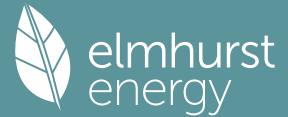


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Property Reference	Flat 1.01			Issued on Date	22/04/2024
Assessment Reference	Baseline	Prop Type Ref			
Property	Christchurch Hall, , 38, Portland Street, Bristol, BS8 4JB				
SAP Rating	75 C	DER	23.13	TER	15.06
Environmental	82 B	% DER < TER			-53.59
CO ₂ Emissions (t/year)	1.32	DFEE	72.11	TFEE	36.59
Compliance Check	See BREL	% DFEE < TFEE			-97.11
% DPER < TPER	-65.71	DPER	134.28	TPER	81.03
Assessor Details	Mr. Jordan Howlett			Assessor ID	H055-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	67.4000 (1b)	x 3.0000 (2b)	= 202.2000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 202.2000 (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) = 0.1484 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8984 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.6962 (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	0.8877	0.8703	0.8529	0.7659	0.7485	0.6614	0.6614	0.6440	0.6962	0.7485	0.7833	0.8181 (22b)
Effective ac	0.8940	0.8787	0.8637	0.7933	0.7801	0.7187	0.7187	0.7074	0.7424	0.7801	0.8068	0.8346 (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
External Door			2.1000	1.4000	2.9400		(26)
Window (Uw = 1.40)			6.0800	1.3258	8.0606		(27)
Exposed Floor Above Office			67.4000	0.2500	16.8500		(28b)
External Wall	31.9800	6.0800	25.9000	0.3000	7.7700		(29a)
Corridor wall	27.3000	2.1000	25.2000	0.3000	7.5600		(29a)
Exposed Ceiling	9.0200		9.0200	0.1600	1.4432		(30)
Total net area of external elements Aum(A, m ²)			135.7000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.6238		(33)
Party Wall			53.7000	0.0000	0.0000		(32)
Party Ceiling			58.3800				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							27.1400 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	71.7638 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	59.6534	58.6325	57.6318	52.9317	52.0523	47.9587	47.9587	47.2006	49.5355	52.0523	53.8313	55.6911 (38)
Heat transfer coeff												

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Average = Sum(39)m / 12 =	131.4172	130.3963	129.3957	124.6955	123.8161	119.7225	119.7225	118.9644	121.2993	123.8161	125.5951	127.4550 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.9498	1.9347	1.9198	1.8501	1.8370	1.7763	1.7763	1.7651	1.7997	1.8370	1.8634	1.8910 (40)
HLP (average)												1.8500
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1814 (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	26.2668	25.8767	25.3273	24.3144	23.5560	22.7150	22.2608	22.8063	23.4002	24.3001	25.3338	26.1780 (42b)
Hot water usage for other uses	36.9696	35.6252	34.2809	32.9365	31.5922	30.2478	30.2478	31.5922	32.9365	34.2809	35.6252	36.9696 (42c)
Average daily hot water use (litres/day)												57.9621 (43)
Daily hot water use	63.2363	61.5019	59.6082	57.2510	55.1482	52.9629	52.5086	54.3984	56.3367	58.5810	60.9591	63.1475 (44)
Energy conte	100.1509	87.5779	91.6156	78.3737	74.2401	65.1240	63.5046	67.3566	69.4688	79.4938	86.8474	98.8738 (45)
Energy content (annual)										Total = Sum(45)m =		962.6271
Distribution loss (46)m = 0.15 x (45)m	15.0226	13.1367	13.7423	11.7561	11.1360	9.7686	9.5257	10.1035	10.4203	11.9241	13.0271	14.8311 (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												
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 (57)
Combi loss	25.3237	22.8680	25.3106	24.4822	25.2901	24.4666	25.2787	25.2837	24.4736	25.2986	24.4943	25.3224 (61)
Total heat required for water heating calculated for each month	125.4746	110.4459	116.9262	102.8559	99.5302	89.5906	88.7833	92.6403	93.9424	104.7924	111.3417	124.1962 (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	125.4746	110.4459	116.9262	102.8559	99.5302	89.5906	88.7833	92.6403	93.9424	104.7924	111.3417	124.1962 (64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				1260.5199 (64)
Electric shower(s)	48.6861	43.3797	47.3690	45.2036	46.0519	43.9290	45.3933	46.0519	45.2036	47.3690	46.4783	48.6861 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												553.8015 (64a)
Heat gains from water heating, kWh/month	51.8026	45.6816	48.6321	43.4807	42.5203	38.7526	38.7833	40.2300	40.5177	44.5986	46.6199	51.3777 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	113.7139	125.8975	113.7139	117.5043	113.7139	117.5043	113.7139	113.7139	117.5043	113.7139	117.5043	113.7139 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	191.1544	193.1380	188.1394	177.4980	164.0652	151.4403	143.0060	141.0225	146.0210	156.6624	170.0952	182.7201 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069 (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)	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554 (71)
Water heating gains (Table 5)	69.6272	67.9785	65.3657	60.3899	57.1510	53.8231	52.1281	54.0725	56.2746	59.9443	64.7498	69.0560 (72)
Total internal gains	433.2162	445.7348	425.9398	414.1131	393.6509	378.4885	364.5688	364.5297	375.5207	389.0414	411.0702	424.2108 (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	

