5868	20.5832	20.5905	20.5832	20.5724	20.5688	20.5580 (88)
util rest of house	0.8382	0.7840	0.6927	0.5472	0.4056	0.2629	0.1702	0.1651	0.3071	0.5104	0.7125	0.8406 (89)
MIT 2	20.3360	20.4274	20.5043	20.5666	20.5749	20.5868	20.5832	20.5905	20.5831	20.5672	20.5149	20.3655 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	20.4380	20.5248	20.5990	20.6567	20.6650	20.6746	20.6718	20.6775	20.6717	20.6581	20.6072	20.4641 (92)
Temperature adjustment	0.0000											
adjusted MIT	20.4380	20.5248	20.5990	20.6567	20.6650	20.6746	20.6718	20.6775	20.6717	20.6581	20.6072	20.4641 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8349	0.7830	0.6945	0.5511	0.4101	0.2673	0.1750	0.1698	0.3120	0.5152	0.7143	0.8377 (94)
Useful gains	649.3717	646.2187	593.5068	482.4318	351.0015	223.7259	140.0469	133.5582	242.7253	391.7268	533.9110	623.4484 (95)
Ext temp.	5.0000	5.4000	7.1000	9.5000	12.6000	15.4000	17.4000	17.5000	15.0000	11.7000	8.1000	5.2000 (96)
Heat loss rate W	726.3441	694.0965	614.2772	486.1637	351.4407	223.7404	140.0475	133.5586	242.7721	393.8117	554.6668	694.5983 (97)
Space heating kWh	57.2675	32.1739	15.4532	2.6869	0.3268	0.0000	0.0000	0.0000	0.0000	1.5512	14.9442	52.9355 (98a)
Space heating requirement - total per year (kWh/year)												177.3392
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	57.2675	32.1739	15.4532	2.6869	0.3268	0.0000	0.0000	0.0000	0.0000	1.5512	14.9442	52.9355 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												177.3392
Space heating per m2												(98c) / (4) = 1.7913 (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												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	57.2675	32.1739	15.4532	2.6869	0.3268	0.0000	0.0000	0.0000	0.0000	1.5512	14.9442	52.9355 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	57.2675	32.1739	15.4532	2.6869	0.3268	0.0000	0.0000	0.0000	0.0000	1.5512	14.9442	52.9355
Space heating requirement	57.2675	32.1739	15.4532	2.6869	0.3268	0.0000	0.0000	0.0000	0.0000	1.5512	14.9442	52.9355 (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	274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00												
310a	274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994
Water heating fuel	274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994 (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	23.9761	21.6558	23.9761	23.2027	23.9761	23.2027	23.9761	23.9761	23.2027	23.9761	23.2027	23.9761 (331)
Lighting	24.8645	19.9472	17.9602	13.1584	10.1640	8.3040	9.2719	12.0520	15.6543	20.5393	23.1991	25.5555 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-23.7063	-32.2598	-49.3860	-61.5962	-68.0814	-67.6213	-66.3038	-61.2308	-51.8655	-40.5373	-26.9661	-19.6893 (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)												

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(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)														
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	0.0000	(335b)
Annual totals kWh/year														
Space heating fuel - community heating													177.3392	(307)
Space heating fuel - secondary													0.0000	(309)
Water heating fuel - community heating													2788.1968	(310)
Efficiency of water heater													0.0000	(311)
Electricity used for heat distribution													1.7734	(313)
Space cooling fuel													0.0000	(321)
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7420)														
mechanical ventilation fans (SFP = 0.7420)													282.2991	(330a)
Total electricity for the above, kWh/year													282.2991	(331)
Electricity for lighting (calculated in Appendix L)													200.6704	(332)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-569.2437	(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													2879.2617	(338)

10b. Fuel costs - using BEDF prices (568)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	177.3392	5.6000	9.9310	(340a)
Space heating total			9.9310	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2788.1968	5.6000	156.1390	(342a)
Water heating total			156.1390	(342)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(347a)
Pumps, fans and electric keep-hot	282.2991	26.0600	73.5671	(349)
Energy for lighting	200.6704	26.0600	52.2947	(350)
Additional standing charges			99.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-569.2437	26.0600	-148.3449	
PV Unit electricity exported	0.0000	5.8100	0.0000	
Total			-148.3449	(352)
Total energy cost			242.5870	(355)

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			333.0000	(367)
Space and Water heating from Heat pump	890.5513	0.1600	8.5196	(367)
Electrical energy for heat distribution (space & water)	1.7734	0.0000	4.2125	(372)
Overall CO2 factor for heat network			0.0441	(386)
Total CO2 associated with community systems			130.7140	(373)
Space and water heating			130.7140	(376)
Pumps, fans and electric keep-hot	282.2991	0.1387	39.1584	(378)
Energy for lighting	200.6704	0.1443	28.9629	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-569.2437	0.1332	-75.8308	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-75.8308	(380)
Total CO2, kg/year			123.0046	(383)

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			333.0000	(467a)
Space and Water heating from Heat pump	890.5513	1.5921	84.7891	(467)
Electrical energy for heat distribution (space & water)	1.7734	0.0000	45.2327	(472)
Overall CO2 factor for heat network			0.4733	(486)
Total CO2 associated with community systems			1403.5721	(473)
Space and water heating			1403.5721	(476)
Pumps, fans and electric keep-hot	282.2991	1.5128	427.0621	(478)
Energy for lighting	200.6704	1.5338	307.7949	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-569.2437	1.4922	-849.4495	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-849.4495	(480)
Total Primary energy kWh/year			1288.9796	(483)

SAP 10 EPC IMPROVEMENTS

0305_3B5P_BG

Current energy efficiency rating: B 91
Current environmental impact rating: A 99

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N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures Typical annual savings Energy Environmental
(none) efficiency impact

Total Savings £0 0.00 kg/m²

Potential energy efficiency rating: B 91
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 568 TEST (31 Mar 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, South East England):

	Current	Potential	Saving
Electricity	£126	£126	£0
Community scheme	£265	£265	£0
Space heating	£182	£182	£0
Water heating	£156	£156	£0
Lighting	£52	£52	£0
Generated (PV)	-£148	-£148	£0
Total cost of fuels	£243	£243	£0
Total cost of uses	£242	£242	£0
Delivered energy	29 kWh/m ²	29 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m ²	1 kg/m ²	1 kg/m ²	0 kg/m ²
Primary energy	13 kWh/m ²	13 kWh/m ²	0 kWh/m ²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	99.0000 (1b)	x 3.1500 (2b)	= 311.8500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 311.8500 (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)

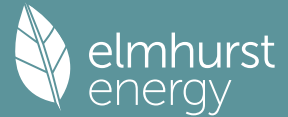
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour
Pressure test		0.0000 / (5) = 0.0000 (8)
Pressure Test Method		Yes
Measured/design AP50		Blower Door
Infiltration rate		3.0000 (17)
Number of sides sheltered		0.1500 (18)
		0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1500 (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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (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	0.2862	0.2825	0.2787	0.2600	0.2562	0.2375	0.2375	0.2337	0.2450	0.2562	0.2637	0.2712 (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							
Glazing			12.4300	0.7752	9.6357		(27)

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External Wall North	32.1000	4.0600	28.0400	0.1400	3.9256	70.0000	1962.8000	(29a)					
External Wall South	33.8300	8.3700	25.4600	0.1400	3.5644	70.0000	1782.2000	(29a)					
Total net area of external elements Aum(A, m2)			65.9300					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =			17.1257		(33)					
Main dwelling													
Party Wall 1 East			33.1100	0.0000	0.0000	45.0000	1489.9500	(32)					
Party Wall 2 West			32.6000	0.0000	0.0000	45.0000	1467.0000	(32)					
Party Floor 1			99.0000			30.0000	2970.0000	(32d)					
Party Ceiling 1			99.0000			30.0000	2970.0000	(32b)					
Internal Wall 1			142.4400			9.0000	1281.9600	(32c)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		13923.9100	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							140.6456	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
E7 Party floor between dwellings (in blocks of flats)				41.5000	0.0300	1.2450							
E18 Party wall between dwellings				12.6000	0.0300	0.3780							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							1.6230	(36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	18.7487	(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	29.4581	29.0722	28.6863	26.7567	26.3708	24.4412	24.4412	24.0553	25.2131	26.3708	27.1426	27.9145	(38)
Average = Sum(39)m / 12 =	48.2068	47.8209	47.4350	45.5054	45.1195	43.1899	43.1899	42.8040	43.9617	45.1195	45.8913	46.6631	(39)
												45.4089	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.4869	0.4830	0.4791	0.4597	0.4558	0.4363	0.4363	0.4324	0.4441	0.4558	0.4635	0.4713	(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													2.7301 (42)
Hot water usage for mixer showers													76.6848 (42a)
Hot water usage for baths													29.5258 (42b)
Hot water usage for other uses													42.5887 (42c)
Average daily hot water use (litres/day)													136.8774 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	148.8919	145.7221	141.8070	136.6440	131.8519	125.7850	122.2493	127.9795	131.6551	137.6795	143.8871	148.7993	(44)
Energy content (annual)	219.1946	192.8198	202.6394	178.4912	169.9046	145.4661	135.0891	150.6342	152.7134	177.4139	194.4682	218.5226	(45)
Distribution loss (46)m = 0.15 x (45)m													2137.3570
Water storage loss:													
Store volume													110.0000 (47)
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													
If cylinder contains dedicated solar storage													
Primary 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)
Combi 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	(57)
Total heat required for water heating calculated for each month	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)
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	(61)
PV diverter	274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994	(62)
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	(63a)
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	(63b)
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	(63c)
Electric shower(s)	274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994	(64)
Heat gains from water heating, kWh/month													
	117.1037	104.0545	111.5990	102.1433	100.7147	91.1624	89.1386	94.3073	93.5721	103.2116	107.4556	116.8802	(65)

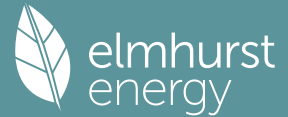
5. Internal gains (see Table 5 and 5a)

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	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	28.4070	25.2308	20.5191	15.5343	11.6120	9.8034	10.5929	13.7690	18.4808	23.4656	27.3878	29.1965	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	380.1506	384.0954	374.1547	352.9921	326.2782	301.1708	284.3976	280.4528	290.3935	311.5561	338.2700	363.3774	(68)
Pumps, fans	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	(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)	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	(71)
Total internal gains	157.3974	154.8430	149.9987	141.8656	135.3692	126.6145	119.8099	126.7571	129.9613	138.7252	149.2439	157.0971	(72)
	674.6670	672.8812	653.3845	619.1040	581.9714	546.3007	523.5123	529.6909	547.5476	582.4589	623.6138	658.3829	(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				4.0600	10.6334	0.3500		0.8500		0.7700		8.9006 (74)
South				8.3700	46.7521	0.3500		0.8500		0.7700		80.6764 (78)
Solar gains	89.5770	149.1366	197.2098	236.6489	260.7641	257.7147	248.8950	230.5999	210.5671	162.7591	106.6090	77.1318 (83)
Total gains	764.2439	822.0178	850.5942	855.7529	842.7355	804.0153	772.4074	760.2908	758.1147	745.2179	730.2228	735.5147 (84)
7. Mean internal temperature (heating season)												
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.2325	80.8800	81.5380	84.9955	85.7225	89.5522	89.5522	90.3596	87.9800	85.7225	84.2807	82.8867
alpha	6.3488	6.3920	6.4359	6.6664	6.7148	6.9701	6.9701	7.0240	6.8653	6.7148	6.6187	6.5258
util living area	0.8853	0.8348	0.7589	0.6309	0.4956	0.3437	0.2460	0.2590	0.3997	0.6189	0.8033	0.8931 (86)
MIT	20.7393	20.8299	20.9140	20.9780	20.9960	20.9998	21.0000	21.0000	20.9993	20.9836	20.8951	20.7407 (87)
Th 2	20.5328	20.5364	20.5400	20.5580	20.5616	20.5796	20.5796	20.5832	20.5724	20.5616	20.5544	20.5472 (88)
util rest of house	0.8739	0.8205	0.7410	0.6099	0.4728	0.3211	0.2225	0.2355	0.3750	0.5949	0.7859	0.8824 (89)
MIT 2	20.2342	20.3453	20.4467	20.5355	20.5578	20.5794	20.5796	20.5832	20.5718	20.5455	20.4400	20.2492 (90)
Living area fraction	fLA = Living area / (4) =											0.2126 (91)
MIT	20.3416	20.4484	20.5461	20.6296	20.6510	20.6688	20.6690	20.6718	20.6627	20.6386	20.5368	20.3537 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3416	20.4484	20.5461	20.6296	20.6510	20.6688	20.6690	20.6718	20.6627	20.6386	20.5368	20.3537 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8690	0.8177	0.7412	0.6134	0.4774	0.3259	0.2275	0.2405	0.3802	0.5992	0.7852	0.8775 (94)
Useful gains	664.1023	672.1634	630.4684	524.8872	402.3534	262.0397	175.7342	182.8446	288.2726	446.5268	573.3768	645.4256 (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	773.3140	743.5361	666.2741	533.7593	403.8645	262.1112	175.7387	182.8509	288.5080	452.9378	616.6316	753.7809 (97)
Space heating kWh	81.2535	47.9625	26.6394	6.3879	1.1242	0.0000	0.0000	0.0000	0.0000	4.7698	31.1434	80.6163 (98a)
Space heating requirement - total per year (kWh/year)												279.8971
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	81.2535	47.9625	26.6394	6.3879	1.1242	0.0000	0.0000	0.0000	0.0000	4.7698	31.1434	80.6163 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												279.8971
Space heating per m2	(98c) / (4) =											2.8272 (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												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement												
81.2535 47.9625 26.6394 6.3879 1.1242 0.0000 0.0000 0.0000 0.0000 4.7698 31.1434 80.6163 (98)												
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a 81.2535 47.9625 26.6394 6.3879 1.1242 0.0000 0.0000 0.0000 4.7698 31.1434 80.6163												
Space heating requirement												
81.2535 47.9625 26.6394 6.3879 1.1242 0.0000 0.0000 0.0000 4.7698 31.1434 80.6163 (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												
274.4714 242.7472 257.9162 231.9849 225.1814 198.9598 190.3659 205.9110 206.2071 232.6907 247.9619 273.7994 (64)												
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00												
310a 274.4714 242.7472 257.9162 231.9849 225.1814 198.9598 190.3659 205.9110 206.2071 232.6907 247.9619 273.7994												
Water heating fuel												
274.4714 242.7472 257.9162 231.9849 225.1814 198.9598 190.3659 205.9110 206.2071 232.6907 247.9619 273.7994 (310)												
Cooling System Energy Efficiency Ratio												
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 (314)												
Pumps and Fa 23.9761 21.6558 23.9761 23.2027 23.9761 23.2027 23.9761 23.9761 23.2027 23.9761 23.2027 23.9761 (331)												
Lighting 24.8645 19.9472 17.9602 13.1584 10.1640 8.3040 9.2719 12.0520 15.6543 20.5393 23.1991 25.5555 (332)												
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m -20.4894 -30.8687 -47.4902 -57.2878 -65.2320 -62.2155 -61.4427 -56.2285 -47.6796 -36.9161 -23.2123 -17.4869 (333a)												
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (334a)												
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (335a)												
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (333b)												
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (334b)												
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (335b)												
Annual totals kWh/year												
Space heating fuel - community heating												279.8971 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2788.1968 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												2.7990 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7420)												

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mechanical ventilation fans (SFP = 0.7420)	282.2991 (330a)
Total electricity for the above, kWh/year	282.2991 (331)
Electricity for lighting (calculated in Appendix L)	200.6704 (332)

Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-526.5497 (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	3024.5136 (338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating from Heat pump	279.8971	4.4400	12.4274 (340a)
Space heating total			12.4274 (340)
Total CO2 associated with community systems			0.0000 (473)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Heat pump	2788.1968	4.4400	123.7959 (342a)
Water heating total			123.7959 (342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (347a)
Pumps, fans and electric keep-hot	282.2991	16.4900	46.5511 (349)
Energy for lighting	200.6704	16.4900	33.0905 (350)
Additional standing charges			92.0000 (351)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-526.5497	16.4900	-86.8281
PV Unit electricity exported	0.0000	5.5900	0.0000
Total			-86.8281 (352)
Total energy cost			221.0370 (355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600 (356)
Energy cost factor (ECF)	0.5526 (357)
SAP value	91.0425
SAP rating (Section 12)	91 (358)
SAP band	B

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			333.0000 (367)
Space and Water heating from Heat pump	921.3495	0.1592	13.3777 (367)
Electrical energy for heat distribution (space & water)	2.7990	0.0000	4.3743 (372)
Overall CO2 factor for heat network			0.0442 (386)
Total CO2 associated with community systems			135.7340 (373)
Space and water heating			135.7340 (376)
Pumps, fans and electric keep-hot	282.2991	0.1387	39.1584 (378)
Energy for lighting	200.6704	0.1443	28.9629 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-526.5497	0.1332	-70.1241
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-70.1241 (380)
Total CO2, kg/year			133.7312 (383)
CO2 emissions per m2			1.3500 (384)
EI value			98.7556 (384a)
EI rating			99 (385)
EI band			A

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

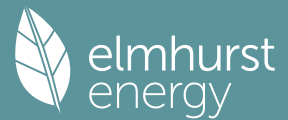
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	99.0000 (1b)	x 3.1500 (2b)	= 311.8500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 311.8500 (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)

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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 0 (19)
Shelter factor (20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1500 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.8000	4.5000	4.4000	3.9000	3.9000	3.6000	3.7000	3.5000	3.7000	4.0000	4.1000	4.4000	(22)
Wind factor	1.2000	1.1250	1.1000	0.9750	0.9750	0.9000	0.9250	0.8750	0.9250	1.0000	1.0250	1.1000	(22a)
Adj infilt rate	0.1800	0.1687	0.1650	0.1462	0.1462	0.1350	0.1388	0.1313	0.1388	0.1500	0.1537	0.1650	(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	0.2750	0.2637	0.2600	0.2412	0.2412	0.2300	0.2337	0.2262	0.2337	0.2450	0.2487	0.2600	(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								
Glazing			12.4300	0.7752	9.6357			(27)
External Wall North	32.1000	4.0600	28.0400	0.1400	3.9256	70.0000	1962.8000	(29a)
External Wall South	33.8300	8.3700	25.4600	0.1400	3.5644	70.0000	1782.2000	(29a)
Total net area of external elements Aum(A, m2)			65.9300					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	17.1257		(33)
Main dwelling								
Party Wall 1 East			33.1100	0.0000	0.0000	45.0000	1489.9500	(32)
Party Wall 2 West			32.6000	0.0000	0.0000	45.0000	1467.0000	(32)
Party Floor 1			99.0000			30.0000	2970.0000	(32d)
Party Ceiling 1			99.0000			30.0000	2970.0000	(32b)
Internal Wall 1			142.4400			9.0000	1281.9600	(32c)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K (28)...(30) + (32) + (32a)...(32e) = 13923.9100 (34)
List of Thermal Bridges 140.6456 (35)

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450	
E18 Party wall between dwellings	12.6000	0.0300	0.3780	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				1.6230 (36)
Point Thermal bridges				(36a) = 0.0000
Total fabric heat loss				(33) + (36) + (36a) = 18.7487 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
(38)m Jan 28.3004 Feb 27.1426 Mar 26.7567 Apr 24.8272 May 24.8272 Jun 23.6694 Jul 24.0553 Aug 23.2835 Sep 24.0553 Oct 25.2131 Nov 25.5990 Dec 26.7567 (38)
Heat transfer coeff 47.0490 45.8913 45.5054 43.5758 43.5758 42.4181 42.8040 42.0322 42.8040 43.9617 44.3476 45.5054 (39)
Average = Sum(39)m / 12 = 44.1225

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.4752	0.4635	0.4597	0.4402	0.4402	0.4285	0.4324	0.4246	0.4324	0.4441	0.4480	0.4597	(40)
HLP (average)													0.4457
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

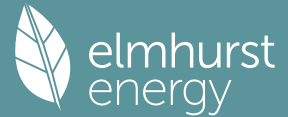
Assumed occupancy 2.7301 (42)
Hot water usage for mixer showers 76.7540 75.5789 73.8471 71.1830 68.7961 65.4568 62.8156 65.9033 67.4563 70.7637 74.2081 76.6848 (42a)
Hot water usage for baths 29.5492 29.1032 28.4686 27.5183 26.6619 25.4829 24.5884 25.6822 26.2562 27.4244 28.6390 29.5258 (42b)
Hot water usage for other uses 42.5887 41.0400 39.4913 37.9426 36.3940 34.8453 34.8453 36.3940 37.9426 39.4913 41.0400 42.5887 (42c)
Average daily hot water use (litres/day) 136.8774 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.8919	145.7221	141.8070	136.6440	131.8519	125.7850	122.2493	127.9795	131.6551	137.6795	143.8871	148.7993	(44)
Energy conte	219.1946	192.8198	202.6394	178.4912	169.9046	145.4661	135.0891	150.6342	152.7134	177.4139	194.4682	218.5226	(45)
Energy content (annual)													Total = Sum(45)m = 2137.3570
Distribution loss (46)m = 0.15 x (45)m	32.8792	28.9230	30.3959	26.7737	25.4857	21.8199	20.2634	22.5951	22.9070	26.6121	29.1702	32.7784	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day)
Volume factor from Table 2a 0.0152 (51)
Temperature factor from Table 2b 1.0294 (52)
Enter (49) or (54) in (55) 0.6000 (53)
Total storage loss 1.0327 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	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	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													
274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994	273.7994	(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)

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Output from w/h	274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994 (64)
	Total per year (kWh/year) = Sum(64)m = 2788.1968 (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	117.1037	104.0545	111.5990	102.1433	100.7147	91.1624	89.1386	94.3073	93.5721	103.2116	107.4556	116.8802 (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
	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044	163.8044 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	28.4070	25.2308	20.5191	15.5343	11.6120	9.8034	10.5929	13.7690	18.4808	23.4656	27.3878	29.1965 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	380.1506	384.0954	374.1547	352.9921	326.2782	301.1708	284.3976	280.4528	290.3935	311.5561	338.2700	363.3774 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105	54.1105 (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)												
	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030 (71)
Water heating gains (Table 5)												
	157.3974	154.8430	149.9987	141.8656	135.3692	126.6145	119.8099	126.7571	129.9613	138.7252	149.2439	157.0971 (72)
Total internal gains	674.6670	672.8812	653.3845	619.1040	581.9714	546.3007	523.5123	529.6909	547.5476	582.4589	623.6138	658.3829 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
North					4.0600	12.7054	0.3500	0.8500			0.7700			10.6349 (74)
South					8.3700	53.5774	0.3500	0.8500			0.7700			92.4543 (78)
Solar gains	103.0892	152.4501	201.2176	256.3577	273.9162	290.5332	276.8490	257.0869	230.5425	177.9406	123.8346	85.8916 (83)		
Total gains	777.7561	825.3313	854.6021	875.4617	855.8876	836.8339	800.3613	786.7778	778.0901	760.3995	747.4484	744.2745 (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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	82.2068	84.2807	84.9955	88.7592	88.7592	91.1817	90.3596	92.0189	90.3596	87.9800	87.2144	84.9955
alpha	6.4805	6.6187	6.6664	6.9173	6.9173	7.0788	7.0240	7.1346	7.0240	6.8653	6.8143	6.6664
util living area	0.8518	0.7996	0.7114	0.5672	0.4270	0.2838	0.1925	0.1870	0.3300	0.5341	0.7322	0.8541 (86)
MIT	20.8159	20.8855	20.9497	20.9906	20.9988	21.0000	21.0000	21.0000	20.9999	20.9945	20.9490	20.8292 (87)
Th 2	20.5436	20.5544	20.5580	20.5760	20.5760	20.5868	20.5832	20.5905	20.5832	20.5724	20.5688	20.5580 (88)
util rest of house	0.8382	0.7840	0.6927	0.5472	0.4056	0.2629	0.1702	0.1651	0.3071	0.5104	0.7125	0.8406 (89)
MIT 2	20.3360	20.4274	20.5043	20.5666	20.5749	20.5868	20.5832	20.5905	20.5831	20.5672	20.5149	20.3655 (90)
Living area fraction									fLA = Living area / (4) =			0.2126 (91)
MIT	20.4380	20.5248	20.5990	20.6567	20.6650	20.6746	20.6718	20.6775	20.6717	20.6581	20.6072	20.4641 (92)
Temperature adjustment												0.0000
adjusted MIT	20.4380	20.5248	20.5990	20.6567	20.6650	20.6746	20.6718	20.6775	20.6717	20.6581	20.6072	20.4641 (93)

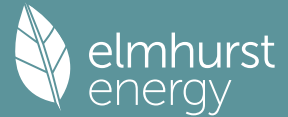
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.8349	0.7830	0.6945	0.5511	0.4101	0.2673	0.1750	0.1698	0.3120	0.5152	0.7143	0.8377 (94)
Useful gains	649.3717	646.2187	593.5068	482.4318	351.0015	223.7259	140.0469	133.5582	242.7253	391.7268	533.9110	623.4484 (95)
Ext temp.	5.0000	5.4000	7.1000	9.5000	12.6000	15.4000	17.4000	17.5000	15.0000	11.7000	8.1000	5.2000 (96)
Heat loss rate W	726.3441	694.0965	614.2772	486.1637	351.4407	223.7404	140.0475	133.5586	242.7721	393.8117	554.6668	694.5983 (97)
Space heating kWh	57.2675	32.1739	15.4532	2.6869	0.3268	0.0000	0.0000	0.0000	0.0000	1.5512	14.9442	52.9355 (98a)
Space heating requirement - total per year (kWh/year)												177.3392
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	57.2675	32.1739	15.4532	2.6869	0.3268	0.0000	0.0000	0.0000	0.0000	1.5512	14.9442	52.9355 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												177.3392
Space heating per m2										(98c) / (4) =		1.7913 (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												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	57.2675	32.1739	15.4532	2.6869	0.3268	0.0000	0.0000	0.0000	0.0000	1.5512	14.9442	52.9355 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	57.2675	32.1739	15.4532	2.6869	0.3268	0.0000	0.0000	0.0000	0.0000	1.5512	14.9442	52.9355
Space heating requirement												

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Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	57.2675	32.1739	15.4532	2.6869	0.3268	0.0000	0.0000	0.0000	0.0000	1.5512	14.9442	52.9355 (307)
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 (308)
Water heating	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Annual water heating requirement	274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00	274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994
310a	274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994
Water heating fuel	274.4714	242.7472	257.9162	231.9849	225.1814	198.9598	190.3659	205.9110	206.2071	232.6907	247.9619	273.7994 (310)
Cooling System Energy Efficiency Ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	23.9761	21.6558	23.9761	23.2027	23.9761	23.2027	23.9761	23.9761	23.2027	23.9761	23.2027	23.9761 (331)
Lighting	24.8645	19.9472	17.9602	13.1584	10.1640	8.3040	9.2719	12.0520	15.6543	20.5393	23.1991	25.5555 (332)
Electricity generated by PVs (Appendix M) (negative quantity)	-23.7063	-32.2598	-49.3860	-61.5962	-68.0814	-67.6213	-66.3038	-61.2308	-51.8655	-40.5373	-26.9661	-19.6893 (333a)
(333a)m	-23.7063	-32.2598	-49.3860	-61.5962	-68.0814	-67.6213	-66.3038	-61.2308	-51.8655	-40.5373	-26.9661	-19.6893 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												177.3392 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2788.1968 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												1.7734 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7420)												
mechanical ventilation fans (SFP = 0.7420)												282.2991 (330a)
Total electricity for the above, kWh/year												282.2991 (331)
Electricity for lighting (calculated in Appendix L)												200.6704 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-569.2437 (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												2879.2617 (338)

10b. Fuel costs - using BEDF prices (568)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating from Heat pump	177.3392	5.6000	9.9310 (340a)
Space heating total			9.9310 (340)
Total CO2 associated with community systems			0.0000 (473)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Heat pump	2788.1968	5.6000	156.1390 (342a)
Water heating total			156.1390 (342)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (347a)
Pumps, fans and electric keep-hot	282.2991	26.0600	73.5671 (349)
Energy for lighting	200.6704	26.0600	52.2947 (350)
Additional standing charges			99.0000 (351)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-569.2437	26.0600	-148.3449
PV Unit electricity exported	0.0000	5.8100	0.0000
Total			-148.3449 (352)
Total energy cost			242.5870 (355)

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			333.0000 (367)
Space and Water heating from Heat pump	890.5513	0.1600	8.5196 (367)
Electrical energy for heat distribution (space & water)	1.7734	0.0000	4.2125 (372)
Overall CO2 factor for heat network			0.0441 (386)
Total CO2 associated with community systems			130.7140 (373)
Space and water heating			130.7140 (376)
Pumps, fans and electric keep-hot	282.2991	0.1387	39.1584 (378)
Energy for lighting	200.6704	0.1443	28.9629 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-569.2437	0.1332	-75.8308
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-75.8308 (380)
Total CO2, kg/year			123.0046 (383)

13b. Primary energy - Community heating scheme

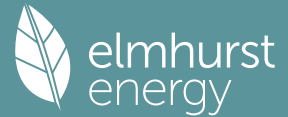
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			333.0000 (467a)
Space and Water heating from Heat pump	890.5513	1.5921	84.7891 (467)
Electrical energy for heat distribution (space & water)	1.7734	0.0000	45.2327 (472)
Overall CO2 factor for heat network			0.4733 (486)
Total CO2 associated with community systems			1403.5721 (473)
Space and water heating			1403.5721 (476)

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Pumps, fans and electric keep-hot	282.2991	1.5128	427.0621 (478)
Energy for lighting	200.6704	1.5338	307.7949 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-569.2437	1.4922	-849.4495
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-849.4495 (480)
Total Primary energy kWh/year			1288.9796 (483)

Full SAP Calculation Printout



Property Reference	Be Green				Issued on Date	08/04/2025
Assessment Reference	0306_3B6P_BG		Prop Type Ref			
Property						
SAP Rating	91 B	DER	1.37	TER	10.34	
Environmental	99 A	% DER < TER				86.75
CO ₂ Emissions (t/year)	0.13	DFEE	21.85	TFEE	26.75	
Compliance Check	See BREL	% DFEE < TFEE				18.31
% DPER < TPER	74.08	DPER	14.33	TPER	55.31	
Assessor Details	Alfie Gamble-Thornton				Assessor ID	CM02-0001
Client	Fifth State, Fifth State					

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	105.0000 (1b)	3.1500 (2b)	330.7500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	330.7500 (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	0	(19)

Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1500 (21)

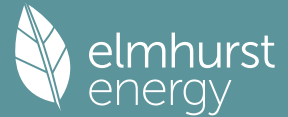
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (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	0.2862	0.2825	0.2787	0.2600	0.2562	0.2375	0.2375	0.2337	0.2450	0.2562	0.2637	0.2712 (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							
Glazing			14.4900	0.7752	11.2326		(27)
External Wall North	21.2600	5.1200	16.1400	0.1400	2.2596	70.0000	1129.8000 (29a)
External Wall South	38.7100	9.3700	29.3400	0.1400	4.1076	70.0000	2053.8000 (29a)
Total net area of external elements Aum(A, m ²)			59.9700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.5998		(33)
Main dwelling							
Party Wall 1 East			32.4800	0.0000	0.0000	45.0000	1461.6000 (32)
Party Wall 2 West			35.0600	0.0000	0.0000	45.0000	1577.7000 (32)
Party Floor 1			105.0000			30.0000	3150.0000 (32d)
Party Ceiling 1			105.0000			20.0000	2100.0000 (32b)
Internal Wall 1			117.9400			9.0000	1061.4600 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12534.3600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		119.3749 (35)
List of Thermal Bridges		

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K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450
E18 Party wall between dwellings	12.6000	0.0300	0.3780
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			1.6230 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	19.2228 (37)

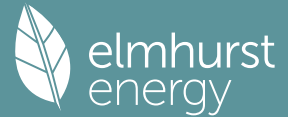
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	31.2435	30.8342	30.4249	28.3784	27.9690	25.9225	25.9225	25.5132	26.7411	27.9690	28.7877	29.6063
Average = Sum(39)m / 12 =	50.4662	50.0569	49.6476	47.6011	47.1918	45.1453	45.1453	44.7360	45.9639	47.1918	48.0104	48.8290
												47.4988
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.4806	0.4767	0.4728	0.4533	0.4494	0.4300	0.4300	0.4261	0.4378	0.4494	0.4572	0.4650
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.7812 (42)
Hot water usage for mixer showers												77.6247 (42a)
Hot water usage for baths												29.8862 (42b)
Hot water usage for other uses												43.1127 (42c)
Average daily hot water use (litres/day)												138.5556 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	150.7174	147.5087	143.5457	138.3193	133.4685	127.3271	123.7482	129.5486	133.2693	139.3675	145.6513	150.6237
Energy content (annual)	221.8821	195.1838	205.1238	180.6795	171.9876	147.2495	136.7454	152.4810	154.5858	179.5891	196.8525	221.2019
Distribution loss (46)m = 0.15 x (45)m												2163.5622
Water storage loss:												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												0.0152 (51)
Hot water storage loss factor from Table 2 (kWh/litre/day)												1.0294 (52)
Volume factor from Table 2a												0.6000 (53)
Temperature factor from Table 2b												1.0327 (55)
Enter (49) or (54) in (55)												
Total storage loss												
If cylinder contains dedicated solar storage												
Primary loss												23.2624 (57)
Combi loss												0.0000 (59)
Total heat required for water heating calculated for each month												
WWHRS												276.4787 (62)
PV diverter												0.0000 (63a)
Solar input												-0.0000 (63b)
FGHRS												0.0000 (63c)
Output from w/h												276.4787 (64)
12Total per year (kWh/year)												2814.4020 (64)
Electric shower(s)												2814 (64)
Heat gains from water heating, kWh/month												
	117.9972	104.8406	112.4251	102.8709	101.4073	91.7554	89.6893	94.9214	94.1947	103.9348	108.2484	117.7711

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	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	137.7833	152.5458	137.7833	142.3761	137.7833	142.3761	137.7833	137.7833	142.3761	137.7833	142.3761	137.7833
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	264.1668	266.9081	260.0003	245.2944	226.7308	209.2837	197.6280	194.8868	201.7946	216.5004	235.0640	252.5111
Pumps, fans	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062
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
Water heating gains (Table 5)	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497
Total internal gains	158.5984	156.0128	151.1090	142.8762	136.3002	127.4381	120.5501	127.5825	130.8260	139.6974	150.3450	158.2944
	625.2672	640.1853	613.6112	595.2654	565.5330	543.8166	520.6801	524.9712	539.7153	558.6998	592.5037	613.3075

6. Solar gains												
[Jan]												
				Area	Solar flux		g		FF		Access	Gains
				m2	Table 6a		Specific data		Specific data		factor	W
					W/m2		or Table 6b		or Table 6c		Table 6d	
North				5.1200	10.6334		0.3500		0.8500		0.7700	11.2244 (74)
South				9.3700	46.7521		0.3500		0.8500		0.7700	90.3151 (78)
Solar gains	101.5395	169.3633	224.8642	271.4967	300.7750	297.9858	287.4832	265.1733	240.6455	185.0718	120.9010	87.3978 (83)
Total gains	726.8068	809.5486	838.4755	866.7621	866.3079	841.8024	808.1633	790.1445	780.3608	743.7716	713.4047	700.7053 (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, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	68.9920	69.5561	70.1296	73.1447	73.7791	77.1236	77.1236	77.8292	75.7500	73.7791	72.5211	71.3053
alpha	5.5995	5.6371	5.6753	5.8763	5.9186	6.1416	6.1416	6.1886	6.0500	5.9186	5.8347	5.7537
util living area	0.9037	0.8474	0.7785	0.6430	0.5021	0.3429	0.2458	0.2604	0.4054	0.6396	0.8237	0.9101 (86)
MIT	20.5917	20.7364	20.8522	20.9587	20.9913	20.9994	20.9999	20.9999	20.9982	20.9664	20.8234	20.5966 (87)
Th 2	20.5386	20.5422	20.5458	20.5638	20.5674	20.5854	20.5854	20.5891	20.5782	20.5674	20.5602	20.5530 (88)
util rest of house	0.8944	0.8348	0.7622	0.6229	0.4797	0.3208	0.2226	0.2372	0.3809	0.6163	0.8083	0.9015 (89)
MIT 2	20.0613	20.2398	20.3812	20.5203	20.5590	20.5850	20.5854	20.5890	20.5767	20.5332	20.3624	20.0801 (90)
Living area fraction									fLA = Living area / (4) =			0.2204 (91)
MIT	20.1782	20.3492	20.4850	20.6169	20.6543	20.6763	20.6768	20.6796	20.6696	20.6287	20.4640	20.1939 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1782	20.3492	20.4850	20.6169	20.6543	20.6763	20.6768	20.6796	20.6696	20.6287	20.4640	20.1939 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8866	0.8292	0.7599	0.6254	0.4842	0.3256	0.2277	0.2423	0.3862	0.6196	0.8048	0.8939 (94)
Useful gains	644.4046	671.3050	637.1839	542.0745	419.4565	274.1271	184.0306	191.4283	301.3692	460.8748	574.1748	626.3950 (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	801.3140	773.3417	694.3209	557.7368	422.5690	274.3161	184.0467	191.4508	301.9625	473.2714	641.6126	780.9687 (97)
Space heating kWh	116.7406	68.5687	42.5099	11.2768	2.3157	0.0000	0.0000	0.0000	0.0000	9.2231	48.5552	115.0028 (98a)
Space heating requirement - total per year (kWh/year)												414.1928
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	116.7406	68.5687	42.5099	11.2768	2.3157	0.0000	0.0000	0.0000	0.0000	9.2231	48.5552	115.0028 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												414.1928
Space heating per m2										(98c) / (4) =		3.9447 (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												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	116.7406	68.5687	42.5099	11.2768	2.3157	0.0000	0.0000	0.0000	0.0000	9.2231	48.5552	115.0028 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	116.7406	68.5687	42.5099	11.2768	2.3157	0.0000	0.0000	0.0000	0.0000	9.2231	48.5552	115.0028
Space heating requirement	116.7406	68.5687	42.5099	11.2768	2.3157	0.0000	0.0000	0.0000	0.0000	9.2231	48.5552	115.0028 (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	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00												
310a	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787
Water heating fuel	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787 (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	25.4292	22.9683	25.4292	24.6089	25.4292	24.6089	25.4292	25.4292	24.6089	25.4292	24.6089	25.4292 (331)
Lighting	25.3128	20.3068	18.2841	13.3957	10.3472	8.4538	9.4391	12.2693	15.9366	20.9096	23.6174	26.0163 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-20.5910	-31.0793	-47.9035	-57.8992	-66.0289	-63.0116	-62.2264	-56.8941	-48.1716	-37.2113	-23.3463	-17.5673 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												414.1928 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2814.4020 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												4.1419 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7420)												
mechanical ventilation fans (SFP = 0.7420)												299.4081 (330a)
Total electricity for the above, kWh/year												299.4081 (331)
Electricity for lighting (calculated in Appendix L)												204.2886 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-531.9305 (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												3200.3611 (338)

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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			333.0000 (367)
Space and Water heating from Heat pump	969.5480	0.1588	19.7458 (367)
Electrical energy for heat distribution (space & water)	4.1419	0.0000	4.6234 (372)
Overall CO2 factor for heat network			0.0444 (386)
Total CO2 associated with community systems			143.4654 (373)
Space and water heating			143.4654 (376)
Pumps, fans and electric keep-hot	299.4081	0.1387	41.5316 (378)
Energy for lighting	204.2886	0.1443	29.4852 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-531.9305	0.1331	-70.8207
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-70.8207 (380)
Total CO2, kg/year			143.6614 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.3700 (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			333.0000 (467a)
Space and Water heating from Heat pump	969.5480	1.5876	197.4733 (467)
Electrical energy for heat distribution (space & water)	4.1419	0.0000	49.3843 (472)
Overall CO2 factor for heat network			0.4746 (486)
Total CO2 associated with community systems			1532.3972 (473)
Space and water heating			1532.3972 (476)
Pumps, fans and electric keep-hot	299.4081	1.5128	452.9446 (478)
Energy for lighting	204.2886	1.5338	313.3447 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-531.9305	1.4920	-793.6277
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-793.6277 (480)
Total Primary energy kWh/year			1505.0588 (483)
Dwelling Primary energy Rate (DPER)			14.3300 (484)

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)
Main dwelling	105.0000	3.1500	330.7500
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.0000		
Dwelling volume			

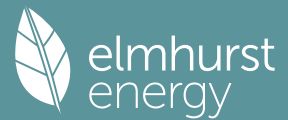
2. Ventilation rate

	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	4 * 10 = 40.0000 (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	40.0000 / (5) = 0.1209 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3709 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3709 (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	0.4729	0.4637	0.4544	0.4080	0.3988	0.3524	0.3524	0.3431	0.3709	0.3988	0.4173	0.4359 (22b)
Effective ac	0.6118	0.6075	0.6032	0.5832	0.5795	0.5621	0.5621	0.5589	0.5688	0.5795	0.5871	0.5950 (25)

3. Heat losses and heat loss parameter

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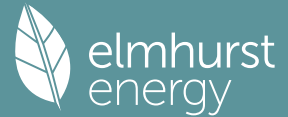
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Main dwelling													
TER Opening Type			14.4900	1.1450	16.5916		(27)						
External Wall North	21.2600	5.1200	16.1400	0.1800	2.9052		(29a)						
External Wall South	38.7100	9.3700	29.3400	0.1800	5.2812		(29a)						
Total net area of external elements Aum(A, m2)			59.9700				(31)						
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.7780		(33)						
Main dwelling													
Party Wall 1 East			32.4800	0.0000	0.0000		(32)						
Party Wall 2 West			35.0600	0.0000	0.0000		(32)						
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							129.3749 (35)						
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
E7 Party floor between dwellings (in blocks of flats)				41.5000	0.0700	2.9050							
E18 Party wall between dwellings				12.6000	0.0600	0.7560							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.6610 (36)						
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss					(33) + (36) + (36a) =		28.4390 (37)						
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 66.7806	Feb 66.3066	Mar 65.8420	Apr 63.6597	May 63.2514	Jun 61.3507	Jul 61.3507	Aug 60.9987	Sep 62.0828	Oct 63.2514	Nov 64.0774	Dec 64.9409	(38)
Heat transfer coeff	95.2196	94.7456	94.2810	92.0987	91.6904	89.7897	89.7897	89.4377	90.5218	91.6904	92.5164	93.3799	(39)
Average = Sum(39)m / 12 =												92.0967	
HLP	Jan 0.9069	Feb 0.9023	Mar 0.8979	Apr 0.8771	May 0.8732	Jun 0.8551	Jul 0.8551	Aug 0.8518	Sep 0.8621	Oct 0.8732	Nov 0.8811	Dec 0.8893	(40)
HLP (average)												0.8771	
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.7812 (42)
Hot water usage for mixer showers	70.8521	69.7873	68.2357	65.2671	63.0763	60.6331	59.2444	60.7843	62.4722	65.0954	68.1278	70.5806 (42a)
Hot water usage for baths	30.5919	30.1376	29.4978	28.3181	27.4348	26.4554	25.9263	26.5616	27.2534	28.3014	29.5054	30.4885 (42b)
Hot water usage for other uses	43.1127	41.5450	39.9772	38.4095	36.8418	35.2740	35.2740	36.8418	38.4095	39.9772	41.5450	43.1127 (42c)
Average daily hot water use (litres/day)												132.8802 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	144.5567	141.4699	137.7108	131.9947	127.3529	122.3625	120.4448	124.1876	128.1351	133.3741	139.1782	144.1818 (44)
Energy content (annual)	228.9425	201.4512	211.6563	180.6942	171.4414	150.4590	145.6675	153.7702	158.0034	180.9874	198.2849	225.7539 (45)
Distribution loss (46)m = 0.15 x (45)m	Total = Sum(45)m =											2207.1119
	34.3414	30.2177	31.7485	27.1041	25.7162	22.5688	21.8501	23.0655	23.7005	27.1481	29.7427	33.8631 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (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	275.5374	243.5370	258.2512	225.7860	218.0363	195.5508	192.2624	200.3651	203.0952	227.5823	243.3767	272.3488 (62)
WWHRS	-32.3906	-28.6465	-29.9970	-24.8387	-23.1488	-19.8086	-18.5674	-19.7445	-20.4947	-24.1610	-27.3715	-31.7908 (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	243.1468	214.8904	228.2543	200.9473	194.8876	175.7422	173.6950	180.6206	182.6005	203.4213	216.0052	240.5580 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											2454.7692 (64)
Electric shower(s)												2455 (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 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000 (64a)
Heat gains from water heating, kWh/month	113.3993	100.6511	107.6517	96.1543	94.2802	86.1011	85.7104	88.4045	88.6096	97.4542	102.0032	112.3391 (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	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	143.3933	158.7569	143.3933	148.1731	143.3933	148.1731	143.3933	143.3933	148.1731	143.3933	148.1731	143.3933 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	264.1668	266.9081	260.0003	245.2944	226.7308	209.2837	197.6280	194.8868	201.7946	216.5004	235.0640	252.5111 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062 (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)	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497 (71)
Water heating gains (Table 5)	152.4184	149.7784	144.6931	133.5476	126.7207	119.5848	115.2021	118.8233	123.0689	130.9869	141.6711	150.9934 (72)
Total internal gains	627.6972	643.1620	615.8053	594.7337	564.5634	541.7603	520.9420	521.8220	537.7551	558.5992	592.6268	614.6164 (73)

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

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												W/m2	or Table 6b		or Table 6c		Table 6d			
North				5.1200		10.6334		0.6300		0.7000		0.7700		16.6385 (74)						
South				9.3700		46.7521		0.6300		0.7000		0.7700		133.8789 (78)						
Solar gains	150.5174	251.0562	333.3281	402.4540	445.8547	441.7202	426.1516	393.0804	356.7216	274.3418	179.2179	129.5544 (83)								
Total gains	778.2146	894.2181	949.1334	997.1877	1010.4181	983.4804	947.0936	914.9023	894.4767	832.9410	771.8447	744.1708 (84)								
7. Mean internal temperature (heating season)																				
Temperature during heating periods in the living area from Table 9, Th1 (C)																				
Utilisation factor for gains for living area, nil,m (see Table 9a)																				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	21.0000 (85)							
tau	39.6287	39.8270	40.0233	40.9716	41.1541	42.0253	42.0253	42.1906	41.6854	41.1541	40.7866	40.4095								
alpha	3.6419	3.6551	3.6682	3.7314	3.7436	3.8017	3.8017	3.8127	3.7790	3.7436	3.7191	3.6940								
util living area	0.9607	0.9359	0.9020	0.8301	0.7177	0.5502	0.4083	0.4377	0.6322	0.8390	0.9342	0.9655 (86)								
MIT	19.5022	19.7743	20.0890	20.4856	20.7708	20.9394	20.9848	20.9801	20.8934	20.5422	19.9874	19.4800 (87)								
Th 2	20.1617	20.1655	20.1693	20.1870	20.1903	20.2058	20.2058	20.2087	20.1998	20.1903	20.1836	20.1766 (88)								
util rest of house	0.9546	0.9263	0.8871	0.8047	0.6766	0.4914	0.3380	0.3669	0.5749	0.8100	0.9228	0.9601 (89)								
MIT 2	18.4109	18.7537	19.1472	19.6411	19.9716	20.1593	20.1974	20.1971	20.1121	19.7185	19.0377	18.3932 (90)								
Living area fraction	fLA = Living area / (4) =																			
MIT	18.6514	18.9786	19.3548	19.8272	20.1477	20.3312	20.3709	20.3697	20.2843	19.9000	19.2470	18.6327 (92)								
Temperature adjustment	0.0000																			
adjusted MIT	18.6514	18.9786	19.3548	19.8272	20.1477	20.3312	20.3709	20.3697	20.2843	19.9000	19.2470	18.6327 (93)								
8. Space heating requirement																				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec								
Utilisation	0.9402	0.9095	0.8700	0.7923	0.6743	0.5010	0.3529	0.3816	0.5813	0.7984	0.9067	0.9468 (94)								
Useful gains	731.6975	813.3075	825.7574	790.0227	681.3022	492.7158	334.2009	349.0920	519.9216	664.9788	699.8404	704.5795 (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	1366.5385	1333.8849	1211.9631	1006.3792	774.5766	514.6031	338.5901	355.0372	559.8103	852.7221	1123.8007	1347.7266 (97)								
Space heating kWh	472.3217	349.8280	287.3370	155.7767	69.3962	0.0000	0.0000	0.0000	0.0000	139.6810	305.2514	478.5014 (98a)								
Space heating requirement - total per year (kWh/year)													2258.0935							
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	472.3217	349.8280	287.3370	155.7767	69.3962	0.0000	0.0000	0.0000	0.0000	139.6810	305.2514	478.5014 (98c)								
Space heating requirement after solar contribution - total per year (kWh/year)													2258.0935							
Space heating per m2													(98c) / (4) =	21.5057 (99)						
9a. Energy requirements - Individual heating systems, including micro-CHP																				
Fraction of space heat from secondary/supplementary system (Table 11)																				
Fraction of space heat from main system(s)																				
Efficiency of main space heating system 1 (in %)																				
Efficiency of main space heating system 2 (in %)																				
Efficiency of secondary/supplementary heating system, %																				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec								
Space heating requirement	472.3217	349.8280	287.3370	155.7767	69.3962	0.0000	0.0000	0.0000	0.0000	139.6810	305.2514	478.5014 (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)	511.7245	379.0119	311.3077	168.7722	75.1854	0.0000	0.0000	0.0000	0.0000	151.3337	330.7166	518.4197 (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	243.1468	214.8904	228.2543	200.9473	194.8876	175.7422	173.6950	180.6206	182.6005	203.4213	216.0052	240.5580 (64)								
Water heating requirement	85.5221	85.1458	84.5771	83.4954	81.9818	79.8000	79.8000	79.8000	79.8000	83.2344	84.8351	79.8000 (216)								
Efficiency of water heater	284.3088	252.3793	269.8770	240.6687	237.7206	220.2284	217.6629	226.3416	228.8227	244.3958	254.6176	85.5713 (217)								
Fuel for 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 (221)								
Space cooling fuel requirement	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)								
(221)m	29.7943	23.9021	21.5212	15.7673	12.1791	9.9505	11.1102	14.4415	18.7581	24.6116	27.7987	30.6224 (232)								
Pumps and Fa																				
Lighting																				
Electricity generated by PVs (Appendix M) (negative quantity)	-17.1041	-25.9181	-39.9986	-48.3792	-55.1987	-52.6230	-51.9706	-47.5401	-40.2990	-31.0769	-19.4299	-14.5840 (233a)								
(233a)m																				
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)								
(234a)m																				
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)								
(235a)m																				
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)								
(235c)m																				
Electricity generated by PVs (Appendix M) (negative quantity)	-4.8589	-10.5476	-21.5972	-33.4013	-45.1415	-45.7370	-45.2128	-37.8366	-27.1497	-15.4032	-6.5855	-3.8192 (233b)								
(233b)m																				
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)								
(234b)m																				
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)								
(235b)m																				
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																				
Annual totals kWh/year																				
Space heating fuel - main system 1													2446.4718 (211)							
Space heating fuel - main system 2													0.0000 (213)							
Space heating fuel - secondary													0.0000 (215)							
Efficiency of water heater													79.8000							