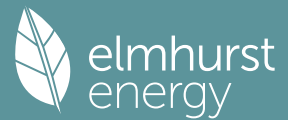
North					2.0200	10.6334	0.6300	0.7000				0.7700			6.5644 (74)	
Northeast					2.0300	11.2829	0.6300	0.7000				0.7700			6.9999 (75)	
Southwest					2.0300	36.7938	0.6300	0.7000				0.7700			22.8267 (79)	

Solar gains					36.3910	65.6756	100.1885	142.3177	176.6290	183.0945	173.2881	146.3956	114.5153	75.3190	44.2468	30.7237 (83)
Total gains					469.6072	511.4104	526.1282	556.4308	570.2799	561.5830	537.8569	510.9253	490.0361	464.3604	455.3170	454.9345 (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	14.2464	14.3579	14.4690	15.0143	15.1210	15.6380	15.6380	15.7377	15.4347	15.1210	14.9068	14.6893
alpha	1.9498	1.9572	1.9646	2.0010	2.0081	2.0425	2.0425	2.0492	2.0290	2.0081	1.9938	1.9793
util living area	0.9607	0.9516	0.9394	0.9097	0.8600	0.7684	0.6643	0.6948	0.8256	0.9135	0.9484	0.9629 (86)
MIT	16.8766	17.1693	17.7035	18.5600	19.3852	20.1680	20.5787	20.5206	19.9324	18.8907	17.8146	16.9036 (87)
Th 2	19.3670	19.3772	19.3873	19.4352	19.4442	19.4866	19.4866	19.4946	19.4702	19.4442	19.4259	19.4070 (88)
util rest of house	0.9532	0.9422	0.9266	0.8882	0.8194	0.6850	0.5167	0.5577	0.7594	0.8887	0.9369	0.9560 (89)
MIT 2	15.7428	16.0378	16.5725	17.4409	18.2434	18.9885	19.3184	19.2871	18.7806	17.7773	16.7071	15.7913 (90)
Living area fraction									fLA = Living area / (4) =			0.4279 (91)

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MIT	16.2279	16.5220	17.0564	17.9197	18.7320	19.4932	19.8577	19.8149	19.2734	18.2537	17.1810	16.2673 (92)
Temperature adjustment												0.0000
adjusted MIT	16.2279	16.5220	17.0564	17.9197	18.7320	19.4932	19.8577	19.8149	19.2734	18.2537	17.1810	16.2673 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9312	0.9176	0.8997	0.8594	0.7951	0.6854	0.5594	0.5926	0.7484	0.8621	0.9126	0.9351	(94)
Useful gains	437.3213	469.2923	473.3708	478.1976	453.4385	384.9126	300.8936	302.7983	366.7359	400.3342	415.5054	425.4049	(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	1567.5354	1515.4626	1365.9545	1124.7212	870.6733	585.8294	390.0189	406.2524	627.5343	947.6558	1266.1207	1538.0326	(97)
Space heating kWh	840.8793	703.0265	664.0823	465.4970	310.4227	0.0000	0.0000	0.0000	0.0000	407.2073	612.4430	827.7950	(98a)
Space heating requirement - total per year (kWh/year)												4831.3530	
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	840.8793	703.0265	664.0823	465.4970	310.4227	0.0000	0.0000	0.0000	0.0000	407.2073	612.4430	827.7950	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4831.3530	
Space heating per m2										(98c) / (4) =		71.6818	(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 %)													89.2000	(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	840.8793	703.0265	664.0823	465.4970	310.4227	0.0000	0.0000	0.0000	0.0000	407.2073	612.4430	827.7950	(98)	
Space heating efficiency (main heating system 1)	89.2000	89.2000	89.2000	89.2000	89.2000	0.0000	0.0000	0.0000	0.0000	89.2000	89.2000	89.2000	(210)	
Space heating fuel (main heating system)	942.6898	788.1463	744.4869	521.8576	348.0075	0.0000	0.0000	0.0000	0.0000	456.5104	686.5952	928.0213	(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	125.4746	110.4459	116.9262	102.8559	99.5302	89.5906	88.7833	92.6403	93.9424	104.7924	111.3417	124.1962	(64)	
Efficiency of water heater	88.9351	88.9231	88.8948	88.8313	88.7060	87.2000	87.2000	87.2000	87.2000	88.7832	88.8864	88.9339	(216)	
Fuel for water heating, kWh/month	141.0855	124.2039	131.5333	115.7879	112.2023	102.7416	101.8158	106.2389	107.7321	118.0318	125.2629	139.6500	(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	28.2147	22.6348	20.3802	14.9314	11.5334	9.4229	10.5212	13.6758	17.7635	23.3067	26.3249	28.9988	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)	
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)	
Annual totals kWh/year														
Space heating fuel - main system 1													5416.3150	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													87.2000	
Water heating fuel used													1426.2860	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
central heating pump													41.0000	(230c)
main heating flue fan													45.0000	(230e)
Total electricity for the above, kWh/year													86.0000	(231)
Electricity for lighting (calculated in Appendix L)													227.7084	(232)