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Water heating fuel used	2958.1431 (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)	240.4570 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-741.4126 (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	4989.6594 (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	2446.4718	0.2100	513.7591 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2958.1431	0.2100	621.2101 (264)
Space and water heating			1134.9691 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	240.4570	0.1443	34.7054 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-444.1222	0.1331	-59.1211
PV Unit electricity exported	-297.2904	0.1250	-37.1735
Total			-96.2946 (269)
Total CO2, kg/year			1085.3092 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.3400 (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	2446.4718	1.1300	2764.5132 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2958.1431	1.1300	3342.7017 (278)
Space and water heating			6107.2149 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	240.4570	1.5338	368.8210 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-444.1222	1.4919	-662.5866
PV Unit electricity exported	-297.2904	0.4589	-136.4396
Total			-799.0261 (283)
Total Primary energy kWh/year			5807.1106 (286)
Target Primary Energy Rate (TPER)			55.3100 (287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

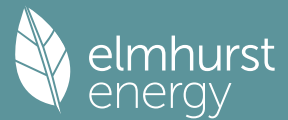
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	105.0000 (1b)	x 3.1500 (2b)	= 330.7500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	330.7500 (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	4 * 10 = 40.0000 (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) =	40.0000 / (5) = 0.1209 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2709 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2709 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3454	0.3387	0.3319	0.2980	0.2913	0.2574	0.2574	0.2506	0.2709	0.2913	0.3048	0.3184 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5597	0.5573	0.5551	0.5444	0.5424	0.5331	0.5331	0.5314	0.5367	0.5424	0.5465	0.5507 (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							
Glazing			14.4900	0.7752	11.2326		(27)
External Wall North	21.2600	5.1200	16.1400	0.1400	2.2596	70.0000	1129.8000 (29a)
External Wall South	38.7100	9.3700	29.3400	0.1400	4.1076	70.0000	2053.8000 (29a)
Total net area of external elements Aum(A, m2)			59.9700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.5998		(33)
Main dwelling							
Party Wall 1 East			32.4800	0.0000	0.0000	45.0000	1461.6000 (32)
Party Wall 2 West			35.0600	0.0000	0.0000	45.0000	1577.7000 (32)
Party Floor 1			105.0000			30.0000	3150.0000 (32d)
Party Ceiling 1			105.0000			30.0000	3150.0000 (32b)
Internal Wall 1			117.9400			9.0000	1061.4600 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13584.3600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							129.3749 (35)
List of Thermal Bridges							
K1 Element				Length 41.5000	Psi-value 0.0300	Total 1.2450	
E7 Party floor between dwellings (in blocks of flats)							
E18 Party wall between dwellings				12.6000	0.0300	0.3780	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							1.6230 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	19.2228 (37)

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

(38)m	Jan 61.0862	Feb 60.8333	Mar 60.5854	Apr 59.4211	May 59.2033	Jun 58.1893	Jul 58.1893	Aug 58.0015	Sep 58.5798	Oct 59.2033	Nov 59.6440	Dec 60.1047 (38)
Heat transfer coeff	80.3089	80.0560	79.8082	78.6439	78.4261	77.4120	77.4120	77.2242	77.8026	78.4261	78.8667	79.3274 (39)
Average = Sum(39)m / 12 =												78.6428

HLP	Jan 0.7648	Feb 0.7624	Mar 0.7601	Apr 0.7490	May 0.7469	Jun 0.7373	Jul 0.7373	Aug 0.7355	Sep 0.7410	Oct 0.7469	Nov 0.7511	Dec 0.7555 (40)
HLP (average)												0.7490
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

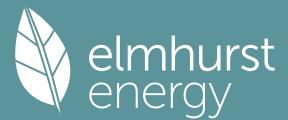
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7812 (42)
Hot water usage for mixer showers												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths												
29.9100	29.4585	28.8161	27.8542	26.9873	25.7939	24.8886	25.9957	26.5767	27.7592	28.9886	29.8862	(42b)
Hot water usage for other uses												
43.1127	41.5450	39.9772	38.4095	36.8418	35.2740	35.2740	36.8418	38.4095	39.9772	41.5450	43.1127	(42c)
Average daily hot water use (litres/day)												66.9270 (43)
Daily hot water use	Jan 73.0227	Feb 71.0034	Mar 68.7934	Apr 66.2637	May 63.8291	Jun 61.0680	Jul 60.1626	Aug 62.8374	Sep 64.9862	Oct 67.7364	Nov 70.5335	Dec 72.9989 (44)
Energy conte	107.5020	93.9519	98.3043	86.5570	82.2502	70.6231	66.4814	73.9608	75.3808	87.2852	95.3284	107.2043 (45)
Energy content (annual)										Total = Sum(45)m =		1044.8294
Distribution loss (46)m = 0.15 x (45)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	(46)
Water storage 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	(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	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	91.3767	79.8591	83.5587	73.5734	69.9127	60.0296	56.5092	62.8667	64.0736	74.1924	81.0292	91.1237 (62)
WWHRS	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	(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	(63c)
FGHRS	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	91.3767	79.8591	83.5587	73.5734	69.9127	60.0296	56.5092	62.8667	64.0736	74.1924	81.0292	91.1237 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		888.1050 (64)
Electric shower(s)	56.7407	50.5564	55.2057	52.6821	53.6707	51.1966	52.9032	53.6707	52.6821	55.2057	54.1676	56.7407 (64a)
Heat gains from water heating, kWh/month	37.0294	32.6039	34.6911	31.5639	30.8958	27.8066	27.3531	29.1343	29.1889	32.3495	33.7992	36.9661 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan 139.0621	Feb 139.0621	Mar 139.0621	Apr 139.0621	May 139.0621	Jun 139.0621	Jul 139.0621	Aug 139.0621	Sep 139.0621	Oct 139.0621	Nov 139.0621	Dec 139.0621 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
137.7833	152.5458	137.7833	142.3761	137.7833	142.3761	137.7833	137.7833	137.7833	142.3761	137.7833	142.3761	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
264.1668	266.9081	260.0003	245.2944	226.7308	209.2837	197.6280	194.8868	201.7946	216.5004	235.0640	252.5111	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)												

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	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497 (71)
Water heating gains (Table 5)	49.7706	48.5177	46.6278	43.8387	41.5267	38.6202	36.7649	39.1591	40.5402	43.4806	46.9433	49.6856 (72)
Total internal gains	516.4394	532.6902	509.1300	496.2279	470.7595	454.9987	436.8949	436.5478	449.4295	462.4830	489.1021	504.6987 (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				5.1200	10.6334	0.3500	0.8500		0.7700		11.2244 (74)	
South				9.3700	46.7521	0.3500	0.8500		0.7700		90.3151 (78)	
Solar gains	101.5395	169.3633	224.8642	271.4967	300.7750	297.9858	287.4832	265.1733	240.6455	185.0718	120.9010	87.3978 (83)
Total gains	617.9789	702.0535	733.9943	767.7246	771.5345	752.9845	724.3781	701.7211	690.0750	647.5548	610.0030	592.0965 (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	46.9865	47.1349	47.2813	47.9813	48.1145	48.7448	48.7448	48.8633	48.5001	48.1145	47.8457	47.5678
alpha	4.1324	4.1423	4.1521	4.1988	4.2076	4.2497	4.2497	4.2576	4.2333	4.2076	4.1897	4.1712
util living area	0.9776	0.9616	0.9389	0.8834	0.7846	0.6152	0.4599	0.4921	0.6963	0.8884	0.9600	0.9809 (86)
MIT	19.6280	19.8564	20.1273	20.4883	20.7678	20.9395	20.9860	20.9813	20.8943	20.5499	20.0451	19.5958 (87)
Th 2	20.2839	20.2860	20.2881	20.2978	20.2996	20.3080	20.3080	20.3096	20.3048	20.2996	20.2959	20.2921 (88)
util rest of house	0.9741	0.9556	0.9292	0.8646	0.7501	0.5600	0.3915	0.4234	0.6448	0.8669	0.9529	0.9778 (89)
MIT 2	19.0149	19.2411	19.5080	19.8625	20.1204	20.2701	20.3016	20.3006	20.2339	19.9263	19.4367	18.9894 (90)
Living area fraction									fLA = Living area / (4) =			0.2204 (91)
MIT	19.1500	19.3767	19.6445	20.0004	20.2630	20.4176	20.4524	20.4506	20.3794	20.0637	19.5708	19.1231 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1500	19.3767	19.6445	20.0004	20.2630	20.4176	20.4524	20.4506	20.3794	20.0637	19.5708	19.1231 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9670	0.9465	0.9190	0.8557	0.7482	0.5691	0.4061	0.4377	0.6506	0.8588	0.9440	0.9714 (94)
Ext temp.	597.6034	664.4984	674.5100	656.9550	577.2471	428.5136	294.1480	307.1645	448.9966	556.0944	575.8280	575.1764 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Space heating kWh	1192.5889	1158.9482	1049.0389	872.9787	671.5654	450.3557	298.2254	312.8045	488.5564	742.2043	983.5290	1183.8080 (97)
Space heating requirement - total per year (kWh/year)	442.6692	332.2703	278.6495	155.5370	70.1728	0.0000	0.0000	0.0000	0.0000	138.4657	293.5447	452.8219 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Space heating kWh	442.6692	332.2703	278.6495	155.5370	70.1728	0.0000	0.0000	0.0000	0.0000	138.4657	293.5447	452.8219 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2164.1312
Space heating per m2										(98c) / (4) =		20.6108 (99)

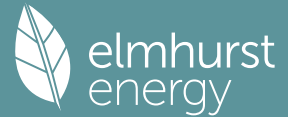
8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	727.6729	572.8489	586.9041	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8551	0.9142	0.9005	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	622.2501	523.7028	528.5063	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	821.4282	790.8713	767.0033	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	143.4082	198.7733	177.4418	0.0000	0.0000	0.0000	0.0000 (104)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	35.8520	49.6933	44.3605	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												129.9058 (107)
Energy for space heating												20.6108 (99)
Energy for space cooling												1.2372 (108)
Total												21.8480 (109)
Fabric Energy Efficiency (DFEE)												21.8 (109)

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

1. Overall dwelling characteristics

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Main dwelling	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	105.0000 (1b)	x 3.1500 (2b)	= 330.7500 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.0000			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 330.7500 (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	4 * 10 =	40.0000 (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) =	40.0000 / (5) =	0.1209 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000 (17)	
Infiltration rate		0.3709 (18)	
Number of sides sheltered		0 (19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =		1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.3709 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	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	0.4729	0.4637	0.4544	0.4080	0.3988	0.3524	0.3524	0.3431	0.3709	0.3988	0.4173	0.4359	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.6118	0.6075	0.6032	0.5832	0.5795	0.5621	0.5621	0.5589	0.5688	0.5795	0.5871	0.5950	(25)

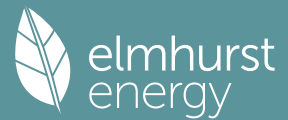
3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Main dwelling													
TER Opening Type			14.4900	1.1450	16.5916			(27)					
External Wall North	21.2600	5.1200	16.1400	0.1800	2.9052			(29a)					
External Wall South	38.7100	9.3700	29.3400	0.1800	5.2812			(29a)					
Total net area of external elements Aum(A, m2)			59.9700					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.7780			(33)					
Main dwelling													
Party Wall 1 East			32.4800	0.0000	0.0000			(32)					
Party Wall 2 West			35.0600	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								129.3749 (35)					
List of Thermal Bridges													
K1 Element					Length	Psi-value	Total						
E7 Party floor between dwellings (in blocks of flats)					41.5000	0.0700	2.9050						
E18 Party wall between dwellings					12.6000	0.0600	0.7560						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								3.6610 (36)					
Point Thermal bridges							(36a) =	0.0000					
Total fabric heat loss						(33) + (36) + (36a) =		28.4390 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 66.7806	Feb 66.3066	Mar 65.8420	Apr 63.6597	May 63.2514	Jun 61.3507	Jul 61.3507	Aug 60.9987	Sep 62.0828	Oct 63.2514	Nov 64.0774	Dec 64.9409	(38)
Heat transfer coeff	95.2196	94.7456	94.2810	92.0987	91.6904	89.7897	89.7897	89.4377	90.5218	91.6904	92.5164	93.3799	(39)
Average = Sum(39)m / 12 =												92.0967	
HLP	Jan 0.9069	Feb 0.9023	Mar 0.8979	Apr 0.8771	May 0.8732	Jun 0.8551	Jul 0.8551	Aug 0.8518	Sep 0.8621	Oct 0.8732	Nov 0.8811	Dec 0.8893	(40)
HLP (average)												0.8771	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7812 (42)
Hot water usage for mixer showers													
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000													(42a)
Hot water usage for baths													
30.5919 30.1376 29.4978 28.3181 27.4348 26.4554 25.9263 26.5616 27.2534 28.3014 29.5054 30.4885													(42b)
Hot water usage for other uses													
43.1127 41.5450 39.9772 38.4095 36.8418 35.2740 35.2740 36.8418 38.4095 39.9772 41.5450 43.1127													(42c)
Average daily hot water use (litres/day)													67.5569 (43)
Daily hot water use	Jan 73.7046	Feb 71.6826	Mar 69.4750	Apr 66.7276	May 64.2766	Jun 61.7294	Jul 61.2003	Aug 63.4034	Sep 65.6629	Oct 68.2787	Nov 71.0504	Dec 73.6012	(44)
Energy conte 116.7301 102.0750 106.7806 91.3468 86.5286 75.9035 74.0165 78.5066 80.9689 92.6535 101.2243 115.2417													(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													1121.9761
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000													(46)
Water storage 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	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)

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Total heat required for water heating calculated for each month												
	99.2206	86.7638	90.7635	77.6448	73.5493	64.5180	62.9140	66.7306	68.8235	78.7555	86.0406	97.9555 (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	99.2206	86.7638	90.7635	77.6448	73.5493	64.5180	62.9140	66.7306	68.8235	78.7555	86.0406	97.9555 (64)

12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											954 (64)
Electric shower(s)	56.7407	50.5564	55.2057	52.6821	53.6707	51.1966	52.9032	53.6707	52.6821	55.2057	54.1676	56.7407 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											645.4223 (64a)
Heat gains from water heating, kWh/month	38.9903	34.3301	36.4923	32.5817	31.8050	28.9286	28.9543	30.1003	30.3764	33.4903	35.0521	38.6740 (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	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621	139.0621 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	143.3933	158.7569	143.3933	148.1731	143.3933	148.1731	143.3933	143.3933	148.1731	143.3933	148.1731	143.3933 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	264.1668	266.9081	260.0003	245.2944	226.7308	209.2837	197.6280	194.8868	201.7946	216.5004	235.0640	252.5111 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062	36.9062 (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)	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497 (71)
Water heating gains (Table 5)	52.4064	51.0864	49.0488	45.2524	42.7487	40.1787	38.9171	40.4574	42.1895	45.0138	48.6834	51.9812 (72)
Total internal gains	524.6851	541.4699	517.1610	503.4385	477.5914	462.3541	444.6570	443.4561	456.8757	469.6262	496.6391	512.6043 (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	5.1200		10.6334		0.6300		0.7000		0.7700		16.6385 (74)	
South	9.3700		46.7521		0.6300		0.7000		0.7700		133.8789 (78)	
Solar gains	150.5174	251.0562	333.3281	402.4540	445.8547	441.7202	426.1516	393.0804	356.7216	274.3418	179.2179	129.5544 (83)
Total gains	675.2025	792.5261	850.4891	905.8924	923.4461	904.0743	870.8085	836.5365	813.5973	743.9679	675.8570	642.1586 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	39.6287	39.8270	40.0233	40.9716	41.1541	42.0253	42.0253	42.1906	41.6854	41.1541	40.7866	40.4095
alpha	3.6419	3.6551	3.6682	3.7314	3.7436	3.8017	3.8017	3.8127	3.7790	3.7436	3.7191	3.6940
util living area	0.9741	0.9539	0.9256	0.8617	0.7567	0.5890	0.4411	0.4745	0.6761	0.8746	0.9544	0.9779 (86)
MIT	19.3423	19.6303	19.9663	20.4010	20.7233	20.9238	20.9802	20.9739	20.8657	20.4557	19.8512	19.3181 (87)
Th 2	20.1617	20.1655	20.1693	20.1870	20.1903	20.2058	20.2058	20.2087	20.1998	20.1903	20.1836	20.1766 (88)
util rest of house	0.9698	0.9466	0.9135	0.8392	0.7172	0.5284	0.3663	0.3992	0.6189	0.8496	0.9460	0.9742 (89)
MIT 2	18.6408	18.9262	19.2568	19.6858	19.9816	20.1595	20.1972	20.1966	20.1121	19.7460	19.1600	18.6279 (90)
Living area fraction	FLA = Living area / (4) =											
MIT	18.7954	19.0814	19.4132	19.8434	20.1450	20.3279	20.3697	20.3679	20.2782	19.9024	19.3123	18.7800 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.7954	19.0814	19.4132	19.8434	20.1450	20.3279	20.3697	20.3679	20.2782	19.9024	19.3123	18.7800 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9608	0.9349	0.9005	0.8285	0.7149	0.5381	0.3821	0.4148	0.6248	0.8395	0.9348	0.9661 (94)
Useful gains	648.7293	740.9005	765.8633	750.5641	660.1325	486.4840	332.7257	346.9829	508.3723	624.5467	631.7862	620.3861 (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	1380.2450	1343.6214	1217.4678	1007.8739	774.3299	514.3089	338.4842	354.8812	559.2605	852.9421	1129.8388	1361.4799 (97)
Space heating kWh	544.2476	405.0284	335.9937	185.2631	84.9628	0.0000	0.0000	0.0000	0.0000	169.9262	358.5979	551.3738 (98a)
Space heating requirement - total per year (kWh/year)												2635.3936
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	544.2476	405.0284	335.9937	185.2631	84.9628	0.0000	0.0000	0.0000	0.0000	169.9262	358.5979	551.3738 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2635.3936
Space heating per m2												25.0990 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	844.0229	664.4435	679.7264	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8502	0.9073	0.8922	0.0000	0.0000	0.0000	0.0000 (101)

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Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	717.6244	602.8315	606.4437	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	991.4786	955.6338	918.4929	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	197.1751	262.4849	232.1646	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	49.2938	65.6212	58.0412	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												172.9561 (107)
Energy for space heating												25.0990 (99)
Energy for space cooling												1.6472 (108)
Total												26.7462 (109)
Fabric Energy Efficiency (TFEE)												26.7 (109)

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

1. Overall dwelling characteristics

Main dwelling		Area (m2)	Storey height (m)	Volume (m3)	
Ground floor		105.0000 (1b)	x 3.1500 (2b)	= 330.7500 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.0000				(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	330.7500 (5)	

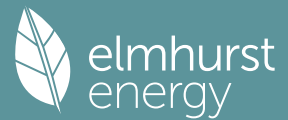
2. Ventilation rate

											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													3.0000 (17)		
Infiltration rate													0.1500 (18)		
Number of sides sheltered													0 (19)		
Shelter factor													(20) = 1 - [0.075 x (19)] =		1.0000 (20)
Infiltration rate adjusted to include shelter factor													(21) = (18) x (20) =		0.1500 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)		
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															
	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762	(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	0.2862	0.2825	0.2787	0.2600	0.2562	0.2375	0.2375	0.2337	0.2450	0.2562	0.2637	0.2712	(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												
Glazing			14.4900	0.7752	11.2326			(27)				
External Wall North	21.2600	5.1200	16.1400	0.1400	2.2596	70.0000	1129.8000	(29a)				
External Wall South	38.7100	9.3700	29.3400	0.1400	4.1076	70.0000	2053.8000	(29a)				
Total net area of external elements Aum(A, m2)			59.9700					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	17.5998			(33)				
Main dwelling												
Party Wall 1 East			32.4800	0.0000	0.0000	45.0000	1461.6000	(32)				
Party Wall 2 West			35.0600	0.0000	0.0000	45.0000	1577.7000	(32)				
Party Floor 1			105.0000			30.0000	3150.0000	(32d)				
Party Ceiling 1			105.0000			30.0000	3150.0000	(32b)				
Internal Wall 1			117.9400			9.0000	1061.4600	(32c)				
Heat capacity Cm = Sum(A x k)												
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K					(28)...(30) + (32) + (32a)...(32e) =		13584.3600	(34)				
List of Thermal Bridges							129.3749	(35)				
K1 Element					Length	Psi-value	Total					
E7 Party floor between dwellings (in blocks of flats)					41.5000	0.0300	1.2450					
E18 Party wall between dwellings					12.6000	0.0300	0.3780					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								1.6230 (36)				
Point Thermal bridges							(36a) =	0.0000				
Total fabric heat loss						(33) + (36) + (36a) =	19.2228	(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

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(38)m	31.2435	30.8342	30.4249	28.3784	27.9690	25.9225	25.9225	25.5132	26.7411	27.9690	28.7877	29.6063 (38)
Heat transfer coeff	50.4662	50.0569	49.6476	47.6011	47.1918	45.1453	45.1453	44.7360	45.9639	47.1918	48.0104	48.8290 (39)
Average = Sum(39)m / 12 =												47.4988
HLP	Jan 0.4806	Feb 0.4767	Mar 0.4728	Apr 0.4533	May 0.4494	Jun 0.4300	Jul 0.4300	Aug 0.4261	Sep 0.4378	Oct 0.4494	Nov 0.4572	Dec 0.4650 (40)
HLP (average)												0.4524
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7812 (42)
Hot water usage for mixer showers												
77.6948	76.5053	74.7523	72.0555	69.6394	66.2591	63.5856	66.7111	68.2831	71.6311	75.1177	77.6247 (42a)	
Hot water usage for baths												
29.9100	29.4585	28.8161	27.8542	26.9873	25.7939	24.8886	25.9957	26.5767	27.7592	28.9886	29.8862 (42b)	
Hot water usage for other uses												
43.1127	41.5450	39.9772	38.4095	36.8418	35.2740	35.2740	36.8418	38.4095	39.9772	41.5450	43.1127 (42c)	
Average daily hot water use (litres/day)												138.5556 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	150.7174	147.5087	143.5457	138.3193	133.4685	127.3271	123.7482	129.5486	133.2693	139.3675	145.6513	150.6237 (44)
Energy content	221.8821	195.1838	205.1238	180.6795	171.9876	147.2495	136.7454	152.4810	154.5858	179.5891	196.8525	221.2019 (45)
Energy content (annual)										Total = Sum(45)m =		2163.5622
Distribution loss (46)m = 0.15 x (45)m												
33.2823	29.2776	30.7686	27.1019	25.7981	22.0874	20.5118	22.8722	23.1879	26.9384	29.5279	33.1803 (46)	
Water storage loss:												
Store volume												110.0000 (47)
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												
277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787 (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												
277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787 (64)	

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	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	28.9192	25.6857	20.8891	15.8144	11.8214	9.9801	10.7839	14.0173	18.8140	23.8887	27.8816	29.7229 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	394.2789	398.3702	388.0601	366.1110	338.4042	312.3638	294.9671	290.8758	301.1859	323.1350	350.8418	376.8822 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687 (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)												
	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497 (71)
Water heating gains (Table 5)												
	158.5984	156.0128	151.1090	142.8762	136.3002	127.4381	120.5501	127.5825	130.8260	139.6974	150.3450	158.2944 (72)
Total internal gains												
	691.8900	690.1623	670.1517	634.8951	596.6193	559.8755	536.3947	542.5691	560.9194	596.8146	639.1620	674.9931 (73)

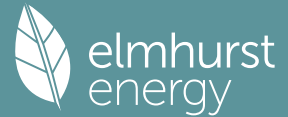
6. Solar gains

[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						5.1200	10.6334	0.3500	0.8500	0.7700	11.2244 (74)	
South						9.3700	46.7521	0.3500	0.8500	0.7700	90.3151 (78)	
Solar gains	101.5395	169.3633	224.8642	271.4967	300.7750	297.9858	287.4832	265.1733	240.6455	185.0718	120.9010	87.3978 (83)
Total gains	793.4295	859.5256	895.0159	906.3919	897.3943	857.8614	823.8779	807.7424	801.5650	781.8864	760.0629	762.3909 (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	74.7715	75.3828	76.0043	79.2720	79.9595	83.5842	83.5842	84.3489	82.0956	79.9595	78.5961	77.2785
alpha	5.9848	6.0255	6.0670	6.2848	6.3306	6.5723	6.5723	6.6233	6.4730	6.3306	6.2397	6.1519
util living area												
	0.8813	0.8286	0.7509	0.6215	0.4864	0.3366	0.2411	0.2547	0.3951	0.6150	0.8001	0.8896 (86)

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MIT	20.7050	20.8071	20.9013	20.9738	20.9949	20.9997	21.0000	21.0000	20.9990	20.9794	20.8771	20.7062 (87)
Th 2	20.5386	20.5422	20.5458	20.5638	20.5674	20.5854	20.5854	20.5891	20.5782	20.5674	20.5602	20.5530 (88)
util rest of house												
	0.8703	0.8148	0.7334	0.6013	0.4643	0.3149	0.2184	0.2320	0.3711	0.5918	0.7833	0.8793 (89)
MIT 2	20.1984	20.3238	20.4376	20.5367	20.5626	20.5852	20.5854	20.5890	20.5774	20.5469	20.4248	20.2130 (90)
Living area fraction									fLA = Living area / (4) =			0.2204 (91)
MIT	20.3101	20.4303	20.5398	20.6330	20.6579	20.6765	20.6768	20.6796	20.6703	20.6422	20.5245	20.3217 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3101	20.4303	20.5398	20.6330	20.6579	20.6765	20.6768	20.6796	20.6703	20.6422	20.5245	20.3217 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8645	0.8112	0.7332	0.6046	0.4689	0.3197	0.2234	0.2370	0.3763	0.5958	0.7819	0.8736 (94)	
Useful gains	685.9129	697.2721	656.2367	547.9736	420.8260	274.2234	184.0403	191.4417	301.6575	465.8606	594.2718	666.0001 (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	807.9671	777.3981	697.0433	558.5048	422.7388	274.3273	184.0478	191.4523	301.9970	473.9085	644.5147	787.2068 (97)	
Space heating kWh	90.8084	53.8447	30.3601	7.5824	1.4231	0.0000	0.0000	0.0000	0.0000	5.9876	36.1749	90.1778 (98a)	
Space heating requirement - total per year (kWh/year)												316.3590	
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	90.8084	53.8447	30.3601	7.5824	1.4231	0.0000	0.0000	0.0000	0.0000	5.9876	36.1749	90.1778 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												316.3590	
Space heating per m2										(98c) / (4) =		3.0129 (99)	

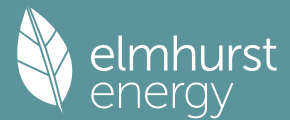
9b. Energy requirements

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													1.0000 (306)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating:													
Space heating requirement	90.8084	53.8447	30.3601	7.5824	1.4231	0.0000	0.0000	0.0000	0.0000	5.9876	36.1749	90.1778 (98)	
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													
307a	90.8084	53.8447	30.3601	7.5824	1.4231	0.0000	0.0000	0.0000	0.0000	5.9876	36.1749	90.1778	
Space heating requirement	90.8084	53.8447	30.3601	7.5824	1.4231	0.0000	0.0000	0.0000	0.0000	5.9876	36.1749	90.1778 (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	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787 (64)	
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310a	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787	
Water heating fuel	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787 (310)	
Cooling System Energy Efficiency Ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	25.4292	22.9683	25.4292	24.6089	25.4292	24.6089	25.4292	25.4292	24.6089	25.4292	24.6089	25.4292 (331)	
Lighting	25.3128	20.3068	18.2841	13.3957	10.3472	8.4538	9.4391	12.2693	15.9366	20.9096	23.6174	26.0163 (332)	
Electricity generated by PVs (Appendix M) (negative quantity)	-20.5910	-31.0793	-47.9035	-57.8992	-66.0289	-63.0116	-62.2264	-56.8941	-48.1716	-37.2113	-23.3463	-17.5673 (333a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)	
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)	
Annual totals kWh/year													
Space heating fuel - community heating												316.3590 (307)	
Space heating fuel - secondary												0.0000 (309)	
Water heating fuel - community heating												2814.4020 (310)	
Efficiency of water heater												0.0000 (311)	
Electricity used for heat distribution												3.1636 (313)	
Space cooling fuel												0.0000 (321)	
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7420)													
mechanical ventilation fans (SFP = 0.7420)												299.4081 (330a)	
Total electricity for the above, kWh/year												299.4081 (331)	
Electricity for lighting (calculated in Appendix L)												204.2886 (332)	
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-531.9305 (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												3102.5272 (338)	

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	316.3590	4.4400	14.0463 (340a)	
Space heating total			14.0463 (340)	

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Total CO2 associated with community systems			0.0000 (473)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Heat pump	2814.4020	4.4400	124.9594 (342a)
Water heating total			124.9594 (342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (347a)
Pumps, fans and electric keep-hot	299.4081	16.4900	49.3724 (349)
Energy for lighting	204.2886	16.4900	33.6872 (350)
Additional standing charges			92.0000 (351)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-531.9305	16.4900	-87.7153
PV Unit electricity exported	0.0000	5.5900	0.0000
Total			-87.7153 (352)
Total energy cost			226.3500 (355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.5432 (357)
SAP value		91.1941
SAP rating (Section 12)		91 (358)
SAP band		B

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			333.0000 (367)
Space and Water heating from Heat pump	940.1685	0.1590	15.1081 (367)
Electrical energy for heat distribution (space & water)	3.1636	0.0000	4.4690 (372)
Overall CO2 factor for heat network			0.0443 (386)
Total CO2 associated with community systems			138.6731 (373)
Space and water heating			138.6731 (376)
Pumps, fans and electric keep-hot	299.4081	0.1387	41.5316 (378)
Energy for lighting	204.2886	0.1443	29.4852 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-531.9305	0.1331	-70.8207
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-70.8207 (380)
Total CO2, kg/year			138.8692 (383)
CO2 emissions per m2			1.3200 (384)
EI value			98.7594 (384a)
EI rating			99 (385)
EI band			A

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

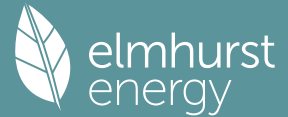
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	105.0000 (1b)	x 3.1500 (2b)	= 330.7500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	330.7500 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.8000	4.5000	4.4000	3.9000	3.9000	3.6000	3.7000	3.5000	3.7000	4.0000	4.1000	4.4000 (22)
Wind factor	1.2000	1.1250	1.1000	0.9750	0.9750	0.9000	0.9250	0.8750	0.9250	1.0000	1.0250	1.1000 (22a)
Adj infilt rate	0.1800	0.1687	0.1650	0.1462	0.1462	0.1350	0.1388	0.1313	0.1388	0.1500	0.1537	0.1650 (22b)
Balanced mechanical ventilation with heat recovery												

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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	0.2750	0.2637	0.2600	0.2412	0.2412	0.2300	0.2337	0.2262	0.2337	0.2450	0.2487	0.2600 (25)
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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								
Glazing			14.4900	0.7752	11.2326			(27)
External Wall North	21.2600	5.1200	16.1400	0.1400	2.2596	70.0000	1129.8000	(29a)
External Wall South	38.7100	9.3700	29.3400	0.1400	4.1076	70.0000	2053.8000	(29a)
Total net area of external elements Aum(A, m2)			59.9700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.5998			(33)
Main dwelling								
Party Wall 1 East			32.4800	0.0000	0.0000	45.0000	1461.6000	(32)
Party Wall 2 West			35.0600	0.0000	0.0000	45.0000	1577.7000	(32)
Party Floor 1			105.0000			30.0000	3150.0000	(32d)
Party Ceiling 1			105.0000			30.0000	3150.0000	(32b)
Internal Wall 1			117.9400			9.0000	1061.4600	(32c)
Heat capacity Cm = Sum(A x k)								
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							13584.3600	(34)
List of Thermal Bridges							129.3749	(35)
K1 Element				Length	Psi-value	Total		
E7 Party floor between dwellings (in blocks of flats)				41.5000	0.0300	1.2450		
E18 Party wall between dwellings				12.6000	0.0300	0.3780		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							1.6230	(36)
Point Thermal bridges							0.0000	
Total fabric heat loss							(33) + (36) + (36a) =	19.2228 (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	30.0156	28.7877	28.3784	26.3318	26.3318	25.1039	25.5132	24.6946	25.5132	26.7411	27.1504	28.3784	(38)
Average = Sum(39)m / 12 =	49.2383	48.0104	47.6011	45.5546	45.5546	44.3267	44.7360	43.9174	44.7360	45.9639	46.3732	47.6011	(39)
												46.1344	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.4689	0.4572	0.4533	0.4339	0.4339	0.4222	0.4261	0.4183	0.4261	0.4378	0.4416	0.4533	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

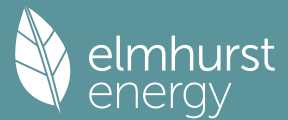
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7812 (42)
Hot water usage for mixer showers													
	77.6948	76.5053	74.7523	72.0555	69.6394	66.2591	63.5856	66.7111	68.2831	71.6311	75.1177	77.6247	(42a)
Hot water usage for baths													
	29.9100	29.4585	28.8161	27.8542	26.9873	25.7939	24.8886	25.9957	26.5767	27.7592	28.9886	29.8862	(42b)
Hot water usage for other uses													
	43.1127	41.5450	39.9772	38.4095	36.8418	35.2740	35.2740	36.8418	38.4095	39.9772	41.5450	43.1127	(42c)
Average daily hot water use (litres/day)													138.5556 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	150.7174	147.5087	143.5457	138.3193	133.4685	127.3271	123.7482	129.5486	133.2693	139.3675	145.6513	150.6237	(44)
Energy content (annual)	221.8821	195.1838	205.1238	180.6795	171.9876	147.2495	136.7454	152.4810	154.5858	179.5891	196.8525	221.2019	(45)
Distribution loss (46)m = 0.15 x (45)m													
	33.2823	29.2776	30.7686	27.1019	25.7981	22.0874	20.5118	22.8722	23.1879	26.9384	29.5279	33.1803	(46)
Water storage loss:													
Store volume													110.0000 (47)
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													
	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787	(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													
	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787	(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													
	117.9972	104.8406	112.4251	102.8709	101.4073	91.7554	89.6893	94.9214	94.1947	103.9348	108.2484	117.7711	(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	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	28.9192	25.6857	20.8891	15.8144	11.8214	9.9801	10.7839	14.0173	18.8140	23.8887	27.8816	29.7229	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	394.2789	398.3702	388.0601	366.1110	338.4042	312.3638	294.9671	290.8758	301.1859	323.1350	350.8418	376.8822	(68)
	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	(69)

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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)											
	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	(71)
Water heating gains (Table 5)												
	158.5984	156.0128	151.1090	142.8762	136.3002	127.4381	120.5501	127.5825	130.8260	139.6974	150.3450	158.2944 (72)
Total internal gains												
	691.8900	690.1623	670.1517	634.8951	596.6193	559.8755	536.3947	542.5691	560.9194	596.8146	639.1620	674.9931 (73)

6. Solar gains

[Jan]	Area		Solar flux		g		FF		Access		Gains	
	m2		Table 6a		Specific data		Specific data		factor		W	
			W/m2		or Table 6b		or Table 6c		Table 6d			
North	5.1200		12.7054		0.3500		0.8500		0.7700		13.4115 (74)	
South	9.3700		53.5774		0.3500		0.8500		0.7700		103.5002 (78)	
Solar gains	116.9117	173.2516	229.6937	294.5274	316.3836	336.3619	320.1972	296.0583	263.8129	202.5115	140.5118	97.3638 (83)
Total gains	808.8017	863.4139	899.8454	929.4226	913.0030	896.2374	856.5919	838.6274	824.7323	799.3261	779.6737	772.3569 (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	76.6361	78.5961	79.2720	82.8332	82.8332	85.1278	84.3489	85.9212	84.3489	82.0956	81.3710	79.2720
alpha	6.1091	6.2397	6.2848	6.5222	6.5222	6.6752	6.6233	6.7281	6.6233	6.4730	6.4247	6.2848
util living area												
	0.8478	0.7938	0.7038	0.5577	0.4183	0.2769	0.1880	0.1833	0.3253	0.5304	0.7294	0.8510 (86)
MIT	20.7892	20.8681	20.9411	20.9885	20.9984	20.9999	21.0000	21.0000	20.9998	20.9927	20.9385	20.8031 (87)
Th 2	20.5494	20.5602	20.5638	20.5818	20.5818	20.5927	20.5891	20.5963	20.5891	20.5782	20.5746	20.5638 (88)
util rest of house												
	0.8347	0.7787	0.6857	0.5385	0.3977	0.2568	0.1665	0.1621	0.3031	0.5073	0.7104	0.8381 (89)
MIT 2	20.3096	20.4126	20.5002	20.5702	20.5804	20.5926	20.5891	20.5963	20.5889	20.5713	20.5087	20.3399 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	20.4153	20.5130	20.5973	20.6623	20.6725	20.6824	20.6796	20.6853	20.6794	20.6642	20.6034	20.4420 (92)
Temperature adjustment												0.0000
adjusted MIT	20.4153	20.5130	20.5973	20.6623	20.6725	20.6824	20.6796	20.6853	20.6794	20.6642	20.6034	20.4420 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8306	0.7771	0.6871	0.5422	0.4021	0.2612	0.1713	0.1668	0.3080	0.5120	0.7117	0.8343 (94)
Useful gains	671.8131	670.9375	618.2906	503.9398	367.1558	234.1290	146.7164	139.8885	254.0035	409.2705	554.8878	644.3987 (95)
Ext temp.	5.0000	5.4000	7.1000	9.5000	12.6000	15.4000	17.4000	17.5000	15.0000	11.7000	8.1000	5.2000 (96)
Heat loss rate W												
	759.0228	725.5806	642.4886	508.4962	367.7397	234.1512	146.7174	139.8891	254.0757	412.0273	579.8236	725.5353 (97)
Space heating kWh												
	64.8840	36.7201	18.0033	3.2806	0.4344	0.0000	0.0000	0.0000	0.0000	2.0510	17.9537	60.3656 (98a)
Space heating requirement - total per year (kWh/year)												203.6928
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												
	64.8840	36.7201	18.0033	3.2806	0.4344	0.0000	0.0000	0.0000	0.0000	2.0510	17.9537	60.3656 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												203.6928
Space heating per m2										(98c) / (4) =		1.9399 (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												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement												
	64.8840	36.7201	18.0033	3.2806	0.4344	0.0000	0.0000	0.0000	0.0000	2.0510	17.9537	60.3656 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	64.8840	36.7201	18.0033	3.2806	0.4344	0.0000	0.0000	0.0000	0.0000	2.0510	17.9537	60.3656
Space heating requirement												
	64.8840	36.7201	18.0033	3.2806	0.4344	0.0000	0.0000	0.0000	0.0000	2.0510	17.9537	60.3656 (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												
	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00												
310a	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787
Water heating fuel												
	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787 (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	25.4292	22.9683	25.4292	24.6089	25.4292	24.6089	25.4292	25.4292	24.6089	25.4292	24.6089	25.4292 (331)
Lighting	25.3128	20.3068	18.2841	13.3957	10.3472	8.4538	9.4391	12.2693	15.9366	20.9096	23.6174	26.0163 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-23.8347	-32.4862	-49.8274	-62.2899	-68.9415	-68.5474	-67.2035	-62.0057	-52.4347	-40.8826	-27.1369	-19.7864 (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)												

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(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												203.6928	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2814.4020	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												2.0369	(313)
Space cooling fuel												0.0000	(321)

Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7420)													
mechanical ventilation fans (SFP = 0.7420)												299.4081	(330a)
Total electricity for the above, kWh/year												299.4081	(331)
Electricity for lighting (calculated in Appendix L)												204.2886	(332)

Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-575.3769	(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												2946.4146	(338)

10b. Fuel costs - using BEDF prices (568)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	203.6928	5.6000	11.4068	(340a)
Space heating total			11.4068	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2814.4020	5.6000	157.6065	(342a)
Water heating total			157.6065	(342)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(347a)
Pumps, fans and electric keep-hot	299.4081	26.0600	78.0258	(349)
Energy for lighting	204.2886	26.0600	53.2376	(350)
Additional standing charges			99.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-575.3769	26.0600	-149.9432	
PV Unit electricity exported	0.0000	5.8100	0.0000	
Total			-149.9432	(352)
Total energy cost			249.3334	(355)

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			333.0000	(367)
Space and Water heating from Heat pump	906.3348	0.1599	9.7783	(367)
Electrical energy for heat distribution (space & water)	2.0369	0.0000	4.2915	(372)
Overall CO2 factor for heat network			0.0441	(386)
Total CO2 associated with community systems			133.1659	(373)
Space and water heating			133.1659	(376)
Pumps, fans and electric keep-hot	299.4081	0.1387	41.5316	(378)
Energy for lighting	204.2886	0.1443	29.4852	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-575.3769	0.1332	-76.6240	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-76.6240	(380)
Total CO2, kg/year			127.5587	(383)

13b. Primary energy - Community heating scheme

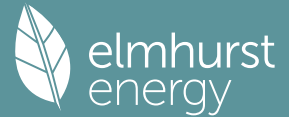
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			333.0000	(467a)
Space and Water heating from Heat pump	906.3348	1.5917	97.3624	(467)
Electrical energy for heat distribution (space & water)	2.0369	0.0000	46.0506	(472)
Overall CO2 factor for heat network			0.4735	(486)
Total CO2 associated with community systems			1428.9527	(473)
Space and water heating			1428.9527	(476)
Pumps, fans and electric keep-hot	299.4081	1.5128	452.9446	(478)
Energy for lighting	204.2886	1.5338	313.3447	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-575.3769	1.4921	-858.5125	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-858.5125	(480)
Total Primary energy kWh/year			1336.7295	(483)

SAP 10 EPC IMPROVEMENTS

0306_3B6P_BG

Current energy efficiency rating: B 91
Current environmental impact rating: A 99

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N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures Typical annual savings Energy Environmental
(none) efficiency impact
Total Savings £0 0.00 kg/m²

Potential energy efficiency rating: B 91
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 568 TEST (31 Mar 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, South East England):

	Current	Potential	Saving
Electricity	£131	£131	£0
Community scheme	£268	£268	£0
Space heating	£188	£188	£0
Water heating	£158	£158	£0
Lighting	£53	£53	£0
Generated (PV)	-£150	-£150	£0
Total cost of fuels	£249	£249	£0
Total cost of uses	£249	£249	£0
Delivered energy	28 kWh/m ²	28 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m ²	1 kg/m ²	1 kg/m ²	0 kg/m ²
Primary energy	13 kWh/m ²	13 kWh/m ²	0 kWh/m ²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	105.0000 (1b)	x 3.1500 (2b)	= 330.7500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 330.7500 (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)

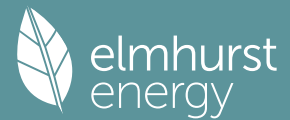
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour
Pressure test		0.0000 / (5) = 0.0000 (8)
Pressure Test Method		Yes
Measured/design AP50		Blower Door
Infiltration rate		3.0000 (17)
Number of sides sheltered		0.1500 (18)
		0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1500 (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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (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	0.2862	0.2825	0.2787	0.2600	0.2562	0.2375	0.2375	0.2337	0.2450	0.2562	0.2637	0.2712 (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							
Glazing			14.4900	0.7752	11.2326		(27)

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External Wall North	21.2600	5.1200	16.1400	0.1400	2.2596	70.0000	1129.8000 (29a)
External Wall South	38.7100	9.3700	29.3400	0.1400	4.1076	70.0000	2053.8000 (29a)
Total net area of external elements Aum(A, m2)			59.9700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	17.5998			(33)
Main dwelling							
Party Wall 1 East			32.4800	0.0000	0.0000	45.0000	1461.6000 (32)
Party Wall 2 West			35.0600	0.0000	0.0000	45.0000	1577.7000 (32)
Party Floor 1			105.0000			30.0000	3150.0000 (32d)
Party Ceiling 1			105.0000			30.0000	3150.0000 (32b)
Internal Wall 1			117.9400			9.0000	1061.4600 (32c)

Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =	13584.3600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K				129.3749 (35)
List of Thermal Bridges				
K1 Element				
E7 Party floor between dwellings (in blocks of flats)	Length	Psi-value	Total	
E18 Party wall between dwellings	41.5000	0.0300	1.2450	
	12.6000	0.0300	0.3780	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				1.6230 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	19.2228 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	31.2435	30.8342	30.4249	28.3784	27.9690	25.9225	25.9225	25.5132	26.7411	27.9690	28.7877	29.6063 (38)
Average = Sum(39)m / 12 =	50.4662	50.0569	49.6476	47.6011	47.1918	45.1453	45.1453	44.7360	45.9639	47.1918	48.0104	48.8290 (39)
												47.4988
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.4806	0.4767	0.4728	0.4533	0.4494	0.4300	0.4300	0.4261	0.4378	0.4494	0.4572	0.4650 (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												2.7812 (42)
Hot water usage for mixer showers												
	77.6948	76.5053	74.7523	72.0555	69.6394	66.2591	63.5856	66.7111	68.2831	71.6311	75.1177	77.6247 (42a)
Hot water usage for baths												
	29.9100	29.4585	28.8161	27.8542	26.9873	25.7939	24.8886	25.9957	26.5767	27.7592	28.9886	29.8862 (42b)
Hot water usage for other uses												
	43.1127	41.5450	39.9772	38.4095	36.8418	35.2740	35.2740	36.8418	38.4095	39.9772	41.5450	43.1127 (42c)
Average daily hot water use (litres/day)												138.5556 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	150.7174	147.5087	143.5457	138.3193	133.4685	127.3271	123.7482	129.5486	133.2693	139.3675	145.6513	150.6237 (44)
Energy content (annual)	221.8821	195.1838	205.1238	180.6795	171.9876	147.2495	136.7454	152.4810	154.5858	179.5891	196.8525	221.2019 (45)
Distribution loss (46)m = 0.15 x (45)m												
	33.2823	29.2776	30.7686	27.1019	25.7981	22.0874	20.5118	22.8722	23.1879	26.9384	29.5279	33.1803 (46)
Water storage loss:												
Store volume												110.0000 (47)
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												
	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787 (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												
	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787 (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												
	117.9972	104.8406	112.4251	102.8709	101.4073	91.7554	89.6893	94.9214	94.1947	103.9348	108.2484	117.7711 (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	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	28.9192	25.6857	20.8891	15.8144	11.8214	9.9801	10.7839	14.0173	18.8140	23.8887	27.8816	29.7229 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	394.2789	398.3702	388.0601	366.1110	338.4042	312.3638	294.9671	290.8758	301.1859	323.1350	350.8418	376.8822 (68)
Pumps, fans	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687 (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)	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497 (71)
Total internal gains	158.5984	156.0128	151.1090	142.8762	136.3002	127.4381	120.5501	127.5825	130.8260	139.6974	150.3450	158.2944 (72)
	691.8900	690.1623	670.1517	634.8951	596.6193	559.8755	536.3947	542.5691	560.9194	596.8146	639.1620	674.9931 (73)

6. Solar gains												
[Jan]	Area	Solar flux	g	FF	Access	Gains						

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mechanical ventilation fans (SFP = 0.7420)	299.4081 (330a)
Total electricity for the above, kWh/year	299.4081 (331)
Electricity for lighting (calculated in Appendix L)	204.2886 (332)

Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-531.9305 (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	3102.5272 (338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating from Heat pump	316.3590	4.4400	14.0463 (340a)
Space heating total			14.0463 (340)
Total CO2 associated with community systems			0.0000 (473)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Heat pump	2814.4020	4.4400	124.9594 (342a)
Water heating total			124.9594 (342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (347a)
Pumps, fans and electric keep-hot	299.4081	16.4900	49.3724 (349)
Energy for lighting	204.2886	16.4900	33.6872 (350)
Additional standing charges			92.0000 (351)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-531.9305	16.4900	-87.7153
PV Unit electricity exported	0.0000	5.5900	0.0000
Total			-87.7153 (352)
Total energy cost			226.3500 (355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600 (356)
Energy cost factor (ECF)	0.5432 (357)
SAP value	91.1941
SAP rating (Section 12)	91 (358)
SAP band	B