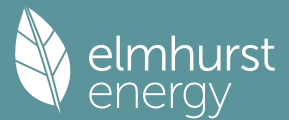
Energy saving/generation technologies (Appendices M ,N and Q)

PV generation													0.0000	(233)
Wind generation													0.0000	(234)
Hydro-electric generation (Appendix N)													0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)													0.0000	(235)
Appendix Q - special features														
Energy saved or generated													-0.0000	(236)
Energy used													0.0000	(237)
Total delivered energy for all uses													7710.1109	(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	5416.3150	0.2100	1137.4261	(261)
Total CO2 associated with community systems			0.0000	(373)

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Water heating (other fuel)	1426.2860	0.2100	299.5201 (264)
Energy for instantaneous electric shower(s)	553.8015	0.1391	77.0460 (264a)
Space and water heating			1436.9462 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	227.7084	0.1443	32.8654 (268)
Total CO ₂ , kg/year			1558.7869 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			23.1300 (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	5416.3150	1.1300	6120.4359 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	1426.2860	1.1300	1611.7031 (278)
Energy for instantaneous electric shower(s)	553.8015	1.5143	838.6406 (278a)
Space and water heating			7732.1391 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	227.7084	1.5338	349.2668 (282)
Total Primary energy kWh/year			9050.1472 (286)
Dwelling Primary energy Rate (DPER)			134.2800 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	67.4000 (1b)	x 3.0000 (2b)	= 202.2000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 202.2000 (5)

2. Ventilation rate

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	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) =	0.0989 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3489	(18)
Number of sides sheltered	3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2704 (21)

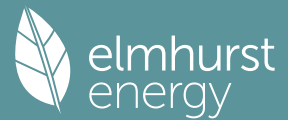
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3448	0.3380	0.3312	0.2974	0.2907	0.2569	0.2569	0.2501	0.2704	0.2907	0.3042	0.3177 (22b)
Effective ac	0.5594	0.5571	0.5549	0.5442	0.5422	0.5330	0.5330	0.5313	0.5366	0.5422	0.5463	0.5505 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type (Uw = 1.20)			6.0800	1.1450	6.9618		(27)
Exposed Floor Above Office			67.4000	0.1300	8.7620		(28b)
External Wall	31.9800	6.0800	25.9000	0.1800	4.6620		(29a)
Corridor wall	27.3000	2.1000	25.2000	0.1800	4.5360		(29a)
Exposed Ceiling	9.0200		9.0200	0.1100	0.9922		(30)
Total net area of external elements Aum(A, m ²)			135.7000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.0140		(33)
Party Wall			53.7000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							6.7850 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	34.7990 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan 37.3287	Feb 37.1747	Mar 37.0238	Apr 36.3148	May 36.1821	Jun 35.5646	Jul 35.5646	Aug 35.4503	Sep 35.8025	Oct 36.1821	Nov 36.4505	Dec 36.7310 (38)
Heat transfer coeff												

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Average = Sum(39)m / 12 =	72.1277	71.9737	71.8228	71.1138	70.9812	70.3637	70.3637	70.2493	70.6015	70.9812	71.2495	71.5301 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0701	1.0679	1.0656	1.0551	1.0531	1.0440	1.0440	1.0423	1.0475	1.0531	1.0571	1.0613 (40)
HLP (average)												1.0551
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1814 (42)
Hot water usage for mixer showers												
60.7943	59.8807	58.5494	56.0021	54.1223	52.0260	50.8344	52.1556	53.6040	55.8548	58.4568	60.5614 (42a)	
Hot water usage for baths												
26.2668	25.8767	25.3273	24.3144	23.5560	22.7150	22.2608	22.8063	23.4002	24.3001	25.3338	26.1780 (42b)	
Hot water usage for other uses												
36.9696	35.6252	34.2809	32.9365	31.5922	30.2478	30.2478	31.5922	32.9365	34.2809	35.6252	36.9696 (42c)	
Average daily hot water use (litres/day)												114.0124 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	124.0306	121.3826	118.1576	113.2531	109.2705	104.9888	103.3430	106.5541	109.9407	114.4358	119.4158	123.7089 (44)
Energy conte	196.4342	172.8472	181.6038	155.0378	147.0991	129.0960	124.9844	131.9362	135.5679	155.2883	170.1297	193.6983 (45)
Energy content (annual)										Total = Sum(45)m =		1893.7228
Distribution loss (46)m = 0.15 x (45)m												
29.4651	25.9271	27.2406	23.2557	22.0649	19.3644	18.7477	19.7904	20.3352	23.2932	25.5195	29.0547 (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 (59)	
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
247.3931	218.8746	232.5627	204.3529	198.0580	178.4111	175.9433	182.8951	184.8830	206.2472	219.4448	244.6572 (62)	
WWHRS	-27.7926	-24.5800	-25.7388	-21.3127	-19.8627	-16.9966	-15.9316	-16.9417	-17.5854	-20.7312	-23.4860	-27.2779 (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												
219.6005	194.2945	206.8239	183.0401	178.1953	161.4144	160.0117	165.9534	167.2976	185.5159	195.9588	217.3792 (64)	
12Total per year (kWh/year)												2235.4854 (64)
Electric shower(s)												2235 (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												
78.0541	68.9785	73.1230	63.8788	61.6502	55.2532	54.2970	56.6085	57.4051	64.3731	68.8969	77.1444 (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	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	113.7139	125.8975	113.7139	117.5043	113.7139	117.5043	113.7139	113.7139	117.5043	113.7139	117.5043	113.7139 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	191.1544	193.1380	188.1394	177.4980	164.0652	151.4403	143.0060	141.0225	146.0210	156.6624	170.0952	182.7201 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069 (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)	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554 (71)
Water heating gains (Table 5)	104.9114	102.6466	98.2836	88.7206	82.8631	76.7405	72.9799	76.0867	79.7293	86.5230	95.6902	103.6887 (72)
Total internal gains	468.5005	480.4029	458.8576	442.4438	419.3630	401.4060	385.4206	386.5438	398.9755	415.6200	442.0105	458.8435 (73)