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			333.0000 (367)
Space and Water heating from Heat pump	940.1685	0.1590	15.1081 (367)
Electrical energy for heat distribution (space & water)	3.1636	0.0000	4.4690 (372)
Overall CO2 factor for heat network			0.0443 (386)
Total CO2 associated with community systems			138.6731 (373)
Space and water heating			138.6731 (376)
Pumps, fans and electric keep-hot	299.4081	0.1387	41.5316 (378)
Energy for lighting	204.2886	0.1443	29.4852 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-531.9305	0.1331	-70.8207
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-70.8207 (380)
Total CO2, kg/year			138.8692 (383)
CO2 emissions per m2			1.3200 (384)
EI value			98.7594 (384a)
EI rating			99 (385)
EI band			A

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

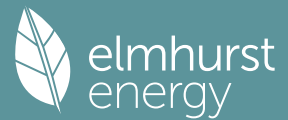
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	105.0000 (1b)	x 3.1500 (2b)	= 330.7500 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.0000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 330.7500 (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)

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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 AF50 3.0000 (17)
Infiltration rate 0.1500 (18)
Number of sides sheltered 0 (19)
Shelter factor (20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1500 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.8000	4.5000	4.4000	3.9000	3.9000	3.6000	3.7000	3.5000	3.7000	4.0000	4.1000	4.4000	(22)
Wind factor	1.2000	1.1250	1.1000	0.9750	0.9750	0.9000	0.9250	0.8750	0.9250	1.0000	1.0250	1.1000	(22a)
Adj infilt rate	0.1800	0.1687	0.1650	0.1462	0.1462	0.1350	0.1388	0.1313	0.1388	0.1500	0.1537	0.1650	(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	0.2750	0.2637	0.2600	0.2412	0.2412	0.2300	0.2337	0.2262	0.2337	0.2450	0.2487	0.2600	(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								
Glazing			14.4900	0.7752	11.2326			(27)
External Wall North	21.2600	5.1200	16.1400	0.1400	2.2596	70.0000	1129.8000	(29a)
External Wall South	38.7100	9.3700	29.3400	0.1400	4.1076	70.0000	2053.8000	(29a)
Total net area of external elements Aum(A, m2)			59.9700					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	17.5998		(33)
Main dwelling								
Party Wall 1 East			32.4800	0.0000	0.0000	45.0000	1461.6000	(32)
Party Wall 2 West			35.0600	0.0000	0.0000	45.0000	1577.7000	(32)
Party Floor 1			105.0000			30.0000	3150.0000	(32d)
Party Ceiling 1			105.0000			30.0000	3150.0000	(32b)
Internal Wall 1			117.9400			9.0000	1061.4600	(32c)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K (28)...(30) + (32) + (32a)...(32e) = 13584.3600 (34)
List of Thermal Bridges 129.3749 (35)

Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450	
E18 Party wall between dwellings	12.6000	0.0300	0.3780	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				1.6230 (36)
Point Thermal bridges				0.0000
Total fabric heat loss				(33) + (36) + (36a) = 19.2228 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
(38)m Jan 30.0156 Feb 28.7877 Mar 28.3784 Apr 26.3318 May 26.3318 Jun 25.1039 Jul 25.5132 Aug 24.6946 Sep 25.5132 Oct 26.7411 Nov 27.1504 Dec 28.3784 (38)
Heat transfer coeff 49.2383 48.0104 47.6011 45.5546 45.5546 44.3267 44.7360 43.9174 44.7360 45.9639 46.3732 47.6011 (39)
Average = Sum(39)m / 12 = 46.1344

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.4689	0.4572	0.4533	0.4339	0.4339	0.4222	0.4261	0.4183	0.4261	0.4378	0.4416	0.4533	(40)
HLP (average)													0.4394
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

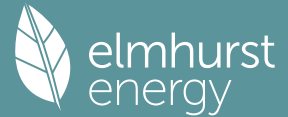
Assumed occupancy 2.7812 (42)
Hot water usage for mixer showers 77.6948 76.5053 74.7523 72.0555 69.6394 66.2591 63.5856 66.7111 68.2831 71.6311 75.1177 77.6247 (42a)
Hot water usage for baths 29.9100 29.4585 28.8161 27.8542 26.9873 25.7939 24.8886 25.9957 26.5767 27.7592 28.9886 29.8862 (42b)
Hot water usage for other uses 43.1127 41.5450 39.9772 38.4095 36.8418 35.2740 35.2740 36.8418 38.4095 39.9772 41.5450 43.1127 (42c)
Average daily hot water use (litres/day) 138.5556 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	150.7174	147.5087	143.5457	138.3193	133.4685	127.3271	123.7482	129.5486	133.2693	139.3675	145.6513	150.6237	(44)
Energy conte	221.8821	195.1838	205.1238	180.6795	171.9876	147.2495	136.7454	152.4810	154.5858	179.5891	196.8525	221.2019	(45)
Energy content (annual)													2163.5622
Distribution loss (46)m = 0.15 x (45)m													
33.2823 29.2776 30.7686 27.1019 25.7981 22.0874 20.5118 22.8722 23.1879 26.9384 29.5279 33.1803													(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day)
Volume factor from Table 2a 0.0152 (51)
Temperature factor from Table 2b 1.0294 (52)
Enter (49) or (54) in (55) 0.6000 (53)
Total storage loss 1.0327 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 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 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													
277.1589 245.1113 260.4006 234.1732 227.2644 200.7432 192.0222 207.7578 208.0795 234.8659 250.3462 276.4787													(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)

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Output from w/h	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787 (64)
	Total per year (kWh/year) = Sum(64)m = 2814.4020 (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	117.9972	104.8406	112.4251	102.8709	101.4073	91.7554	89.6893	94.9214	94.1947	103.9348	108.2484	117.7711 (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	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	166.8745	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.9192	25.6857	20.8891	15.8144	11.8214	9.9801	10.7839	14.0173	18.8140	23.8887	27.8816	29.7229	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	394.2789	398.3702	388.0601	366.1110	338.4042	312.3638	294.9671	290.8758	301.1859	323.1350	350.8418	376.8822	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	54.4687	(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)	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	-111.2497	(71)
Water heating gains (Table 5)	158.5984	156.0128	151.1090	142.8762	136.3002	127.4381	120.5501	127.5825	130.8260	139.6974	150.3450	158.2944	(72)
Total internal gains	691.8900	690.1623	670.1517	634.8951	596.6193	559.8755	536.3947	542.5691	560.9194	596.8146	639.1620	674.9931	(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				5.1200	12.7054	0.3500	0.8500		0.7700		13.4115 (74)	
South				9.3700	53.5774	0.3500	0.8500		0.7700		103.5002 (78)	
Solar gains	116.9117	173.2516	229.6937	294.5274	316.3836	336.3619	320.1972	296.0583	263.8129	202.5115	140.5118	97.3638 (83)
Total gains	808.8017	863.4139	899.8454	929.4226	913.0030	896.2374	856.5919	838.6274	824.7323	799.3261	779.6737	772.3569 (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	76.6361	78.5961	79.2720	82.8332	82.8332	85.1278	84.3489	85.9212	84.3489	82.0956	81.3710	79.2720
alpha	6.1091	6.2397	6.2848	6.5222	6.5222	6.6752	6.6233	6.7281	6.6233	6.4730	6.4247	6.2848
util living area	0.8478	0.7938	0.7038	0.5577	0.4183	0.2769	0.1880	0.1833	0.3253	0.5304	0.7294	0.8510 (86)
MIT	20.7892	20.8681	20.9411	20.9885	20.9984	20.9999	21.0000	21.0000	20.9998	20.9927	20.9385	20.8031 (87)
Th 2	20.5494	20.5602	20.5638	20.5818	20.5818	20.5927	20.5891	20.5963	20.5891	20.5782	20.5746	20.5638 (88)
util rest of house	0.8347	0.7787	0.6857	0.5385	0.3977	0.2568	0.1665	0.1621	0.3031	0.5073	0.7104	0.8381 (89)
MIT 2	20.3096	20.4126	20.5002	20.5702	20.5804	20.5926	20.5891	20.5963	20.5889	20.5713	20.5087	20.3399 (90)
Living area fraction	20.4153	20.5130	20.5973	20.6623	20.6725	20.6824	20.6796	20.6853	20.6794	20.6642	20.6034	0.2204 (91)
MIT	20.4153	20.5130	20.5973	20.6623	20.6725	20.6824	20.6796	20.6853	20.6794	20.6642	20.6034	20.4420 (92)
Temperature adjustment	20.4153	20.5130	20.5973	20.6623	20.6725	20.6824	20.6796	20.6853	20.6794	20.6642	20.6034	0.0000
adjusted MIT	20.4153	20.5130	20.5973	20.6623	20.6725	20.6824	20.6796	20.6853	20.6794	20.6642	20.6034	20.4420 (93)

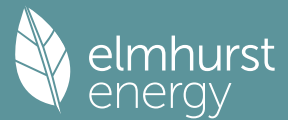
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8306	0.7771	0.6871	0.5422	0.4021	0.2612	0.1713	0.1668	0.3080	0.5120	0.7117	0.8343	(94)
Useful gains	671.8131	670.9375	618.2906	503.9398	367.1558	234.1290	146.7164	139.8885	254.0035	409.2705	554.8878	644.3987	(95)
Ext temp.	5.0000	5.4000	7.1000	9.5000	12.6000	15.4000	17.4000	17.5000	15.0000	11.7000	8.1000	5.2000	(96)
Heat loss rate W	759.0228	725.5806	642.4886	508.4962	367.7397	234.1512	146.7174	139.8891	254.0757	412.0273	579.8236	725.5353	(97)
Space heating kWh	64.8840	36.7201	18.0033	3.2806	0.4344	0.0000	0.0000	0.0000	0.0000	2.0510	17.9537	60.3656	(98a)
Space heating requirement - total per year (kWh/year)												203.6928	
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	64.8840	36.7201	18.0033	3.2806	0.4344	0.0000	0.0000	0.0000	0.0000	2.0510	17.9537	60.3656	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												203.6928	
Space heating per m2											(98c) / (4) =	1.9399	(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	1.0000 (306)											
Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
Space heating:												
Space heating requirement	64.8840	36.7201	18.0033	3.2806	0.4344	0.0000	0.0000	0.0000	0.0000	2.0510	17.9537	60.3656 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00	64.8840	36.7201	18.0033	3.2806	0.4344	0.0000	0.0000	0.0000	0.0000	2.0510	17.9537	60.3656
307a	64.8840	36.7201	18.0033	3.2806	0.4344	0.0000	0.0000	0.0000	0.0000	2.0510	17.9537	60.3656
Space heating requirement												

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Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	64.8840	36.7201	18.0033	3.2806	0.4344	0.0000	0.0000	0.0000	0.0000	2.0510	17.9537	60.3656 (307)
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 (308)
Water heating	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Annual water heating requirement	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787
310a	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787
Water heating fuel	277.1589	245.1113	260.4006	234.1732	227.2644	200.7432	192.0222	207.7578	208.0795	234.8659	250.3462	276.4787 (310)
Cooling System Energy Efficiency Ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	25.4292	22.9683	25.4292	24.6089	25.4292	24.6089	25.4292	25.4292	24.6089	25.4292	24.6089	25.4292 (331)
Lighting	25.3128	20.3068	18.2841	13.3957	10.3472	8.4538	9.4391	12.2693	15.9366	20.9096	23.6174	26.0163 (332)
Electricity generated by PVs (Appendix M) (negative quantity)	-23.8347	-32.4862	-49.8274	-62.2899	-68.9415	-68.5474	-67.2035	-62.0057	-52.4347	-40.8826	-27.1369	-19.7864 (333a)
(333a)m	-23.8347	-32.4862	-49.8274	-62.2899	-68.9415	-68.5474	-67.2035	-62.0057	-52.4347	-40.8826	-27.1369	-19.7864 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												203.6928 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2814.4020 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												2.0369 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7420)												
mechanical ventilation fans (SFP = 0.7420)												299.4081 (330a)
Total electricity for the above, kWh/year												299.4081 (331)
Electricity for lighting (calculated in Appendix L)												204.2886 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-575.3769 (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												2946.4146 (338)

10b. Fuel costs - using BEDF prices (568)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating from Heat pump	203.6928	5.6000	11.4068 (340a)
Space heating total			11.4068 (340)
Total CO2 associated with community systems			0.0000 (473)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Heat pump	2814.4020	5.6000	157.6065 (342a)
Water heating total			157.6065 (342)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (347a)
Pumps, fans and electric keep-hot	299.4081	26.0600	78.0258 (349)
Energy for lighting	204.2886	26.0600	53.2376 (350)
Additional standing charges			99.0000 (351)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-575.3769	26.0600	-149.9432
PV Unit electricity exported	0.0000	5.8100	0.0000
Total			-149.9432 (352)
Total energy cost			249.3334 (355)

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			333.0000 (367)
Space and Water heating from Heat pump	906.3348	0.1599	9.7783 (367)
Electrical energy for heat distribution (space & water)	2.0369	0.0000	4.2915 (372)
Overall CO2 factor for heat network			0.0441 (386)
Total CO2 associated with community systems			133.1659 (373)
Space and water heating			133.1659 (376)
Pumps, fans and electric keep-hot	299.4081	0.1387	41.5316 (378)
Energy for lighting	204.2886	0.1443	29.4852 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-575.3769	0.1332	-76.6240
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-76.6240 (380)
Total CO2, kg/year			127.5587 (383)

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			333.0000 (467a)
Space and Water heating from Heat pump	906.3348	1.5917	97.3624 (467)
Electrical energy for heat distribution (space & water)	2.0369	0.0000	46.0506 (472)
Overall CO2 factor for heat network			0.4735 (486)
Total CO2 associated with community systems			1428.9527 (473)
Space and water heating			1428.9527 (476)

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Pumps, fans and electric keep-hot	299.4081	1.5128	452.9446 (478)
Energy for lighting	204.2886	1.5338	313.3447 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-575.3769	1.4921	-858.5125
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-858.5125 (480)
Total Primary energy kWh/year			1336.7295 (483)

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Property Reference	Be Green			Issued on Date	08/04/2025
Assessment Reference	0307_2B3P_BG	Prop Type Ref			
Property					
SAP Rating	90 B	DER	1.61	TER	12.76
Environmental	99 A	% DER < TER			87.38
CO ₂ Emissions (t/year)	0.12	DFEE	26.95	TFEE	34.35
Compliance Check	See BREL	% DFEE < TFEE			21.56
% DPER < TPER	75.40	DPER	16.82	TPER	68.38
Assessor Details	Alfie Gamble-Thornton			Assessor ID	CM02-0001
Client	Fifth State, Fifth State				

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	86.0000 (1b)	3.1500 (2b)	270.9000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	270.9000 (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	0	(19)

Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1500 (21)

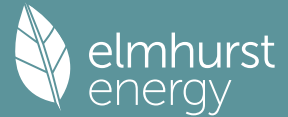
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (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	0.2862	0.2825	0.2787	0.2600	0.2562	0.2375	0.2375	0.2337	0.2450	0.2562	0.2637	0.2712 (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							
Glazing			22.2000	0.7752	17.2093		(27)
External Wall North	21.7700	14.8000	6.9700	0.1400	0.9758	70.0000	487.9000 (29a)
External Wall East	39.9100		39.9100	0.1400	5.5874	70.0000	2793.7000 (29a)
External Wall South	21.5800	7.4000	14.1800	0.1400	1.9852	70.0000	992.6000 (29a)
Total net area of external elements Aum(A, m ²)			83.2600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	25.7577	(33)
Main dwelling							
Party Wall 1 West			39.3100	0.0000	0.0000	45.0000	1768.9500 (32)
Party Floor 1			82.0000			30.0000	2460.0000 (32d)
Party Ceiling 1			82.0000			20.0000	1640.0000 (32b)
Internal Wall 1			89.5900			9.0000	806.3100 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10949.4600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		127.3193 (35)
List of Thermal Bridges		

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K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450
E18 Party wall between dwellings	12.6000	0.0300	0.3780
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			1.6230 (36)
Point Thermal bridges			0.0000 (36a) =
Total fabric heat loss		(33) + (36) + (36a) =	27.3807 (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	25.5899	25.2547	24.9194	23.2432	22.9080	21.2318	21.2318	20.8965	21.9023	22.9080	23.5785	24.2489 (38)
Heat transfer coeff	52.9706	52.6354	52.3001	50.6239	50.2887	48.6125	48.6125	48.2773	49.2830	50.2887	50.9592	51.6296 (39)
Average = Sum(39)m / 12 =												50.5401
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.6159	0.6120	0.6081	0.5887	0.5848	0.5653	0.5653	0.5614	0.5731	0.5848	0.5925	0.6003 (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													2.5669 (42)
Hot water usage for mixer showers	73.7542	72.6250	70.9609	68.4009	66.1073	62.8985	60.3606	63.3276	64.8199	67.9980	71.3078	73.6877 (42a)	
Hot water usage for baths	28.3991	27.9704	27.3605	26.4472	25.6241	24.4910	23.6313	24.6825	25.2342	26.3569	27.5242	28.3765 (42b)	
Hot water usage for other uses	40.9178	39.4299	37.9420	36.4541	34.9661	33.4782	33.4782	34.9661	36.4541	37.9420	39.4299	40.9178 (42c)	
Average daily hot water use (litres/day)												131.5263 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	143.0710	140.0253	136.2634	131.3022	126.6975	120.8677	117.4701	122.9762	126.5081	132.2969	138.2619	142.9820 (44)	
Energy content (annual)	210.6253	185.2817	194.7176	171.5135	163.2626	139.7795	129.8079	144.7453	146.7431	170.4780	186.8656	209.9796 (45)	
Distribution loss (46)m = 0.15 x (45)m	31.5938	27.7923	29.2076	25.7270	24.4894	20.9669	19.4712	21.7118	22.0115	25.5717	28.0298	31.4969 (46)	
Water storage loss:													
Store volume												110.0000 (47)	
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	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564 (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	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564 (64)	
12Total per year (kWh/year)												2704.6393 (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	114.2544	101.5481	108.9650	99.8232	98.5062	89.2716	87.3826	92.3492	91.5870	100.9054	104.9278	114.0396 (65)	

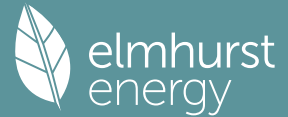
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	116.7770	129.2888	116.7770	120.6695	116.7770	120.6695	116.7770	116.7770	120.6695	116.7770	120.6695	116.7770 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	231.5234	233.9259	227.8717	214.9831	198.7134	183.4223	173.2069	170.8044	176.8586	189.7472	206.0168	221.3080 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346 (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)	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768 (71)
Water heating gains (Table 5)	153.5677	151.1133	146.4584	138.6433	132.4009	123.9884	117.4497	124.1253	127.2042	135.6255	145.7330	153.2791 (72)
Total internal gains	563.3719	575.8318	552.6108	535.7997	509.3951	489.5840	468.9373	473.2105	486.2361	503.6535	533.9232	552.8678 (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				14.8000	10.6334		0.3500		0.8500		0.7700		32.4454 (74)
South				7.4000	46.7521		0.3500		0.8500		0.7700		71.3268 (78)
Solar gains	103.7722	178.8198	254.1630	337.4156	403.2304	412.7138	392.6463	340.8084	282.1194	199.8046	124.5722		88.6810 (83)
Total gains	667.1441	754.6516	806.7738	873.2152	912.6254	902.2978	861.5837	814.0188	768.3555	703.4581	658.4954		641.5489 (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, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	57.4190	57.7847	58.1551	60.0806	60.4811	62.5666	62.5666	63.0010	61.7154	60.4811	59.6854	58.9103
alpha	4.8279	4.8523	4.8770	5.0054	5.0321	5.1711	5.1711	5.2001	5.1144	5.0321	4.9790	4.9274
util living area	0.9220	0.8734	0.8032	0.6612	0.5037	0.3439	0.2481	0.2726	0.4387	0.6919	0.8616	0.9292 (86)
MIT	20.3474	20.5434	20.7320	20.9140	20.9803	20.9980	20.9997	20.9995	20.9927	20.9112	20.6558	20.3396 (87)
Th 2	20.4157	20.4192	20.4227	20.4402	20.4437	20.4614	20.4614	20.4649	20.4543	20.4437	20.4367	20.4297 (88)
util rest of house	0.9128	0.8602	0.7847	0.6365	0.4754	0.3152	0.2178	0.2410	0.4051	0.6633	0.8456	0.9209 (89)
MIT 2	19.6555	19.8974	20.1264	20.3511	20.4254	20.4598	20.4612	20.4646	20.4483	20.3544	20.0520	19.6576 (90)
Living area fraction	19.9225	20.1467	20.3601	20.5683	20.6395	20.6675	20.6690	20.6711	20.6584	20.5693	20.2850	19.9208 (92)
MIT	19.9225	20.1467	20.3601	20.5683	20.6395	20.6675	20.6690	20.6711	20.6584	20.5693	20.2850	19.9208 (93)
Temperature adjustment												0.0000
adjusted MIT	19.9225	20.1467	20.3601	20.5683	20.6395	20.6675	20.6690	20.6711	20.6584	20.5693	20.2850	19.9208 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9042	0.8536	0.7826	0.6423	0.4854	0.3262	0.2295	0.2532	0.4177	0.6699	0.8410	0.9125 (94)
Useful gains	603.2416	644.1550	631.3807	560.8265	442.9988	294.3424	197.7296	206.0727	320.9742	471.2438	553.8110	585.4306 (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	827.5335	802.5171	724.8869	590.6971	449.5579	294.9550	197.8051	206.1947	323.2195	501.3426	671.8983	811.6591 (97)
Space heating kWh	166.8732	106.4193	69.5686	21.5068	4.8800	0.0000	0.0000	0.0000	0.0000	22.3935	85.0229	168.3140 (98a)
Space heating requirement - total per year (kWh/year)												644.9782
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	166.8732	106.4193	69.5686	21.5068	4.8800	0.0000	0.0000	0.0000	0.0000	22.3935	85.0229	168.3140 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												644.9782
Space heating per m2										(98c) / (4) =		7.4997 (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												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	166.8732	106.4193	69.5686	21.5068	4.8800	0.0000	0.0000	0.0000	0.0000	22.3935	85.0229	168.3140 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	166.8732	106.4193	69.5686	21.5068	4.8800	0.0000	0.0000	0.0000	0.0000	22.3935	85.0229	168.3140
Space heating requirement	166.8732	106.4193	69.5686	21.5068	4.8800	0.0000	0.0000	0.0000	0.0000	22.3935	85.0229	168.3140 (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	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00												
310a	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564
Water heating fuel	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564 (310)
Cooling System Energy Efficiency Ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	19.6488	17.7473	19.6488	19.0150	19.6488	19.0150	19.6488	19.6488	19.0150	19.6488	19.0150	19.6488 (331)
Lighting	21.4536	17.2109	15.4965	11.3534	8.7697	7.1649	8.0000	10.3987	13.5069	17.7218	20.0167	22.0499 (332)
Electricity generated by PVs (Appendix M) (negative quantity)	-20.1878	-30.2515	-46.2947	-55.5413	-62.9760	-59.9661	-59.2156	-54.3130	-46.2431	-36.0423	-22.8127	-17.2469 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												644.9782 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2704.6393 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												6.4498 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)												
mechanical ventilation fans (SFP = 0.7000)												231.3486 (330a)
Total electricity for the above, kWh/year												231.3486 (331)
Electricity for lighting (calculated in Appendix L)												173.1429 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-511.0910 (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												3243.0181 (338)

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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			333.0000 (367)
Space and Water heating from Heat pump	1005.8912	0.1580	30.6037 (367)
Electrical energy for heat distribution (space & water)	6.4498	0.0000	4.8296 (372)
Overall CO2 factor for heat network			0.0447 (386)
Total CO2 associated with community systems			149.8627 (373)
Space and water heating			149.8627 (376)
Pumps, fans and electric keep-hot	231.3486	0.1387	32.0909 (378)
Energy for lighting	173.1429	0.1443	24.9899 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-511.0910	0.1333	-68.1205
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-68.1205 (380)
Total CO2, kg/year			138.8230 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6100 (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			333.0000 (467a)
Space and Water heating from Heat pump	1005.8912	1.5849	306.9740 (467)
Electrical energy for heat distribution (space & water)	6.4498	0.0000	51.3584 (472)
Overall CO2 factor for heat network			0.4758 (486)
Total CO2 associated with community systems			1593.6538 (473)
Space and water heating			1593.6538 (476)
Pumps, fans and electric keep-hot	231.3486	1.5128	349.9842 (478)
Energy for lighting	173.1429	1.5338	265.5723 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-511.0910	1.4925	-762.8145
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-762.8145 (480)
Total Primary energy kWh/year			1446.3957 (483)
Dwelling Primary energy Rate (DPER)			16.8200 (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	86.0000	3.1500	270.9000
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0000		
Dwelling volume			

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) =	0.1107 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000 (17)	
Infiltration rate		0.3607 (18)	
Number of sides sheltered		0 (19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)	
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3607 (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	0.4599	0.4509	0.4419	0.3968	0.3878	0.3427	0.3427	0.3337	0.3607	0.3878	0.4058	0.4239 (22b)
Effective ac	0.6058	0.6017	0.5976	0.5787	0.5752	0.5587	0.5587	0.5557	0.5651	0.5752	0.5824	0.5898 (25)

3. Heat losses and heat loss parameter

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Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Main dwelling													
TER Opening Type			21.5100	1.1450	24.6298			(27)					
External Wall North	21.7700	14.3400	7.4300	0.1800	1.3374			(29a)					
External Wall East	39.9100		39.9100	0.1800	7.1838			(29a)					
External Wall South	21.5800	7.1700	14.4100	0.1800	2.5938			(29a)					
Total net area of external elements Aum(A, m2)			83.2600					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)... (30) + (32) =		35.7448			(33)					
Main dwelling													
Party Wall 1 West			39.3100	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							136.8542	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value		Total						
E7 Party floor between dwellings (in blocks of flats)				41.5000	0.0700		2.9050						
E18 Party wall between dwellings				12.6000	0.0600		0.7560						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.6610	(36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	39.4058	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 54.1545	Feb 53.7873	Mar 53.4274	Apr 51.7369	May 51.4206	Jun 49.9482	Jul 49.9482	Aug 49.6755	Sep 50.5153	Oct 51.4206	Nov 52.0604	Dec 52.7294	(38)
Heat transfer coeff	93.5603	93.1931	92.8332	91.1426	90.8263	89.3540	89.3540	89.0813	89.9211	90.8263	91.4662	92.1351	(39)
Average = Sum(39)m / 12 =												91.1411	
HLP	Jan 1.0879	Feb 1.0836	Mar 1.0795	Apr 1.0598	May 1.0561	Jun 1.0390	Jul 1.0390	Aug 1.0358	Sep 1.0456	Oct 1.0561	Nov 1.0636	Dec 1.0713	(40)
HLP (average)												1.0598	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

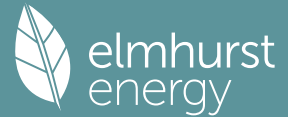
4. Water heating energy requirements (kWh/year)													
Assumed occupancy													2.5669 (42)
Hot water usage for mixer showers													
67.2585	66.2478	64.7749	61.9568	59.8771	57.5579	56.2396	57.7013	59.3037	61.7938	64.6725	67.0008		(42a)
Hot water usage for baths													
29.0466	28.6152	28.0077	26.8877	26.0490	25.1190	24.6166	25.2199	25.8767	26.8718	28.0149	28.9484		(42b)
Hot water usage for other uses													
40.9178	39.4299	37.9420	36.4541	34.9661	33.4782	33.4782	34.9661	36.4541	37.9420	39.4299	40.9178		(42c)
Average daily hot water use (litres/day)												126.1389	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.2229	134.2929	130.7246	125.2985	120.8922	116.1550	114.3344	117.8873	121.6344	126.6076	132.1173	136.8670	(44)
Energy conte	217.3276	191.2313	200.9188	171.5274	162.7441	142.8262	138.2776	145.9691	149.9874	171.8053	188.2253	214.3007	(45)
Energy content (annual)										Total = Sum(45)m =		2095.1407	
Distribution loss (46)m = 0.15 x (45)m													
32.5991	28.6847	30.1378	25.7291	24.4116	21.4239	20.7416	21.8954	22.4981	25.7708	28.2338	32.1451		(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	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	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													
263.9225	233.3170	247.5137	216.6192	209.3390	187.9180	184.8725	192.5640	195.0792	218.4002	233.3171	260.8956		(62)
WWHRS	-30.7478	-27.1936	-28.4756	-23.5789	-21.9747	-18.8039	-17.6257	-18.7431	-19.4552	-22.9356	-25.9832	-30.1784	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
233.1747	206.1234	219.0382	193.0403	187.3643	169.1141	167.2469	173.8209	175.6240	195.4646	207.3339	230.7172		(64)
Total per year (kWh/year)												2358.0625	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
109.5373	97.2530	104.0814	93.1063	91.3883	83.5632	83.2532	85.8107	85.9443	94.4012	98.6584	108.5309		(65)

5. Internal gains (see Table 5 and 5a)													
Metabolic gains (Table 5), Watts													
(66)m	Jan 128.3459	Feb 128.3459	Mar 128.3459	Apr 128.3459	May 128.3459	Jun 128.3459	Jul 128.3459	Aug 128.3459	Sep 128.3459	Oct 128.3459	Nov 128.3459	Dec 128.3459	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
116.7770	129.2888	116.7770	120.6695	116.7770	120.6695	116.7770	116.7770	120.6695	116.7770	120.6695	116.7770	116.7770	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
231.5234	233.9259	227.8717	214.9831	198.7134	183.4223	173.2069	170.8044	176.8586	189.7472	206.0168	221.3080		(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	(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)													
-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	(71)
Water heating gains (Table 5)													
147.2276	144.7217	139.8944	129.3143	122.8338	116.0600	111.8995	115.3369	119.3670	126.8833	137.0255	145.8749		(72)
Total internal gains													
560.0318	572.4402	549.0469	529.4707	502.8280	481.6556	463.3871	464.4220	478.3989	497.9113	528.2157	548.4636		(73)

6. Solar gains

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

North	14.3400	10.6334	0.6300	0.7000	0.7700	46.6007 (74)
South	7.1700	46.7521	0.6300	0.7000	0.7700	102.4452 (78)

Solar gains	149.0460	256.8353	365.0491	484.6231	579.1516	592.7725	563.9500	489.4962	405.2024	286.9753	178.9206	127.3708 (83)
Total gains	709.0778	829.2755	914.0960	1014.0939	1081.9796	1074.4281	1027.3371	953.9182	883.6013	784.8866	707.1362	675.8344 (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	34.9432	35.0809	35.2169	35.8701	35.9950	36.5881	36.5881	36.7001	36.3574	35.9950	35.7432	35.4837	
alpha	3.3295	3.3387	3.3478	3.3913	3.3997	3.4392	3.4392	3.4467	3.4238	3.3997	3.3829	3.3656	
util living area	0.9593	0.9331	0.8921	0.8035	0.6695	0.5020	0.3739	0.4159	0.6234	0.8384	0.9340	0.9644 (86)	
MIT	19.2570	19.5627	19.9491	20.4264	20.7601	20.9348	20.9819	20.9739	20.8607	20.4286	19.7844	19.2211 (87)	
Th 2	20.0107	20.0142	20.0176	20.0338	20.0368	20.0510	20.0510	20.0536	20.0455	20.0368	20.0307	20.0243 (88)	
util rest of house	0.9523	0.9220	0.8743	0.7725	0.6210	0.4365	0.2968	0.3356	0.5571	0.8055	0.9211	0.9582 (89)	
MIT 2	17.9961	18.3797	18.8595	19.4425	19.8186	20.0045	20.0421	20.0399	19.9367	19.4613	18.6741	17.9600 (90)	
Living area fraction	fLA = Living area / (4) =												0.3859 (91)
MIT	18.4827	18.8363	19.2800	19.8222	20.1820	20.3635	20.4048	20.4004	20.2933	19.8346	19.1026	18.4467 (92)	
Temperature adjustment													0.0000
adjusted MIT	18.4827	18.8363	19.2800	19.8222	20.1820	20.3635	20.4048	20.4004	20.2933	19.8346	19.1026	18.4467 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9381	0.9057	0.8586	0.7651	0.6287	0.4586	0.3260	0.3656	0.5751	0.7976	0.9060	0.9450 (94)
Useful gains	665.1864	751.0741	784.8605	775.8561	680.2392	492.7658	334.8615	348.7659	508.1955	626.0579	640.6351	638.6781 (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	1326.9388	1298.7644	1186.4103	995.4797	770.3848	514.9935	339.9711	356.3579	556.9087	838.7469	1097.8325	1312.6181 (97)
Space heating kWh	492.3438	368.0479	298.7531	158.1290	67.0683	0.0000	0.0000	0.0000	0.0000	158.2406	329.1821	501.4114 (98a)
Space heating requirement - total per year (kWh/year)	2373.1762											
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	492.3438	368.0479	298.7531	158.1290	67.0683	0.0000	0.0000	0.0000	0.0000	158.2406	329.1821	501.4114 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2373.1762											
Space heating per m2	(98c) / (4) = 27.5951 (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	492.3438	368.0479	298.7531	158.1290	67.0683	0.0000	0.0000	0.0000	0.0000	158.2406	329.1821	501.4114 (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)	533.4168	398.7518	323.6762	171.3207	72.6634	0.0000	0.0000	0.0000	0.0000	171.4416	356.6437	543.2409 (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	233.1747	206.1234	219.0382	193.0403	187.3643	169.1141	167.2469	173.8209	175.6240	195.4646	207.3339	230.7172 (64)
Water heating requirement	85.6939	85.3446	84.7563	83.6161	81.9905	79.8000	79.8000	79.8000	79.8000	83.5902	85.0914	79.8000 (216)
Fuel for water heating, kWh/month	272.1020	241.5190	258.4328	230.8651	228.5196	211.9225	209.5825	217.8207	220.0802	233.8368	243.6603	269.0509 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	24.2639	19.4654	17.5265	12.8406	9.9185	8.1035	9.0480	11.7609	15.2762	20.0433	22.6388	24.9383 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-14.1333	-21.4881	-33.2771	-40.4010	-46.2402	-44.1436	-43.5994	-39.8103	-33.6426	-25.8271	-16.0801	-12.0434 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-3.8554	-8.3790	-17.1728	-26.5811	-35.9431	-36.4179	-35.9984	-30.1173	-21.6012	-12.2424	-5.2277	-3.0297 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1	2571.1551 (211)											
Space heating fuel - main system 2	0.0000 (213)											
Space heating fuel - secondary	0.0000 (215)											
Efficiency of water heater	79.8000											

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Water heating fuel used	2837.3925 (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)	195.8240 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-607.2522 (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	5083.1194 (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	2571.1551	0.2100	539.9426 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2837.3925	0.2100	595.8524 (264)
Space and water heating			1135.7950 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	195.8240	0.1443	28.2635 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-370.6862	0.1330	-49.3178
PV Unit electricity exported	-236.5660	0.1250	-29.5755
Total			-78.8933 (269)
Total CO2, kg/year			1097.0944 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.7600 (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	2571.1551	1.1300	2905.4053 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2837.3925	1.1300	3206.2535 (278)
Space and water heating			6111.6588 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	195.8240	1.5338	300.3613 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-370.6862	1.4916	-552.9238
PV Unit electricity exported	-236.5660	0.4589	-108.5520
Total			-661.4758 (283)
Total Primary energy kWh/year			5880.6451 (286)
Target Primary Energy Rate (TPER)			68.3800 (287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF FABRIC ENERGY EFFICIENCY

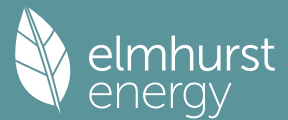
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	86.0000 (1b)	x 3.1500 (2b)	= 270.9000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	270.9000 (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	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) = 0.1107 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2607 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2607 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3324	0.3259	0.3194	0.2868	0.2803	0.2477	0.2477	0.2412	0.2607	0.2803	0.2933	0.3064 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5553	0.5531	0.5510	0.5411	0.5393	0.5307	0.5307	0.5291	0.5340	0.5393	0.5430	0.5469 (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							
Glazing			22.2000	0.7752	17.2093		(27)
External Wall North	21.7700	14.8000	6.9700	0.1400	0.9758	70.0000	487.9000 (29a)
External Wall East	39.9100		39.9100	0.1400	5.5874	70.0000	2793.7000 (29a)
External Wall South	21.5800	7.4000	14.1800	0.1400	1.9852	70.0000	992.6000 (29a)
Total net area of external elements Aum(A, m ²)			83.2600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...	(30) + (32) =	25.7577		(33)
Main dwelling							
Party Wall 1 West			39.3100	0.0000	0.0000	45.0000	1768.9500 (32)
Party Floor 1			82.0000			30.0000	2460.0000 (32d)
Party Ceiling 1			82.0000			30.0000	2460.0000 (32b)
Internal Wall 1			89.5900			9.0000	806.3100 (32c)
Heat capacity Cm = Sum(A x k)						(28)...	(30) + (32) + (32a)...
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							11769.4600 (34)
List of Thermal Bridges							136.8542 (35)
K1 Element				Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)				41.5000	0.0300	1.2450	
E18 Party wall between dwellings				12.6000	0.0300	0.3780	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							1.6230 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	27.3807 (37)

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

(38)m	Jan 49.6386	Feb 49.4468	Mar 49.2587	Apr 48.3756	May 48.2103	Jun 47.4411	Jul 47.4411	Aug 47.2986	Sep 47.7374	Oct 48.2103	Nov 48.5446	Dec 48.8941 (38)
Heat transfer coeff	77.0193	76.8275	76.6394	75.7563	75.5910	74.8218	74.8218	74.6794	75.1181	75.5910	75.9253	76.2748 (39)
Average = Sum(39)m / 12 =												75.7555
HLP	Jan 0.8956	Feb 0.8933	Mar 0.8912	Apr 0.8809	May 0.8790	Jun 0.8700	Jul 0.8700	Aug 0.8684	Sep 0.8735	Oct 0.8790	Nov 0.8829	Dec 0.8869 (40)
HLP (average)												0.8809
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5669 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths	28.3991	27.9704	27.3605	26.4472	25.6241	24.4910	23.6313	24.6825	25.2342	26.3569	27.5242	28.3765 (42b)
Hot water usage for other uses	40.9178	39.4299	37.9420	36.4541	34.9661	33.4782	33.4782	34.9661	36.4541	37.9420	39.4299	40.9178 (42c)
Average daily hot water use (litres/day)												63.5307 (43)
Daily hot water use	Jan 69.3169	Feb 67.4003	Mar 65.3025	Apr 62.9012	May 60.5902	Jun 57.9692	Jul 57.1095	Aug 59.6486	Sep 61.6883	Oct 64.2989	Nov 66.9541	Dec 69.2944 (44)
Energy conte	102.0464	89.1842	93.3159	82.1647	78.0766	67.0394	63.1077	70.2076	71.5553	82.8556	90.4907	101.7638 (45)
Energy content (annual)										Total = Sum(45)m =		991.8080
Distribution loss (46)m = 0.15 x (45)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 (46)
Water storage 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	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	86.7395	75.8066	79.3185	69.8400	66.3651	56.9835	53.6416	59.6764	60.8220	70.4273	76.9171	86.4993 (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	86.7395	75.8066	79.3185	69.8400	66.3651	56.9835	53.6416	59.6764	60.8220	70.4273	76.9171	86.4993 (64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				843.0368 (64)
Electric shower(s)	53.8629	47.9923	52.4057	50.0101	50.9486	48.6000	50.2200	50.9486	50.0101	52.4057	51.4203	53.8629 (64a)
Heat gains from water heating, kWh/month	35.1506	30.9497	32.9311	29.9625	29.3284	26.3959	25.9654	27.6562	27.7080	30.7082	32.0843	35.0905 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan 128.3459	Feb 128.3459	Mar 128.3459	Apr 128.3459	May 128.3459	Jun 128.3459	Jul 128.3459	Aug 128.3459	Sep 128.3459	Oct 128.3459	Nov 128.3459	Dec 128.3459 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	116.7770	129.2888	116.7770	120.6695	116.7770	120.6695	116.7770	116.7770	120.6695	116.7770	120.6695	116.7770 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	231.5234	233.9259	227.8717	214.9831	198.7134	183.4223	173.2069	170.8044	176.8586	189.7472	206.0168	221.3080 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346 (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)												

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	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	(71)
Water heating gains (Table 5)	47.2454	46.0561	44.2622	41.6146	39.4199	36.6609	34.8997	37.1724	38.4834	41.2745	44.5616	(72)
Total internal gains	457.0496	470.7746	450.4146	438.7710	416.4141	402.2565	386.3873	386.2575	397.5153	409.3025	432.7518	(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						14.8000	10.6334	0.3500	0.8500	0.7700				32.4454 (74)
South						7.4000	46.7521	0.3500	0.8500	0.7700				71.3268 (78)
Solar gains	103.7722	178.8198	254.1630	337.4156	403.2304	412.7138	392.6463	340.8084	282.1194	199.8046	124.5722			88.6810 (83)
Total gains	560.8218	649.5944	704.5776	776.1866	819.6445	814.9703	779.0337	727.0659	679.6346	609.1071	557.3240			535.4345 (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	42.4477	42.5537	42.6581	43.1554	43.2498	43.6944	43.6944	43.7778	43.5221	43.2498	43.0594	42.8621		
alpha	3.8298	3.8369	3.8439	3.8770	3.8833	3.9130	3.9130	3.9185	3.9015	3.8833	3.8706	3.8575		
util living area	0.9761	0.9580	0.9287	0.8553	0.7302	0.5549	0.4141	0.4589	0.6771	0.8826	0.9583	0.9796	(86)	
MIT	19.4545	19.7135	20.0428	20.4688	20.7803	20.9439	20.9860	20.9792	20.8775	20.4775	19.9053	19.4125	(87)	
Th 2	20.1713	20.1732	20.1750	20.1838	20.1854	20.1931	20.1931	20.1945	20.1901	20.1854	20.1821	20.1786	(88)	
util rest of house	0.9720	0.9510	0.9166	0.8314	0.6885	0.4944	0.3416	0.3838	0.6183	0.8579	0.9501	0.9761	(89)	
MIT 2	18.7545	19.0101	19.3325	19.7436	20.0233	20.1602	20.1873	20.1853	20.1116	19.7607	19.2083	18.7185	(90)	
Living area fraction														
MIT	19.0246	19.2816	19.6066	20.0235	20.3154	20.4626	20.4955	20.4917	20.4072	20.0373	19.4773	18.9864	(92)	
Temperature adjustment														
adjusted MIT	19.0246	19.2816	19.6066	20.0235	20.3154	20.4626	20.4955	20.4917	20.4072	20.0373	19.4773	18.9864	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	541.0514	611.8258	638.9838	641.3412	570.0655	419.8136	287.5446	299.5498	431.4447	519.4752	524.7489	519.1096	(94)	
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	1134.0818	1104.8982	1004.4830	842.6751	651.2499	438.6538	291.4698	305.5655	473.7846	713.3763	939.7471	1127.8261	(97)	
Space heating kWh	441.2146	331.3447	271.9314	144.9604	60.4012	0.0000	0.0000	0.0000	0.0000	144.2624	298.7987	452.8850	(98a)	
Space heating requirement - total per year (kWh/year)												2145.7985		
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	441.2146	331.3447	271.9314	144.9604	60.4012	0.0000	0.0000	0.0000	0.0000	144.2624	298.7987	452.8850	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												2145.7985		
Space heating per m2												24.9511	(99)	

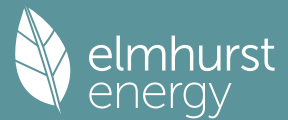
8c. Space cooling requirement

Calculated for June, July and August. See Table 10b														
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000		
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	703.3249	553.6813	567.5631	0.0000	0.0000	0.0000	0.0000	(100)	
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8837	0.9299	0.9098	0.0000	0.0000	0.0000	0.0000	(101)	
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	621.5547	514.8661	516.3911	0.0000	0.0000	0.0000	0.0000	(102)	
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	907.3426	867.7019	809.1092	0.0000	0.0000	0.0000	0.0000	(103)	
Cooled fraction														
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)	
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	51.4418	65.6274	54.4456	0.0000	0.0000	0.0000	0.0000	(107)	
Space cooling requirement														
Energy for space heating													171.5149	(107)
Energy for space cooling													24.9511	(99)
Total													1.9944	(108)
Fabric Energy Efficiency (DFEE)													26.9455	(109)
													26.9	(109)

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

1. Overall dwelling characteristics

Full SAP Calculation Printout



Main dwelling		Area (m ²)	Storey height (m)	Volume (m ³)	
Ground floor		86.0000 (1b)	x 3.1500 (2b)	= 270.9000 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0000				(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 270.9000 (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													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													Air changes per hour
Pressure test													30.0000 / (5) = 0.1107 (8)
Pressure Test Method													Yes
Measured/design AP50													Blower Door
Infiltration rate													5.0000 (17)
Number of sides sheltered													0.3607 (18)
													0 (19)
Shelter factor													(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor													(21) = (18) x (20) = 0.3607 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	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	0.4599	0.4509	0.4419	0.3968	0.3878	0.3427	0.3427	0.3337	0.3607	0.3878	0.4058	0.4239	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													0.0000 (23c)
Effective ac	0.6058	0.6017	0.5976	0.5787	0.5752	0.5587	0.5587	0.5557	0.5651	0.5752	0.5824	0.5898	(25)

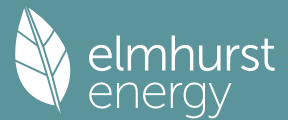
3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Main dwelling													
TER Opening Type			21.5100	1.1450	24.6298			(27)					
External Wall North	21.7700	14.3400	7.4300	0.1800	1.3374			(29a)					
External Wall East	39.9100		39.9100	0.1800	7.1838			(29a)					
External Wall South	21.5800	7.1700	14.4100	0.1800	2.5938			(29a)					
Total net area of external elements Aum(A, m2)			83.2600					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.7448			(33)					
Main dwelling													
Party Wall 1 West			39.3100	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								136.8542 (35)					
List of Thermal Bridges													
K1 Element					Length	Psi-value	Total						
E7 Party floor between dwellings (in blocks of flats)					41.5000	0.0700	2.9050						
E18 Party wall between dwellings					12.6000	0.0600	0.7560						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								3.6610 (36)					
Point Thermal bridges							(36a) =	0.0000					
Total fabric heat loss						(33) + (36) + (36a) =		39.4058 (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	
	54.1545	53.7873	53.4274	51.7369	51.4206	49.9482	49.9482	49.6755	50.5153	51.4206	52.0604	52.7294	(38)
Heat transfer coeff	93.5603	93.1931	92.8332	91.1426	90.8263	89.3540	89.3540	89.0813	89.9211	90.8263	91.4662	92.1351	(39)
Average = Sum(39)m / 12 =												91.1411	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0879	1.0836	1.0795	1.0598	1.0561	1.0390	1.0390	1.0358	1.0456	1.0561	1.0636	1.0713	(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													2.5669 (42)
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	29.0466	28.6152	28.0077	26.8877	26.0490	25.1190	24.6166	25.2199	25.8767	26.8718	28.0149	28.9484	(42b)
Hot water usage for other uses													
	40.9178	39.4299	37.9420	36.4541	34.9661	33.4782	33.4782	34.9661	36.4541	37.9420	39.4299	40.9178	(42c)
Average daily hot water use (litres/day)													64.1288 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	69.9644	68.0451	65.9497	63.3417	61.0151	58.5972	58.0948	60.1860	62.3307	64.8138	67.4448	69.8662	(44)
Energy conte	110.8065	96.8953	101.3622	86.7116	82.1380	72.0521	70.2607	74.5228	76.8600	87.9517	96.0875	109.3936	(45)
Energy content (annual)													Total = Sum(45)m = 1065.0421
Distribution loss (46)m = 0.15 x (45)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	(46)
Water storage 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	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)

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Total heat required for water heating calculated for each month												
	94.1855	82.3610	86.1579	73.7049	69.8173	61.2443	59.7216	63.3444	65.3310	74.7589	81.6744	92.9846 (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	94.1855	82.3610	86.1579	73.7049	69.8173	61.2443	59.7216	63.3444	65.3310	74.7589	81.6744	92.9846 (64)

12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											905.2858 (64)
Electric shower(s)	53.8629	47.9923	52.4057	50.0101	50.9486	48.6000	50.2200	50.9486	50.0101	52.4057	51.4203	53.8629 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											612.6870 (64a)
Heat gains from water heating, kWh/month	37.0121	32.5883	34.6409	30.9288	30.1915	27.4611	27.4854	28.5732	28.8353	31.7912	33.2737	36.7119 (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	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	116.7770	129.2888	116.7770	120.6695	116.7770	120.6695	116.7770	116.7770	120.6695	116.7770	120.6695	116.7770 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	231.5234	233.9259	227.8717	214.9831	198.7134	183.4223	173.2069	170.8044	176.8586	189.7472	206.0168	221.3080 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346 (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)	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768 (71)
Water heating gains (Table 5)	49.7475	48.4945	46.5604	42.9566	40.5799	38.1404	36.9427	38.4049	40.0490	42.7300	46.2134	49.3439 (72)
Total internal gains	459.5516	473.2130	452.7128	440.1130	417.5741	403.7360	388.4303	387.4900	399.0809	410.7580	434.4036	448.9326 (73)