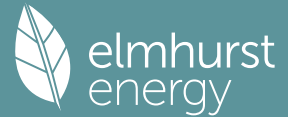
6. Solar gains

[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					2.0200	10.6334	0.6300	0.7000	0.7700	6.5644 (74)		
Northeast					2.0300	11.2829	0.6300	0.7000	0.7700	6.9999 (75)		
Southwest					2.0300	36.7938	0.6300	0.7000	0.7700	22.8267 (79)		
Solar gains	36.3910	65.6756	100.1885	142.3177	176.6290	183.0945	173.2881	146.3956	114.5153	75.3190	44.2468	30.7237 (83)
Total gains	504.8914	546.0785	559.0461	584.7615	595.9920	584.5004	558.7087	532.9395	513.4908	490.9390	486.2573	489.5673 (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	25.9570	26.0126	26.0672	26.3271	26.3763	26.6078	26.6078	26.6511	26.5182	26.3763	26.2770	26.1739
alpha	2.7305	2.7342	2.7378	2.7551	2.7584	2.7739	2.7739	2.7767	2.7679	2.7584	2.7518	2.7449
util living area												
	0.9437	0.9281	0.9065	0.8556	0.7702	0.6334	0.5003	0.5363	0.7150	0.8613	0.9228	0.9478 (86)
MIT	18.7346	18.9696	19.3337	19.8733	20.3705	20.7485	20.9055	20.8826	20.6235	20.0128	19.3067	18.6973 (87)
Th 2	20.0253	20.0272	20.0290	20.0377	20.0393	20.0469	20.0469	20.0483	20.0439	20.0393	20.0360	20.0326 (88)
util rest of house												
	0.9360	0.9182	0.8930	0.8332	0.7314	0.5678	0.4087	0.4460	0.6568	0.8356	0.9106	0.9406 (89)
MIT 2	17.3834	17.6801	18.1394	18.8140	19.4126	19.8398	19.9898	19.9733	19.7123	18.9956	18.1149	17.3409 (90)
Living area fraction									fLA = Living area / (4) =			
												0.4279 (91)