6. Solar gains

[Jan]	Area m2		Solar flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
North	14.3400		10.6334		0.6300		0.7000		0.7700		46.6007 (74)	
South	7.1700		46.7521		0.6300		0.7000		0.7700		102.4452 (78)	
Solar gains	149.0460	256.8353	365.0491	484.6231	579.1516	592.7725	563.9500	489.4962	405.2024	286.9753	178.9206	127.3708 (83)
Total gains	608.5976	730.0483	817.7620	924.7361	996.7257	996.5085	952.3803	876.9862	804.2832	697.7333	613.3241	576.3034 (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	34.9432	35.0809	35.2169	35.8701	35.9950	36.5881	36.5881	36.7001	36.3574	35.9950	35.7432	35.4837
alpha	3.3295	3.3387	3.3478	3.3913	3.3997	3.4392	3.4392	3.4467	3.4238	3.3997	3.3829	3.3656
util living area	0.9731	0.9515	0.9164	0.8350	0.7051	0.5343	0.4010	0.4485	0.6652	0.8733	0.9542	0.9771 (86)
MIT	19.0831	19.4061	19.8183	20.3413	20.7170	20.9210	20.9775	20.9671	20.8291	20.3314	19.6347	19.0451 (87)
Th 2	20.0107	20.0142	20.0176	20.0338	20.0368	20.0510	20.0510	20.0536	20.0455	20.0368	20.0307	20.0243 (88)
util rest of house	0.9682	0.9430	0.9017	0.8067	0.6575	0.4665	0.3192	0.3634	0.5989	0.8449	0.9447	0.9729 (89)
MIT 2	18.2708	18.5898	18.9926	19.4985	19.8337	20.0066	20.0423	20.0399	19.9395	19.5032	18.8303	18.2431 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.5843	18.9048	19.3113	19.8238	20.1746	20.3595	20.4032	20.3978	20.2829	19.8228	19.1407	18.5526 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.5843	18.9048	19.3113	19.8238	20.1746	20.3595	20.4032	20.3978	20.2829	19.8228	19.1407	18.5526 (93)

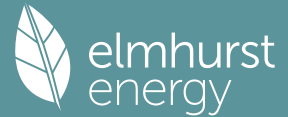
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9590	0.9311	0.8891	0.7999	0.6647	0.4893	0.3501	0.3951	0.6164	0.8376	0.9337	0.9646 (94)
Useful gains	583.6152	679.7623	727.0570	739.7131	662.5217	487.5475	333.4494	346.4799	495.7211	584.4178	572.6871	555.8945 (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	1336.4437	1305.1542	1189.3122	995.6224	769.7151	514.6305	339.8303	356.1249	555.9698	837.6751	1101.3210	1322.3765 (97)
Space heating kWh	560.1044	420.2634	343.9179	184.2547	79.7519	0.0000	0.0000	0.0000	0.0000	188.4234	380.6164	570.2626 (98a)
Space heating requirement - total per year (kWh/year)												2727.5948
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	560.1044	420.2634	343.9179	184.2547	79.7519	0.0000	0.0000	0.0000	0.0000	188.4234	380.6164	570.2626 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2727.5948
Space heating per m2												31.7162 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	839.9272	661.2193	677.0178	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8710	0.9173	0.8939	0.0000	0.0000	0.0000	0.0000 (101)

Full SAP Calculation Printout



Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	731.5379	606.5042	605.2099	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1119.2803	1069.9700	984.1327	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	279.1745	344.8185	281.9186	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	69.7936	86.2046	70.4796	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												226.4779 (107)
Energy for space heating												31.7162 (99)
Energy for space cooling												2.6335 (108)
Total												34.3497 (109)
Fabric Energy Efficiency (TFEE)												34.3 (109)

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

1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	86.0000 (1b)	x 3.1500 (2b)	= 270.9000 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0000		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	270.9000 (5)	

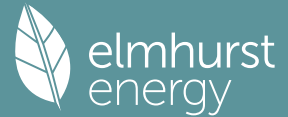
2. Ventilation rate

											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											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											3.0000 (17)	
Infiltration rate											0.1500 (18)	
Number of sides sheltered											0 (19)	
Shelter factor											(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1500 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
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												
	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (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	0.2862	0.2825	0.2787	0.2600	0.2562	0.2375	0.2375	0.2337	0.2450	0.2562	0.2637	0.2712 (25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K					
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K					
Glazing			22.2000	0.7752	17.2093			(27)				
External Wall North	21.7700	14.8000	6.9700	0.1400	0.9758	70.0000	487.9000	(29a)				
External Wall East	39.9100		39.9100	0.1400	5.5874	70.0000	2793.7000	(29a)				
External Wall South	21.5800	7.4000	14.1800	0.1400	1.9852	70.0000	992.6000	(29a)				
Total net area of external elements Aum(A, m2)			83.2600					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	25.7577			(33)				
Main dwelling												
Party Wall 1 West			39.3100	0.0000	0.0000	45.0000	1768.9500	(32)				
Party Floor 1			82.0000			30.0000	2460.0000	(32d)				
Party Ceiling 1			82.0000			30.0000	2460.0000	(32b)				
Internal Wall 1			89.5900			9.0000	806.3100	(32c)				
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		11769.4600	(34)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							136.8542	(35)				
List of Thermal Bridges												
K1 Element				Length	Psi-value	Total						
E7 Party floor between dwellings (in blocks of flats)				41.5000	0.0300	1.2450						
E18 Party wall between dwellings				12.6000	0.0300	0.3780						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							1.6230	(36)				
Point Thermal bridges						(36a) =	0.0000					
Total fabric heat loss					(33) + (36) + (36a) =		27.3807	(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

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(38)m	25.5899	25.2547	24.9194	23.2432	22.9080	21.2318	21.2318	20.8965	21.9023	22.9080	23.5785	24.2489 (38)
Heat transfer coeff	52.9706	52.6354	52.3001	50.6239	50.2887	48.6125	48.6125	48.2773	49.2830	50.2887	50.9592	51.6296 (39)
Average = Sum(39)m / 12 =												50.5401
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.6159	0.6120	0.6081	0.5887	0.5848	0.5653	0.5653	0.5614	0.5731	0.5848	0.5925	0.6003 (40)
HLP (average)												0.5877
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5669 (42)
Hot water usage for mixer showers												
73.7542	72.6250	70.9609	68.4009	66.1073	62.8985	60.3606	63.3276	64.8199	67.9980	71.3078	73.6877 (42a)	
Hot water usage for baths												
28.3991	27.9704	27.3605	26.4472	25.6241	24.4910	23.6313	24.6825	25.2342	26.3569	27.5242	28.3765 (42b)	
Hot water usage for other uses												
40.9178	39.4299	37.9420	36.4541	34.9661	33.4782	33.4782	34.9661	36.4541	37.9420	39.4299	40.9178 (42c)	
Average daily hot water use (litres/day)												131.5263 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	143.0710	140.0253	136.2634	131.3022	126.6975	120.8677	117.4701	122.9762	126.5081	132.2969	138.2619	142.9820 (44)
Energy content	210.6253	185.2817	194.7176	171.5135	163.2626	139.7795	129.8079	144.7453	146.7431	170.4780	186.8656	209.9796 (45)
Energy content (annual)										Total = Sum(45)m =		2053.7995
Distribution loss (46)m = 0.15 x (45)m												
31.5938	27.7923	29.2076	25.7270	24.4894	20.9669	19.4712	21.7118	22.0115	25.5717	28.0298	31.4969 (46)	
Water storage loss:												
Store volume												110.0000 (47)
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												
265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564 (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												
265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564 (64)	

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	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.5102	21.7697	17.7043	13.4033	10.0191	8.4586	9.1398	11.8802	15.9456	20.2466	23.6308	25.1914 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	345.5573	349.1431	340.1070	320.8702	296.5872	273.7646	258.5177	254.9319	263.9680	283.2048	307.4878	330.3104 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684 (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)	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768 (71)
Water heating gains (Table 5)	153.5677	151.1133	146.4584	138.6433	132.4009	123.9884	117.4497	124.1253	127.2042	135.6255	145.7330	153.2791 (72)
Total internal gains	627.9420	626.3329	608.5765	577.2236	543.3140	510.5183	489.4140	495.2443	511.4246	543.3838	581.1585	613.0877 (73)

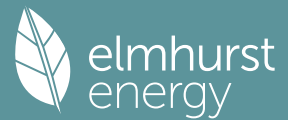
6. Solar gains

[Jan]													
				Area	Solar flux	g	FF			Access		Gains	
				m2	Table 6a	Specific data	Specific data			factor		W	
					W/m2	or Table 6b	or Table 6c			Table 6d			
North				14.8000	10.6334	0.3500	0.8500			0.7700		32.4454	(74)
South				7.4000	46.7521	0.3500	0.8500			0.7700		71.3268	(78)
Solar gains	103.7722	178.8198	254.1630	337.4156	403.2304	412.7138	392.6463	340.8084	282.1194	199.8046	124.5722	88.6810	(83)
Total gains	731.7142	805.1528	862.7395	914.6392	946.5444	923.2322	882.0603	836.0526	793.5440	743.1883	705.7307	701.7688	(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	61.7190	62.1121	62.5103	64.5800	65.0105	67.2521	67.2521	67.7192	66.3372	65.0105	64.1552	63.3220
alpha	5.1146	5.1408	5.1674	5.3053	5.3340	5.4835	5.4835	5.5146	5.4225	5.3340	5.2770	5.2215
util living area												
	0.9046	0.8578	0.7794	0.6411	0.4882	0.3364	0.2424	0.2655	0.4260	0.6679	0.8422	0.9138 (86)

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MIT	20.4906	20.6409	20.8030	20.9395	20.9871	20.9988	20.9998	20.9997	20.9954	20.9384	20.7373	20.4801 (87)
Th 2	20.4157	20.4192	20.4227	20.4402	20.4437	20.4614	20.4614	20.4649	20.4543	20.4437	20.4367	20.4297 (88)
util rest of house												
	0.8936	0.8431	0.7595	0.6160	0.4603	0.3083	0.2128	0.2347	0.3931	0.6385	0.8244	0.9037 (89)
MIT 2	19.8293	20.0136	20.2081	20.3786	20.4320	20.4604	20.4613	20.4647	20.4507	20.3830	20.1474	19.8285 (90)
Living area fraction									fLA = Living area /	(4) =		0.3859 (91)
MIT	20.0845	20.2557	20.4377	20.5951	20.6462	20.6682	20.6691	20.6712	20.6609	20.5973	20.3751	20.0799 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0845	20.2557	20.4377	20.5951	20.6462	20.6682	20.6691	20.6712	20.6609	20.5973	20.3751	20.0799 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8868	0.8388	0.7600	0.6230	0.4705	0.3191	0.2242	0.2466	0.4056	0.6468	0.8224	0.8969	(94)
Useful gains	648.8828	675.3294	655.7211	569.8408	445.3863	294.6046	197.7680	206.1337	321.8632	480.6731	580.3766	629.3989	(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													
	836.1149	808.2529	728.9446	592.0506	449.8933	294.9899	197.8102	206.2027	323.3404	502.7524	676.4860	819.8751	(97)
Space heating kWh													
	139.3007	89.3246	54.4783	15.9910	3.3532	0.0000	0.0000	0.0000	0.0000	16.4270	69.1987	141.7143	(98a)
Space heating requirement - total per year (kWh/year)												529.7878	
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													
	139.3007	89.3246	54.4783	15.9910	3.3532	0.0000	0.0000	0.0000	0.0000	16.4270	69.1987	141.7143	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												529.7878	
Space heating per m2											(98c) / (4) =	6.1603	(99)

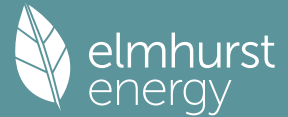
9b. Energy requirements

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													1.0000 (306)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating:													
Space heating requirement													
	139.3007	89.3246	54.4783	15.9910	3.3532	0.0000	0.0000	0.0000	0.0000	16.4270	69.1987	141.7143	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													
307a	139.3007	89.3246	54.4783	15.9910	3.3532	0.0000	0.0000	0.0000	0.0000	16.4270	69.1987	141.7143	
Space heating requirement													
	139.3007	89.3246	54.4783	15.9910	3.3532	0.0000	0.0000	0.0000	0.0000	16.4270	69.1987	141.7143	(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													
	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310a	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564	
Water heating fuel													
	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564	(310)
Cooling System Energy Efficiency Ratio													0.0000 (314)
Space coolin													0.0000 (315)
Pumps and Fa	19.6488	17.7473	19.6488	19.0150	19.6488	19.0150	19.6488	19.6488	19.0150	19.6488	19.0150	19.6488	(331)
Lighting	21.4536	17.2109	15.4965	11.3534	8.7697	7.1649	8.0000	10.3987	13.5069	17.7218	20.0167	22.0499	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-20.1878	-30.2515	-46.2947	-55.5413	-62.9760	-59.9661	-59.2156	-54.3130	-46.2431	-36.0423	-22.8127	-17.2469	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating													529.7878 (307)
Space heating fuel - secondary													0.0000 (309)
Water heating fuel - community heating													2704.6393 (310)
Efficiency of water heater													0.0000 (311)
Electricity used for heat distribution													5.2979 (313)
Space cooling fuel													0.0000 (321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)													
mechanical ventilation fans (SFP = 0.7000)													231.3486 (330a)
Total electricity for the above, kWh/year													231.3486 (331)
Electricity for lighting (calculated in Appendix L)													173.1429 (332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-511.0910 (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													3127.8276 (338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	529.7878	4.4400	23.5226	(340a)
Space heating total			23.5226	(340)

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Total CO2 associated with community systems			0.0000 (473)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Heat pump	2704.6393	4.4400	120.0860 (342a)
Water heating total			120.0860 (342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (347a)
Pumps, fans and electric keep-hot	231.3486	16.4900	38.1494 (349)
Energy for lighting	173.1429	16.4900	28.5513 (350)
Additional standing charges			92.0000 (351)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-511.0910	16.4900	-84.2789
PV Unit electricity exported	0.0000	5.5900	0.0000
Total			-84.2789 (352)
Total energy cost			218.0303 (355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600 (356)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.5992 (357)
SAP value		90.2875
SAP rating (Section 12)		90 (358)
SAP band		B

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			333.0000 (367)
Space and Water heating from Heat pump	971.2994	0.1583	25.1787 (367)
Electrical energy for heat distribution (space & water)	5.2979	0.0000	4.6490 (372)
Overall CO2 factor for heat network			0.0446 (386)
Total CO2 associated with community systems			144.2571 (373)
Space and water heating			144.2571 (376)
Pumps, fans and electric keep-hot	231.3486	0.1387	32.0909 (378)
Energy for lighting	173.1429	0.1443	24.9899 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-511.0910	0.1333	-68.1205
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-68.1205 (380)
Total CO2, kg/year			133.2174 (383)
CO2 emissions per m2			1.5500 (384)
EI value			98.6373 (384a)
EI rating			99 (385)
EI band			A

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	86.0000 (1b)	x 3.1500 (2b)	= 270.9000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	270.9000 (5)

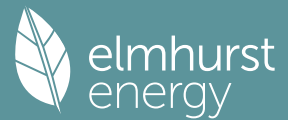
2. Ventilation rate

	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	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	0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1500 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.8000	4.5000	4.4000	3.9000	3.9000	3.6000	3.7000	3.5000	3.7000	4.0000	4.1000	4.4000 (22)
Wind factor	1.2000	1.1250	1.1000	0.9750	0.9750	0.9000	0.9250	0.8750	0.9250	1.0000	1.0250	1.1000 (22a)
Adj infilt rate	0.1800	0.1687	0.1650	0.1462	0.1462	0.1350	0.1388	0.1313	0.1388	0.1500	0.1537	0.1650 (22b)
Balanced mechanical ventilation with heat recovery												

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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	0.2750	0.2637	0.2600	0.2412	0.2412	0.2300	0.2337	0.2262	0.2337	0.2450	0.2487	0.2600 (25)
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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								
Glazing			22.2000	0.7752	17.2093			(27)
External Wall North	21.7700	14.8000	6.9700	0.1400	0.9758	70.0000	487.9000	(29a)
External Wall East	39.9100		39.9100	0.1400	5.5874	70.0000	2793.7000	(29a)
External Wall South	21.5800	7.4000	14.1800	0.1400	1.9852	70.0000	992.6000	(29a)
Total net area of external elements Aum(A, m2)			83.2600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...	(30) + (32) =	25.7577			(33)
Main dwelling								
Party Wall 1 West			39.3100	0.0000	0.0000	45.0000	1768.9500	(32)
Party Floor 1			82.0000			30.0000	2460.0000	(32d)
Party Ceiling 1			82.0000			30.0000	2460.0000	(32b)
Internal Wall 1			89.5900			9.0000	806.3100	(32c)
Heat capacity Cm = Sum(A x k)					(28)...	(30) + (32) + (32a)...	(32e) =	11769.4600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								136.8542 (35)
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		
E7 Party floor between dwellings (in blocks of flats)				41.5000	0.0300	1.2450		
E18 Party wall between dwellings				12.6000	0.0300	0.3780		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								1.6230 (36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss						(33) + (36) + (36a) =	27.3807	(37)

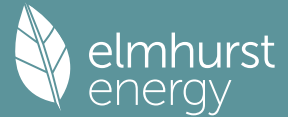
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5669 (42)
Hot water usage for mixer showers													
	73.7542	72.6250	70.9609	68.4009	66.1073	62.8985	60.3606	63.3276	64.8199	67.9980	71.3078	73.6877	(42a)
Hot water usage for baths													
	28.3991	27.9704	27.3605	26.4472	25.6241	24.4910	23.6313	24.6825	25.2342	26.3569	27.5242	28.3765	(42b)
Hot water usage for other uses													
	40.9178	39.4299	37.9420	36.4541	34.9661	33.4782	33.4782	34.9661	36.4541	37.9420	39.4299	40.9178	(42c)
Average daily hot water use (litres/day)													131.5263 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	143.0710	140.0253	136.2634	131.3022	126.6975	120.8677	117.4701	122.9762	126.5081	132.2969	138.2619	142.9820	(44)
Energy content (annual)	210.6253	185.2817	194.7176	171.5135	163.2626	139.7795	129.8079	144.7453	146.7431	170.4780	186.8656	209.9796	(45)
Distribution loss (46)m = 0.15 x (45)m													
	31.5938	27.7923	29.2076	25.7270	24.4894	20.9669	19.4712	21.7118	22.0115	25.5717	28.0298	31.4969	(46)
Water storage loss:													
Store volume													110.0000 (47)
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													
	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564	(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													
	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564	(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													
	114.2544	101.5481	108.9650	99.8232	98.5062	89.2716	87.3826	92.3492	91.5870	100.9054	104.9278	114.0396	(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	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	24.5102	21.7697	17.7043	13.4033	10.0191	8.4586	9.1398	11.8802	15.9456	20.2466	23.6308	25.1914	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	345.5573	349.1431	340.1070	320.8702	296.5872	273.7646	258.5177	254.9319	263.9680	283.2048	307.4878	330.3104	(68)
	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	(69)

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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)	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768 (71)
Water heating gains (Table 5)	153.5677	151.1133	146.4584	138.6433	132.4009	123.9884	117.4497	124.1253	127.2042	135.6255	145.7330	153.2791 (72)
Total internal gains	627.9420	626.3329	608.5765	577.2236	543.3140	510.5183	489.4140	495.2443	511.4246	543.3838	581.1585	613.0877 (73)

6. Solar gains

[Jan]	Area m2		Solar flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		FF		Access factor Table 6d	Gains W
North	14.8000		12.7054		0.3500		0.8500		0.7700		0.7700	38.7677 (74)
South	7.4000		53.5774		0.3500		0.8500		0.7700		0.7700	81.7397 (78)
Solar gains	120.5074	185.2392	264.3899	373.7005	432.1187	473.6379	445.0547	388.2777	315.4848	221.8909	146.1821	99.5379 (83)
Total gains	748.4494	811.5722	872.9664	950.9241	975.4327	984.1562	934.4686	883.5220	826.9095	765.2747	727.3405	712.6256 (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	62.9135	64.1552	64.5800	66.7915	66.7915	68.1927	67.7192	68.6729	67.7192	66.3372	65.8890	64.5800
alpha	5.1942	5.2770	5.3053	5.4528	5.4528	5.5462	5.5146	5.5782	5.5146	5.4225	5.3926	5.3053
util living area	0.8792	0.8319	0.7390	0.5776	0.4193	0.2726	0.1860	0.1886	0.3496	0.5834	0.7851	0.8857 (86)
MIT	20.6019	20.7237	20.8649	20.9683	20.9950	20.9997	21.0000	21.0000	20.9987	20.9725	20.8400	20.6106 (87)
Th 2	20.4262	20.4367	20.4402	20.4578	20.4578	20.4684	20.4649	20.4720	20.4649	20.4543	20.4508	20.4402 (88)
util rest of house	0.8659	0.8156	0.7176	0.5529	0.3928	0.2468	0.1583	0.1601	0.3187	0.5525	0.7634	0.8728 (89)
MIT 2	19.9738	20.1280	20.2955	20.4263	20.4535	20.4682	20.4649	20.4720	20.4639	20.4286	20.2796	19.9973 (90)
Living area fraction	20.2162	20.3579	20.5153	20.6355	20.6625	20.6733	20.6714	20.6757	20.6703	20.6385	20.4959	20.2340 (92)
MIT	20.2162	20.3579	20.5153	20.6355	20.6625	20.6733	20.6714	20.6757	20.6703	20.6385	20.4959	20.2340 (93)
Temperature adjustment												0.0000
adjusted MIT	20.2162	20.3579	20.5153	20.6355	20.6625	20.6733	20.6714	20.6757	20.6703	20.6385	20.4959	20.2340 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8607	0.8132	0.7206	0.5611	0.4028	0.2568	0.1690	0.1711	0.3305	0.5630	0.7653	0.8677 (94)
Useful gains	644.1725	659.9713	629.0507	533.5535	392.9439	252.7128	157.9264	151.1798	273.3331	430.8829	556.6075	618.3635 (95)
Ext temp.	5.0000	5.4000	7.1000	9.5000	12.6000	15.4000	17.4000	17.5000	15.0000	11.7000	8.1000	5.2000 (96)
Heat loss rate W	790.7064	762.2430	679.1340	545.0579	394.6397	252.8129	157.9337	151.1864	273.7457	440.5165	615.0612	761.0812 (97)
Space heating kWh	109.0213	68.7265	37.2620	8.2832	1.2617	0.0000	0.0000	0.0000	0.0000	7.1674	42.0866	106.1820 (98a)
Space heating requirement - total per year (kWh/year)												379.9907
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	109.0213	68.7265	37.2620	8.2832	1.2617	0.0000	0.0000	0.0000	0.0000	7.1674	42.0866	106.1820 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												379.9907
Space heating per m2										(98c) / (4) =		4.4185 (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												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	109.0213	68.7265	37.2620	8.2832	1.2617	0.0000	0.0000	0.0000	0.0000	7.1674	42.0866	106.1820 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	109.0213	68.7265	37.2620	8.2832	1.2617	0.0000	0.0000	0.0000	0.0000	7.1674	42.0866	106.1820
Space heating requirement	109.0213	68.7265	37.2620	8.2832	1.2617	0.0000	0.0000	0.0000	0.0000	7.1674	42.0866	106.1820 (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	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00												
310a	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564
Water heating fuel	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564 (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	19.6488	17.7473	19.6488	19.0150	19.6488	19.0150	19.6488	19.6488	19.0150	19.6488	19.0150	19.6488 (331)
Lighting	21.4536	17.2109	15.4965	11.3534	8.7697	7.1649	8.0000	10.3987	13.5069	17.7218	20.0167	22.0499 (332)
Electricity generated by PVs (Appendix M) (negative quantity)	-23.3258	-31.5966	-48.1095	-59.6168	-65.6481	-65.0090	-63.7509	-59.0043	-50.2052	-39.5168	-26.4572	-19.3995 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												

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(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												379.9907	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2704.6393	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												3.7999	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)													
mechanical ventilation fans (SFP = 0.7000)												231.3486	(330a)
Total electricity for the above, kWh/year												231.3486	(331)
Electricity for lighting (calculated in Appendix L)												173.1429	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-551.6396	(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												2937.4819	(338)

10b. Fuel costs - using BEDF prices (568)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	379.9907	5.6000	21.2795	(340a)
Space heating total			21.2795	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2704.6393	5.6000	151.4598	(342a)
Water heating total			151.4598	(342)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(347a)
Pumps, fans and electric keep-hot	231.3486	26.0600	60.2894	(349)
Energy for lighting	173.1429	26.0600	45.1210	(350)
Additional standing charges			99.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-551.6396	26.0600	-143.7573	
PV Unit electricity exported	0.0000	5.8100	0.0000	
Total			-143.7573	(352)
Total energy cost			233.3925	(355)

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			333.0000	(367)
Space and Water heating from Heat pump	926.3153	0.1591	18.1551	(367)
Electrical energy for heat distribution (space & water)	3.7999	0.0000	4.4151	(372)
Overall CO2 factor for heat network			0.0444	(386)
Total CO2 associated with community systems			136.9996	(373)
Space and water heating			136.9996	(376)
Pumps, fans and electric keep-hot	231.3486	0.1387	32.0909	(378)
Energy for lighting	173.1429	0.1443	24.9899	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-551.6396	0.1333	-73.5514	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-73.5514	(380)
Total CO2, kg/year			120.5289	(383)

13b. Primary energy - Community heating scheme

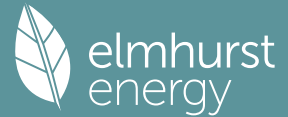
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			333.0000	(467a)
Space and Water heating from Heat pump	926.3153	1.5889	181.3142	(467)
Electrical energy for heat distribution (space & water)	3.7999	0.0000	47.1740	(472)
Overall CO2 factor for heat network			0.4745	(486)
Total CO2 associated with community systems			1463.8095	(473)
Space and water heating			1463.8095	(476)
Pumps, fans and electric keep-hot	231.3486	1.5128	349.9842	(478)
Energy for lighting	173.1429	1.5338	265.5723	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-551.6396	1.4927	-823.4269	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-823.4269	(480)
Total Primary energy kWh/year			1255.9391	(483)

SAP 10 EPC IMPROVEMENTS

0307_2B3P_BG

Current energy efficiency rating: B 90
Current environmental impact rating: A 99

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N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures (none)
Typical annual savings
Total Savings £0 0.00 kg/m²
Energy efficiency B 90
Environmental impact A 99

Fuel prices for cost data on this page from database revision number 568 TEST (31 Mar 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, South East England):

	Current	Potential	Saving
Electricity	£105	£105	£0
Community scheme	£272	£272	£0
Space heating	£181	£181	£0
Water heating	£151	£151	£0
Lighting	£45	£45	£0
Generated (PV)	-£144	-£144	£0
Total cost of fuels	£233	£233	£0
Total cost of uses	£233	£233	£0
Delivered energy	34 kWh/m ²	34 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m ²	1 kg/m ²	1 kg/m ²	0 kg/m ²
Primary energy	15 kWh/m ²	15 kWh/m ²	0 kWh/m ²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	86.0000 (1b)	x 3.1500 (2b)	= 270.9000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 270.9000 (5)

2. Ventilation rate

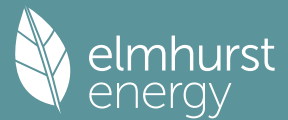
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) =	Air changes per hour 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	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1500 (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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (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	0.2862	0.2825	0.2787	0.2600	0.2562	0.2375	0.2375	0.2337	0.2450	0.2562	0.2637	0.2712 (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							
Glazing			22.2000	0.7752	17.2093		(27)

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External Wall North	21.7700	14.8000	6.9700	0.1400	0.9758	70.0000	487.9000 (29a)
External Wall East	39.9100		39.9100	0.1400	5.5874	70.0000	2793.7000 (29a)
External Wall South	21.5800	7.4000	14.1800	0.1400	1.9852	70.0000	992.6000 (29a)
Total net area of external elements Aum(A, m2)			83.2600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	25.7577			(33)
Main dwelling							
Party Wall 1 West			39.3100	0.0000	0.0000	45.0000	1768.9500 (32)
Party Floor 1			82.0000			30.0000	2460.0000 (32d)
Party Ceiling 1			82.0000			30.0000	2460.0000 (32b)
Internal Wall 1			89.5900			9.0000	806.3100 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11769.4600	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		136.8542	(35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450
E18 Party wall between dwellings	12.6000	0.0300	0.3780
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			1.6230 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	27.3807 (37)

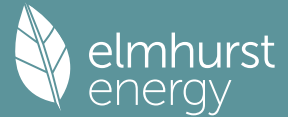
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	25.5899	25.2547	24.9194	23.2432	22.9080	21.2318	21.2318	20.8965	21.9023	22.9080	23.5785	24.2489	(38)
Average = Sum(39)m / 12 =	52.9706	52.6354	52.3001	50.6239	50.2887	48.6125	48.6125	48.2773	49.2830	50.2887	50.9592	51.6296	(39)
												50.5401	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.6159	0.6120	0.6081	0.5887	0.5848	0.5653	0.5653	0.5614	0.5731	0.5848	0.5925	0.6003	(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												2.5669 (42)
Hot water usage for mixer showers												
	73.7542	72.6250	70.9609	68.4009	66.1073	62.8985	60.3606	63.3276	64.8199	67.9980	71.3078	73.6877 (42a)
Hot water usage for baths												
	28.3991	27.9704	27.3605	26.4472	25.6241	24.4910	23.6313	24.6825	25.2342	26.3569	27.5242	28.3765 (42b)
Hot water usage for other uses												
	40.9178	39.4299	37.9420	36.4541	34.9661	33.4782	33.4782	34.9661	36.4541	37.9420	39.4299	40.9178 (42c)
Average daily hot water use (litres/day)												131.5263 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	143.0710	140.0253	136.2634	131.3022	126.6975	120.8677	117.4701	122.9762	126.5081	132.2969	138.2619	142.9820 (44)
Energy content (annual)	210.6253	185.2817	194.7176	171.5135	163.2626	139.7795	129.8079	144.7453	146.7431	170.4780	186.8656	209.9796 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2053.7995
	31.5938	27.7923	29.2076	25.7270	24.4894	20.9669	19.4712	21.7118	22.0115	25.5717	28.0298	31.4969 (46)
Water storage loss:												
Store volume												110.0000 (47)
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												
	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564 (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	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564 (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												
	114.2544	101.5481	108.9650	99.8232	98.5062	89.2716	87.3826	92.3492	91.5870	100.9054	104.9278	114.0396 (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	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.5102	21.7697	17.7043	13.4033	10.0191	8.4586	9.1398	11.8802	15.9456	20.2466	23.6308	25.1914	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	345.5573	349.1431	340.1070	320.8702	296.5872	273.7646	258.5177	254.9319	263.9680	283.2048	307.4878	330.3104	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	(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)	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	(71)
Water heating gains (Table 5)	153.5677	151.1133	146.4584	138.6433	132.4009	123.9884	117.4497	124.1253	127.2042	135.6255	145.7330	153.2791	(72)
Total internal gains	627.9420	626.3329	608.5765	577.2236	543.3140	510.5183	489.4140	495.2443	511.4246	543.3838	581.1585	613.0877	(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				14.8000		10.6334		0.3500		0.8500		0.7700		32.4454 (74)	
South				7.4000		46.7521		0.3500		0.8500		0.7700		71.3268 (78)	
Solar gains	103.7722	178.8198	254.1630	337.4156	403.2304	412.7138	392.6463	340.8084	282.1194	199.8046	124.5722	88.6810 (83)			
Total gains	731.7142	805.1528	862.7395	914.6392	946.5444	923.2322	882.0603	836.0526	793.5440	743.1883	705.7307	701.7688 (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	61.7190	62.1121	62.5103	64.5800	65.0105	67.2521	67.2521	67.7192	66.3372	65.0105	64.1552	63.3220			
alpha	5.1146	5.1408	5.1674	5.3053	5.3340	5.4835	5.4835	5.5146	5.4225	5.3340	5.2770	5.2215			
util living area	0.9046	0.8578	0.7794	0.6411	0.4882	0.3364	0.2424	0.2655	0.4260	0.6679	0.8422	0.9138	(86)		
MIT	20.4906	20.6409	20.8030	20.9395	20.9871	20.9988	20.9998	20.9997	20.9954	20.9384	20.7373	20.4801	(87)		
Th 2	20.4157	20.4192	20.4227	20.4402	20.4437	20.4614	20.4614	20.4649	20.4543	20.4437	20.4367	20.4297	(88)		
util rest of house	0.8936	0.8431	0.7595	0.6160	0.4603	0.3083	0.2128	0.2347	0.3931	0.6385	0.8244	0.9037	(89)		
MIT 2	19.8293	20.0136	20.2081	20.3786	20.4320	20.4604	20.4613	20.4647	20.4507	20.3830	20.1474	19.8285	(90)		
Living area fraction	fLA = Living area / (4) =												0.3859 (91)		
MIT	20.0845	20.2557	20.4377	20.5951	20.6462	20.6682	20.6691	20.6712	20.6609	20.5973	20.3751	20.0799	(92)		
Temperature adjustment													0.0000		
adjusted MIT	20.0845	20.2557	20.4377	20.5951	20.6462	20.6682	20.6691	20.6712	20.6609	20.5973	20.3751	20.0799	(93)		
8. Space heating requirement															
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Utilisation	0.8868	0.8388	0.7600	0.6230	0.4705	0.3191	0.2242	0.2466	0.4056	0.6468	0.8224	0.8969	(94)		
Useful gains	648.8828	675.3294	655.7211	569.8408	445.3863	294.6046	197.7680	206.1337	321.8632	480.6731	580.3766	629.3989	(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	836.1149	808.2529	728.9446	592.0506	449.8933	294.9899	197.8102	206.2027	323.3404	502.7524	676.4860	819.8751	(97)		
Space heating kWh	139.3007	89.3246	54.4783	15.9910	3.3532	0.0000	0.0000	0.0000	0.0000	16.4270	69.1987	141.7143	(98a)		
Space heating requirement - total per year (kWh/year)													529.7878		
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	139.3007	89.3246	54.4783	15.9910	3.3532	0.0000	0.0000	0.0000	0.0000	16.4270	69.1987	141.7143	(98c)		
Space heating requirement after solar contribution - total per year (kWh/year)													529.7878		
Space heating per m2	(98c) / (4) =												6.1603 (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														1.0000 (306)	
Efficiency of secondary/supplementary heating system, %														0.0000 (208)	
Space heating:															
Space heating requirement															
	139.3007	89.3246	54.4783	15.9910	3.3532	0.0000	0.0000	0.0000	0.0000	16.4270	69.1987	141.7143	(98)		
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00															
307a	139.3007	89.3246	54.4783	15.9910	3.3532	0.0000	0.0000	0.0000	0.0000	16.4270	69.1987	141.7143			
Space heating requirement															
	139.3007	89.3246	54.4783	15.9910	3.3532	0.0000	0.0000	0.0000	0.0000	16.4270	69.1987	141.7143	(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															
	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564	(64)		
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00															
310a	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564			
Water heating fuel															
	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564	(310)		
Cooling System Energy Efficiency Ratio															
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	(314)		
Pumps and Fa	19.6488	17.7473	19.6488	19.0150	19.6488	19.0150	19.6488	19.6488	19.0150	19.6488	19.0150	19.6488	(315)		
Lighting	21.4536	17.2109	15.4965	11.3534	8.7697	7.1649	8.0000	10.3987	13.5069	17.7218	20.0167	22.0499	(332)		
Electricity generated by PVs (Appendix M) (negative quantity)															
(333a)m	-20.1878	-30.2515	-46.2947	-55.5413	-62.9760	-59.9661	-59.2156	-54.3130	-46.2431	-36.0423	-22.8127	-17.2469	(333a)		
Electricity generated by wind turbines (Appendix M) (negative quantity)															
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)		
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)															
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)		
Electricity generated by PVs (Appendix M) (negative quantity)															
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)		
Electricity generated by wind turbines (Appendix M) (negative quantity)															
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)		
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)															
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)		
Annual totals kWh/year															
Space heating fuel - community heating														529.7878 (307)	
Space heating fuel - secondary														0.0000 (309)	
Water heating fuel - community heating														2704.6393 (310)	
Efficiency of water heater														0.0000 (311)	
Electricity used for heat distribution														5.2979 (313)	
Space cooling fuel														0.0000 (321)	
Electricity for pumps and fans:															
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)															

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mechanical ventilation fans (SFP = 0.7000)	231.3486 (330a)
Total electricity for the above, kWh/year	231.3486 (331)
Electricity for lighting (calculated in Appendix L)	173.1429 (332)

Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-511.0910 (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	3127.8276 (338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating from Heat pump	529.7878	4.4400	23.5226 (340a)
Space heating total			23.5226 (340)
Total CO2 associated with community systems			0.0000 (473)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Heat pump	2704.6393	4.4400	120.0860 (342a)
Water heating total			120.0860 (342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (347a)
Pumps, fans and electric keep-hot	231.3486	16.4900	38.1494 (349)
Energy for lighting	173.1429	16.4900	28.5513 (350)
Additional standing charges			92.0000 (351)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-511.0910	16.4900	-84.2789
PV Unit electricity exported	0.0000	5.5900	0.0000
Total			-84.2789 (352)
Total energy cost			218.0303 (355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600 (356)
Energy cost factor (ECF)	0.5992 (357)
SAP value	90.2875
SAP rating (Section 12)	90 (358)
SAP band	B

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			333.0000 (367)
Space and Water heating from Heat pump	971.2994	0.1583	25.1787 (367)
Electrical energy for heat distribution (space & water)	5.2979	0.0000	4.6490 (372)
Overall CO2 factor for heat network			0.0446 (386)
Total CO2 associated with community systems			144.2571 (373)
Space and water heating			144.2571 (376)
Pumps, fans and electric keep-hot	231.3486	0.1387	32.0909 (378)
Energy for lighting	173.1429	0.1443	24.9899 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-511.0910	0.1333	-68.1205
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-68.1205 (380)
Total CO2, kg/year			133.2174 (383)
CO2 emissions per m2			1.5500 (384)
EI value			98.6373 (384a)
EI rating			99 (385)
EI band			A

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

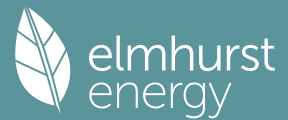
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	86.0000 (1b)	x 3.1500 (2b)	= 270.9000 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 270.9000 (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)

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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 0 (19)
Shelter factor (20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1500 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.8000	4.5000	4.4000	3.9000	3.9000	3.6000	3.7000	3.5000	3.7000	4.0000	4.1000	4.4000	(22)
Wind factor	1.2000	1.1250	1.1000	0.9750	0.9750	0.9000	0.9250	0.8750	0.9250	1.0000	1.0250	1.1000	(22a)
Adj infilt rate	0.1800	0.1687	0.1650	0.1462	0.1462	0.1350	0.1388	0.1313	0.1388	0.1500	0.1537	0.1650	(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	0.2750	0.2637	0.2600	0.2412	0.2412	0.2300	0.2337	0.2262	0.2337	0.2450	0.2487	0.2600	(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								
Glazing			22.2000	0.7752	17.2093			(27)
External Wall North	21.7700	14.8000	6.9700	0.1400	0.9758	70.0000	487.9000	(29a)
External Wall East	39.9100		39.9100	0.1400	5.5874	70.0000	2793.7000	(29a)
External Wall South	21.5800	7.4000	14.1800	0.1400	1.9852	70.0000	992.6000	(29a)
Total net area of external elements Aum(A, m2)			83.2600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	25.7577			(33)
Main dwelling								
Party Wall 1 West			39.3100	0.0000	0.0000	45.0000	1768.9500	(32)
Party Floor 1			82.0000			30.0000	2460.0000	(32d)
Party Ceiling 1			82.0000			30.0000	2460.0000	(32b)
Internal Wall 1			89.5900			9.0000	806.3100	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 11769.4600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 136.8542 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450	
E18 Party wall between dwellings	12.6000	0.0300	0.3780	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				1.6230 (36)
Point Thermal bridges				(36a) = 0.0000
Total fabric heat loss				(33) + (36) + (36a) = 27.3807 (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	24.5842	23.5785	23.2432	21.5670	21.5670	20.5613	20.8965	20.2261	20.8965	21.9023	22.2375	23.2432	(38)
Heat transfer coeff	51.9649	50.9592	50.6239	48.9477	48.9477	47.9420	48.2773	47.6068	48.2773	49.2830	49.6182	50.6239	(39)
Average = Sum(39)m / 12 =													49.4227

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6042	0.5925	0.5887	0.5692	0.5692	0.5575	0.5614	0.5536	0.5614	0.5731	0.5770	0.5887	(40)
HLP (average)													0.5747
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

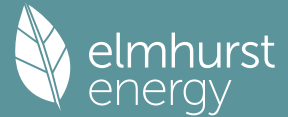
Assumed occupancy 2.5669 (42)
Hot water usage for mixer showers 73.7542 72.6250 70.9609 68.4009 66.1073 62.8985 60.3606 63.3276 64.8199 67.9980 71.3078 73.6877 (42a)
Hot water usage for baths 28.3991 27.9704 27.3605 26.4472 25.6241 24.4910 23.6313 24.6825 25.2342 26.3569 27.5242 28.3765 (42b)
Hot water usage for other uses 40.9178 39.4299 37.9420 36.4541 34.9661 33.4782 33.4782 34.9661 36.4541 37.9420 39.4299 40.9178 (42c)
Average daily hot water use (litres/day) 131.5263 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	143.0710	140.0253	136.2634	131.3022	126.6975	120.8677	117.4701	122.9762	126.5081	132.2969	138.2619	142.9820	(44)
Energy conte	210.6253	185.2817	194.7176	171.5135	163.2626	139.7795	129.8079	144.7453	146.7431	170.4780	186.8656	209.9796	(45)
Energy content (annual)										Total = Sum(45)m =			2053.7995
Distribution loss (46)m = 0.15 x (45)m													
	31.5938	27.7923	29.2076	25.7270	24.4894	20.9669	19.4712	21.7118	22.0115	25.5717	28.0298	31.4969	(46)
Water storage loss:													
Store volume													110.0000 (47)
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													
	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564	(62)
WVHRS	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)

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Output from w/h	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564 (64)
	Total per year (kWh/year) = Sum(64)m = 2704.6393 (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	114.2544	101.5481	108.9650	99.8232	98.5062	89.2716	87.3826	92.3492	91.5870	100.9054	104.9278	114.0396 (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
	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	24.5102	21.7697	17.7043	13.4033	10.0191	8.4586	9.1398	11.8802	15.9456	20.2466	23.6308	25.1914 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	345.5573	349.1431	340.1070	320.8702	296.5872	273.7646	258.5177	254.9319	263.9680	283.2048	307.4878	330.3104 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684 (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)												
	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768 (71)
Water heating gains (Table 5)												
	153.5677	151.1133	146.4584	138.6433	132.4009	123.9884	117.4497	124.1253	127.2042	135.6255	145.7330	153.2791 (72)
Total internal gains	627.9420	626.3329	608.5765	577.2236	543.3140	510.5183	489.4140	495.2443	511.4246	543.3838	581.1585	613.0877 (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					14.8000	12.7054	0.3500	0.8500	0.7700		38.7677 (74)	
South					7.4000	53.5774	0.3500	0.8500	0.7700		81.7397 (78)	
Solar gains	120.5074	185.2392	264.3899	373.7005	432.1187	473.6379	445.0547	388.2777	315.4848	221.8909	146.1821	99.5379 (83)
Total gains	748.4494	811.5722	872.9664	950.9241	975.4327	984.1562	934.4686	883.5220	826.9095	765.2747	727.3405	712.6256 (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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	62.9135	64.1552	64.5800	66.7915	66.7915	68.1927	67.7192	68.6729	67.7192	66.3372	65.8890	64.5800
alpha	5.1942	5.2770	5.3053	5.4528	5.4528	5.5462	5.5146	5.5782	5.5146	5.4225	5.3926	5.3053
util living area	0.8792	0.8319	0.7390	0.5776	0.4193	0.2726	0.1860	0.1886	0.3496	0.5834	0.7851	0.8857 (86)
MIT	20.6019	20.7237	20.8649	20.9683	20.9950	20.9997	21.0000	21.0000	20.9987	20.9725	20.8400	20.6106 (87)
Th 2	20.4262	20.4367	20.4402	20.4578	20.4578	20.4684	20.4649	20.4720	20.4649	20.4543	20.4508	20.4402 (88)
util rest of house	0.8659	0.8156	0.7176	0.5529	0.3928	0.2468	0.1583	0.1601	0.3187	0.5525	0.7634	0.8728 (89)
MIT 2	19.9738	20.1280	20.2955	20.4263	20.4535	20.4682	20.4649	20.4720	20.4639	20.4286	20.2796	19.9973 (90)
Living area fraction	20.2162	20.3579	20.5153	20.6355	20.6625	20.6733	20.6714	20.6757	20.6703	20.6385	20.4959	20.2340 (92)
MIT	20.2162	20.3579	20.5153	20.6355	20.6625	20.6733	20.6714	20.6757	20.6703	20.6385	20.4959	20.2340 (93)
Temperature adjustment												0.0000
adjusted MIT	20.2162	20.3579	20.5153	20.6355	20.6625	20.6733	20.6714	20.6757	20.6703	20.6385	20.4959	20.2340 (93)

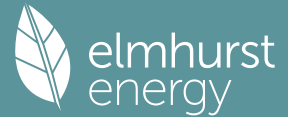
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.8607	0.8132	0.7206	0.5611	0.4028	0.2568	0.1690	0.1711	0.3305	0.5630	0.7653	0.8677 (94)
Useful gains	644.1725	659.9713	629.0507	533.5535	392.9439	252.7128	157.9264	151.1798	273.3331	430.8829	556.6075	618.3635 (95)
Ext temp.	5.0000	5.4000	7.1000	9.5000	12.6000	15.4000	17.4000	17.5000	15.0000	11.7000	8.1000	5.2000 (96)
Heat loss rate W	790.7064	762.2430	679.1340	545.0579	394.6397	252.8129	157.9337	151.1864	273.7457	440.5165	615.0612	761.0812 (97)
Space heating kWh	109.0213	68.7265	37.2620	8.2832	1.2617	0.0000	0.0000	0.0000	0.0000	7.1674	42.0866	106.1820 (98a)
Space heating requirement - total per year (kWh/year)												379.9907
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	109.0213	68.7265	37.2620	8.2832	1.2617	0.0000	0.0000	0.0000	0.0000	7.1674	42.0866	106.1820 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												379.9907
Space heating per m2										(98c) / (4) =		4.4185 (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												1.0000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	109.0213	68.7265	37.2620	8.2832	1.2617	0.0000	0.0000	0.0000	0.0000	7.1674	42.0866	106.1820 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00												
307a	109.0213	68.7265	37.2620	8.2832	1.2617	0.0000	0.0000	0.0000	0.0000	7.1674	42.0866	106.1820
Space heating requirement												

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Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	109.0213	68.7265	37.2620	8.2832	1.2617	0.0000	0.0000	0.0000	0.0000	7.1674	42.0866	106.1820 (307)
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 (308)
Water heating	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Annual water heating requirement	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564
Water heating fuel	265.9021	235.2092	249.9944	225.0071	218.5394	193.2731	185.0847	200.0221	200.2368	225.7548	240.3593	265.2564 (310)
Cooling System Energy Efficiency Ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	19.6488	17.7473	19.6488	19.0150	19.6488	19.0150	19.6488	19.6488	19.0150	19.6488	19.0150	19.6488 (331)
Lighting	21.4536	17.2109	15.4965	11.3534	8.7697	7.1649	8.0000	10.3987	13.5069	17.7218	20.0167	22.0499 (332)
Electricity generated by PVs (Appendix M) (negative quantity)	-23.3258	-31.5966	-48.1095	-59.6168	-65.6481	-65.0090	-63.7509	-59.0043	-50.2052	-39.5168	-26.4572	-19.3995 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												379.9907 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2704.6393 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												3.7999 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)												
mechanical ventilation fans (SFP = 0.7000)												231.3486 (330a)
Total electricity for the above, kWh/year												231.3486 (331)
Electricity for lighting (calculated in Appendix L)												173.1429 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-551.6396 (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												2937.4819 (338)

10b. Fuel costs - using BEDF prices (568)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating from Heat pump	379.9907	5.6000	21.2795 (340a)
Space heating total			21.2795 (340)
Total CO2 associated with community systems			0.0000 (473)
Space heating - secondary			0.0000 (341)
Water heating from Heat pump	2704.6393	5.6000	151.4598 (342a)
Water heating total			151.4598 (342)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (347a)
Pumps, fans and electric keep-hot	231.3486	26.0600	60.2894 (349)
Energy for lighting	173.1429	26.0600	45.1210 (350)
Additional standing charges			99.0000 (351)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-551.6396	26.0600	-143.7573
PV Unit electricity exported	0.0000	5.8100	0.0000
Total			-143.7573 (352)
Total energy cost			233.3925 (355)

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			333.0000 (367)
Space and Water heating from Heat pump	926.3153	0.1591	18.1551 (367)
Electrical energy for heat distribution (space & water)	3.7999	0.0000	4.4151 (372)
Overall CO2 factor for heat network			0.0444 (386)
Total CO2 associated with community systems			136.9996 (373)
Space and water heating			136.9996 (376)
Pumps, fans and electric keep-hot	231.3486	0.1387	32.0909 (378)
Energy for lighting	173.1429	0.1443	24.9899 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-551.6396	0.1333	-73.5514
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-73.5514 (380)
Total CO2, kg/year			120.5289 (383)

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			333.0000 (467a)
Space and Water heating from Heat pump	926.3153	1.5889	181.3142 (467)
Electrical energy for heat distribution (space & water)	3.7999	0.0000	47.1740 (472)
Overall CO2 factor for heat network			0.4745 (486)
Total CO2 associated with community systems			1463.8095 (473)
Space and water heating			1463.8095 (476)

Full SAP Calculation Printout



Pumps, fans and electric keep-hot	231.3486	1.5128	349.9842 (478)
Energy for lighting	173.1429	1.5338	265.5723 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-551.6396	1.4927	-823.4269
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-823.4269 (480)
Total Primary energy kWh/year			1255.9391 (483)



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