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MIT	17.9616	18.2319	18.6504	19.2672	19.8225	20.2286	20.3816	20.3624	20.1022	19.4309	18.6248	17.9213 (92)
Temperature adjustment												0.0000
adjusted MIT	17.9616	18.2319	18.6504	19.2672	19.8225	20.2286	20.3816	20.3624	20.1022	19.4309	18.6248	17.9213 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9144	0.8949	0.8690	0.8120	0.7216	0.5812	0.4423	0.4773	0.6607	0.8161	0.8878	0.9198	(94)
Useful gains	461.6653	488.7055	485.8266	474.8430	430.0915	339.6991	247.1298	254.3896	339.2705	400.6600	431.7201	450.3019	(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	985.3787	959.5475	872.6779	737.2540	576.5416	396.0500	266.0871	278.3533	423.7656	626.8242	821.1392	981.4846	(97)
Space heating kWh	389.6428	316.4058	287.8173	188.9359	108.9589	0.0000	0.0000	0.0000	0.0000	168.2662	280.3818	395.1999	(98a)
Space heating requirement - total per year (kWh/year)												2135.6086	
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	389.6428	316.4058	287.8173	188.9359	108.9589	0.0000	0.0000	0.0000	0.0000	168.2662	280.3818	395.1999	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2135.6086	
Space heating per m2										(98c) / (4) =		31.6856	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.4000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	389.6428	316.4058	287.8173	188.9359	108.9589	0.0000	0.0000	0.0000	0.0000	168.2662	280.3818	395.1999	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	421.6913	342.4305	311.4906	204.4761	117.9208	0.0000	0.0000	0.0000	0.0000	182.1063	303.4435	427.7055	(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	219.6005	194.2945	206.8239	183.0401	178.1953	161.4144	160.0117	165.9534	167.2976	185.5159	195.9588	217.3792	(64)
Efficiency of water heater (217)m	85.5957	85.4196	85.0896	84.4495	83.3599	80.3000	80.3000	80.3000	80.3000	84.1728	85.1485	80.3000	(216)
Fuel for water heating, kWh/month	256.5555	227.4591	243.0660	216.7452	213.7663	201.0142	199.2673	206.6668	208.3407	220.3988	230.1378	253.8140	(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	23.6275	18.9549	17.0667	12.5038	9.6583	7.8909	8.8106	11.4524	14.8755	19.5175	22.0450	24.2842	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-12.8022	-19.3927	-29.9193	-36.1828	-41.2901	-39.3831	-38.9172	-35.6122	-30.1875	-23.2736	-14.5479	-10.9180	(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	-3.6456	-7.9160	-16.2091	-25.0616	-33.8535	-34.2776	-33.8623	-28.3255	-20.3241	-11.5348	-4.9347	-2.8639	(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													2311.2647 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													80.3000
Water heating fuel used													2677.2317 (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)													190.6874 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-555.2356 (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													4709.9482 (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	2311.2647	0.2100	485.3656	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2677.2317	0.2100	562.2187	(264)
Space and water heating			1047.5842	(265)

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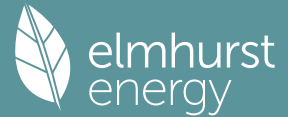


Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	190.6874	0.1443	27.5221 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-332.4268	0.1331	-44.2505
PV Unit electricity exported	-222.8089	0.1251	-27.8654
Total			-72.1159 (269)
Total CO2, kg/year			1014.9197 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.0600 (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	2311.2647	1.1300	2611.7291 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2677.2317	1.1300	3025.2718 (278)
Space and water heating			5637.0009 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	190.6874	1.5338	292.4828 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-332.4268	1.4919	-495.9411
PV Unit electricity exported	-222.8089	0.4590	-102.2761
Total			-598.2172 (283)
Total Primary energy kWh/year			5461.3673 (286)
Target Primary Energy Rate (TPER)			81.0300 (287)

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Property Reference	Flat 1.01			Issued on Date	22/04/2024
Assessment Reference	Additional Measures		Prop Type Ref		
Property	Christchurch Hall, , 38, Portland Street, Bristol, BS8 4JB				
SAP Rating	76 C	DER	21.18	TER	15.06
Environmental	83 B	% DER < TER			-40.64
CO ₂ Emissions (t/year)	1.21	DFEE	67.98	TFEE	36.59
Compliance Check	See BREL	% DFEE < TFEE			-85.80
% DPER < TPER	-52.28	DPER	123.39	TPER	81.03
Assessor Details	Mr. Jordan Howlett			Assessor ID	H055-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	67.4000 (1b)	x 3.0000 (2b)	= 202.2000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 202.2000 (5)

2. Ventilation rate

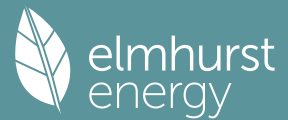
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1484 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8984 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.6962 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.8877	0.8703	0.8529	0.7659	0.7485	0.6614	0.6614	0.6440	0.6962	0.7485	0.7833	0.8181 (22b)
Effective ac	0.8940	0.8787	0.8637	0.7933	0.7801	0.7187	0.7187	0.7074	0.7424	0.7801	0.8068	0.8346 (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
External Door			2.1000	1.4000	2.9400		(26)
Window (Uw = 1.40)			6.0800	1.3258	8.0606		(27)
Exposed Floor Above Office			67.4000	0.1800	12.1320		(28b)
External Wall	31.9800	6.0800	25.9000	0.2600	6.7340		(29a)
Corridor wall	27.3000	2.1000	25.2000	0.2600	6.5520		(29a)
Exposed Ceiling	9.0200		9.0200	0.1600	1.4432		(30)
Total net area of external elements Aum(A, m ²)			135.7000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.8618		(33)
Party Wall			53.7000	0.0000	0.0000		(32)
Party Ceiling			58.3800				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							27.1400 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	65.0018 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	59.6534	58.6325	57.6318	52.9317	52.0523	47.9587	47.9587
Heat transfer coeff						47.2006	49.5355
							52.0523
							53.8313
							55.6911 (38)

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Average = Sum(39)m / 12 =	124.6552	123.6343	122.6337	117.9335	117.0541	112.9605	112.9605	112.2024	114.5373	117.0541	118.8331	120.6930 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.8495	1.8343	1.8195	1.7498	1.7367	1.6760	1.6760	1.6647	1.6994	1.7367	1.7631	1.7907 (40)
HLP (average)												1.7497
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1814 (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	26.2668	25.8767	25.3273	24.3144	23.5560	22.7150	22.2608	22.8063	23.4002	24.3001	25.3338	26.1780 (42b)
Hot water usage for other uses	36.9696	35.6252	34.2809	32.9365	31.5922	30.2478	30.2478	31.5922	32.9365	34.2809	35.6252	36.9696 (42c)
Average daily hot water use (litres/day)												57.9621 (43)
Daily hot water use	63.2363	61.5019	59.6082	57.2510	55.1482	52.9629	52.5086	54.3984	56.3367	58.5810	60.9591	63.1475 (44)
Energy conte	100.1509	87.5779	91.6156	78.3737	74.2401	65.1240	63.5046	67.3566	69.4688	79.4938	86.8474	98.8738 (45)
Energy content (annual)										Total = Sum(45)m =		962.6271
Distribution loss (46)m = 0.15 x (45)m	15.0226	13.1367	13.7423	11.7561	11.1360	9.7686	9.5257	10.1035	10.4203	11.9241	13.0271	14.8311 (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												
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 (57)
Combi loss	25.3237	22.8680	25.3106	24.4822	25.2901	24.4666	25.2787	25.2837	24.4736	25.2986	24.4943	25.3224 (61)
Total heat required for water heating calculated for each month	125.4746	110.4459	116.9262	102.8559	99.5302	89.5906	88.7833	92.6403	93.9424	104.7924	111.3417	124.1962 (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	125.4746	110.4459	116.9262	102.8559	99.5302	89.5906	88.7833	92.6403	93.9424	104.7924	111.3417	124.1962 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1260.5199 (64)
Electric shower(s)	48.6861	43.3797	47.3690	45.2036	46.0519	43.9290	45.3933	46.0519	45.2036	47.3690	46.4783	48.6861 (64a)
												553.8015 (64a)
Heat gains from water heating, kWh/month	51.8026	45.6816	48.6321	43.4807	42.5203	38.7526	38.7833	40.2300	40.5177	44.5986	46.6199	51.3777 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	113.7139	125.8975	113.7139	117.5043	113.7139	117.5043	113.7139	113.7139	117.5043	113.7139	117.5043	113.7139 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	191.1544	193.1380	188.1394	177.4980	164.0652	151.4403	143.0060	141.0225	146.0210	156.6624	170.0952	182.7201 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069 (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)	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554 (71)
Water heating gains (Table 5)	69.6272	67.9785	65.3657	60.3899	57.1510	53.8231	52.1281	54.0725	56.2746	59.9443	64.7498	69.0560 (72)
Total internal gains	433.2162	445.7348	425.9398	414.1131	393.6509	378.4885	364.5688	364.5297	375.5207	389.0414	411.0702	424.2108 (73)

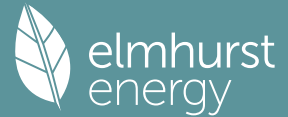
6. Solar gains

[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				2.0200	10.6334	0.6300	0.7000	0.7700	6.5644 (74)			
Northeast				2.0300	11.2829	0.6300	0.7000	0.7700	6.9999 (75)			
Southwest				2.0300	36.7938	0.6300	0.7000	0.7700	22.8267 (79)			
Solar gains	36.3910	65.6756	100.1885	142.3177	176.6290	183.0945	173.2881	146.3956	114.5153	75.3190	44.2468	30.7237 (83)
Total gains	469.6072	511.4104	526.1282	556.4308	570.2799	561.5830	537.8569	510.9253	490.0361	464.3604	455.3170	454.9345 (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	15.0192	15.1432	15.2668	15.8752	15.9945	16.5741	16.5741	16.6861	16.3460	15.9945	15.7551	15.5123
alpha	2.0013	2.0095	2.0178	2.0583	2.0663	2.1049	2.1049	2.1124	2.0897	2.0663	2.0503	2.0342
util living area	0.9602	0.9508	0.9381	0.9070	0.8548	0.7587	0.6508	0.6821	0.8186	0.9109	0.9474	0.9625 (86)
MIT	17.0305	17.3225	17.8461	18.6896	19.4885	20.2402	20.6238	20.5696	20.0109	19.0027	17.9546	17.0644 (87)
Th 2	19.4356	19.4461	19.4564	19.5054	19.5146	19.5581	19.5581	19.5662	19.5413	19.5146	19.4959	19.4765 (88)
util rest of house	0.9528	0.9415	0.9254	0.8856	0.8146	0.6770	0.5093	0.5501	0.7534	0.8863	0.9360	0.9556 (89)
MIT 2	14.9878	15.3566	16.0180	17.0869	18.0722	18.9704	19.3614	19.3230	18.7174	17.4899	16.1699	15.0393 (90)
Living area fraction									fLA = Living area / (4) =			0.4279 (91)

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MIT	15.8619	16.1978	16.8002	17.7727	18.6783	19.5138	19.9016	19.8564	19.2709	18.1372	16.9335	15.9058 (92)
Temperature adjustment												0.0000
adjusted MIT	15.8619	16.1978	16.8002	17.7727	18.6783	19.5138	19.9016	19.8564	19.2709	18.1372	16.9335	15.9058 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9260	0.9115	0.8927	0.8508	0.7848	0.6740	0.5486	0.5817	0.7378	0.8538	0.9063	0.9301	(94)
Useful gains	434.8427	466.1711	469.6767	473.3871	447.5808	378.4873	295.0538	297.2026	361.5675	396.4818	412.6743	423.1457	(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	1441.2510	1396.8005	1263.1532	1046.3874	816.8336	555.0615	372.9511	387.8194	592.2602	882.2608	1168.5510	1412.8118	(97)
Space heating kWh	748.7678	625.3829	590.3465	412.5603	274.7241	0.0000	0.0000	0.0000	0.0000	361.4195	544.2312	736.3116	(98a)
Space heating requirement - total per year (kWh/year)												4293.7440	
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	748.7678	625.3829	590.3465	412.5603	274.7241	0.0000	0.0000	0.0000	0.0000	361.4195	544.2312	736.3116	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4293.7440	
Space heating per m2										(98c) / (4) =		63.7054	(99)

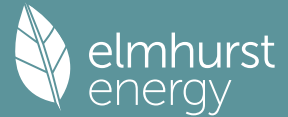
9a. Energy requirements - Individual heating systems, including micro-CHP

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 %)												89.2000	(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	748.7678	625.3829	590.3465	412.5603	274.7241	0.0000	0.0000	0.0000	0.0000	361.4195	544.2312	736.3116	(98)
Space heating efficiency (main heating system 1)	89.2000	89.2000	89.2000	89.2000	89.2000	0.0000	0.0000	0.0000	0.0000	89.2000	89.2000	89.2000	(210)
Space heating fuel (main heating system)	839.4258	701.1019	661.8234	462.5115	307.9867	0.0000	0.0000	0.0000	0.0000	405.1789	610.1247	825.4615	(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	125.4746	110.4459	116.9262	102.8559	99.5302	89.5906	88.7833	92.6403	93.9424	104.7924	111.3417	124.1962	(64)
Efficiency of water heater	88.9073	88.8940	88.8631	88.7936	88.6592	87.2000	87.2000	87.2000	87.2000	88.7425	88.8539	88.9057	(216)
Fuel for water heating, kWh/month	141.1297	124.2445	131.5803	115.8371	112.2615	102.7416	101.8158	106.2389	107.7321	118.0859	125.3087	139.6943	(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	23.9458	19.2102	17.2967	12.6723	9.7884	7.9972	8.9293	11.6067	15.0760	19.7805	22.3420	24.6114	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												4813.6143	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.2000	
Water heating fuel used												1426.6704	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												193.2565	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												7073.3428	(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	4813.6143	0.2100	1010.8590	(261)
Total CO2 associated with community systems			0.0000	(373)

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Water heating (other fuel)	1426.6704	0.2100	299.6008 (264)
Energy for instantaneous electric shower(s)	553.8015	0.1391	77.0460 (264a)
Space and water heating			1310.4598 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	193.2565	0.1443	27.8929 (268)
Total CO ₂ , kg/year			1427.3280 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			21.1800 (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	4813.6143	1.1300	5439.3842 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	1426.6704	1.1300	1612.1376 (278)
Energy for instantaneous electric shower(s)	553.8015	1.5143	838.6406 (278a)
Space and water heating			7051.5218 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	193.2565	1.5338	296.4233 (282)
Total Primary energy kWh/year			8316.6865 (286)
Dwelling Primary energy Rate (DPER)			123.3900 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	67.4000 (1b)	x 3.0000 (2b)	= 202.2000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 202.2000 (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) = 0.0989 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3489 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2704 (21)

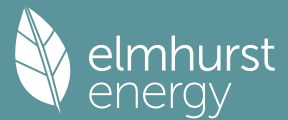
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3448	0.3380	0.3312	0.2974	0.2907	0.2569	0.2569	0.2501	0.2704	0.2907	0.3042	0.3177 (22b)
Effective ac	0.5594	0.5571	0.5549	0.5442	0.5422	0.5330	0.5330	0.5313	0.5366	0.5422	0.5463	0.5505 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type (Uw = 1.20)			6.0800	1.1450	6.9618		(27)
Exposed Floor Above Office			67.4000	0.1300	8.7620		(28b)
External Wall	31.9800	6.0800	25.9000	0.1800	4.6620		(29a)
Corridor wall	27.3000	2.1000	25.2000	0.1800	4.5360		(29a)
Exposed Ceiling	9.0200		9.0200	0.1100	0.9922		(30)
Total net area of external elements Aum(A, m ²)			135.7000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.0140		(33)
Party Wall			53.7000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							6.7850 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	34.7990 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	37.3287	37.1747	37.0238	36.3148	36.1821	35.5646	35.5646	35.4503	35.8025	36.1821	36.4505	36.7310 (38)
Heat transfer coeff												

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Average = Sum(39)m / 12 =	72.1277	71.9737	71.8228	71.1138	70.9812	70.3637	70.3637	70.2493	70.6015	70.9812	71.2495	71.5301 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0701	1.0679	1.0656	1.0551	1.0531	1.0440	1.0440	1.0423	1.0475	1.0531	1.0571	1.0613 (40)
HLP (average)												1.0551
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1814 (42)
Hot water usage for mixer showers												
60.7943	59.8807	58.5494	56.0021	54.1223	52.0260	50.8344	52.1556	53.6040	55.8548	58.4568	60.5614 (42a)	
Hot water usage for baths												
26.2668	25.8767	25.3273	24.3144	23.5560	22.7150	22.2608	22.8063	23.4002	24.3001	25.3338	26.1780 (42b)	
Hot water usage for other uses												
36.9696	35.6252	34.2809	32.9365	31.5922	30.2478	30.2478	31.5922	32.9365	34.2809	35.6252	36.9696 (42c)	
Average daily hot water use (litres/day)												114.0124 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	124.0306	121.3826	118.1576	113.2531	109.2705	104.9888	103.3430	106.5541	109.9407	114.4358	119.4158	123.7089 (44)
Energy conte	196.4342	172.8472	181.6038	155.0378	147.0991	129.0960	124.9844	131.9362	135.5679	155.2883	170.1297	193.6983 (45)
Energy content (annual)										Total = Sum(45)m =		1893.7228
Distribution loss (46)m = 0.15 x (45)m												
29.4651	25.9271	27.2406	23.2557	22.0649	19.3644	18.7477	19.7904	20.3352	23.2932	25.5195	29.0547 (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 (59)	
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
247.3931	218.8746	232.5627	204.3529	198.0580	178.4111	175.9433	182.8951	184.8830	206.2472	219.4448	244.6572 (62)	
WWHRS	-27.7926	-24.5800	-25.7388	-21.3127	-19.8627	-16.9966	-15.9316	-16.9417	-17.5854	-20.7312	-23.4860	-27.2779 (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												
219.6005	194.2945	206.8239	183.0401	178.1953	161.4144	160.0117	165.9534	167.2976	185.5159	195.9588	217.3792 (64)	
12Total per year (kWh/year)												2235.4854 (64)
Electric shower(s)												2235 (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												
78.0541	68.9785	73.1230	63.8788	61.6502	55.2532	54.2970	56.6085	57.4051	64.3731	68.8969	77.1444 (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	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	113.7139	125.8975	113.7139	117.5043	113.7139	117.5043	113.7139	113.7139	117.5043	113.7139	117.5043	113.7139 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	191.1544	193.1380	188.1394	177.4980	164.0652	151.4403	143.0060	141.0225	146.0210	156.6624	170.0952	182.7201 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069 (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)	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554 (71)
Water heating gains (Table 5)	104.9114	102.6466	98.2836	88.7206	82.8631	76.7405	72.9799	76.0867	79.7293	86.5230	95.6902	103.6887 (72)
Total internal gains	468.5005	480.4029	458.8576	442.4438	419.3630	401.4060	385.4206	386.5438	398.9755	415.6200	442.0105	458.8435 (73)

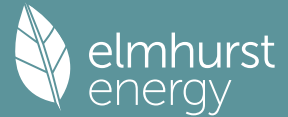
6. Solar gains

[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				2.0200	10.6334	0.6300	0.7000	0.7700	6.5644 (74)			
Northeast				2.0300	11.2829	0.6300	0.7000	0.7700	6.9999 (75)			
Southwest				2.0300	36.7938	0.6300	0.7000	0.7700	22.8267 (79)			
Solar gains	36.3910	65.6756	100.1885	142.3177	176.6290	183.0945	173.2881	146.3956	114.5153	75.3190	44.2468	30.7237 (83)
Total gains	504.8914	546.0785	559.0461	584.7615	595.9920	584.5004	558.7087	532.9395	513.4908	490.9390	486.2573	489.5673 (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	25.9570	26.0126	26.0672	26.3271	26.3763	26.6078	26.6078	26.6511	26.5182	26.3763	26.2770	26.1739
alpha	2.7305	2.7342	2.7378	2.7551	2.7584	2.7739	2.7739	2.7767	2.7679	2.7584	2.7518	2.7449
util living area												
	0.9437	0.9281	0.9065	0.8556	0.7702	0.6334	0.5003	0.5363	0.7150	0.8613	0.9228	0.9478 (86)
MIT	18.7346	18.9696	19.3337	19.8733	20.3705	20.7485	20.9055	20.8826	20.6235	20.0128	19.3067	18.6973 (87)
Th 2	20.0253	20.0272	20.0290	20.0377	20.0393	20.0469	20.0469	20.0483	20.0439	20.0393	20.0360	20.0326 (88)
util rest of house												
	0.9360	0.9182	0.8930	0.8332	0.7314	0.5678	0.4087	0.4460	0.6568	0.8356	0.9106	0.9406 (89)
MIT 2	17.3834	17.6801	18.1394	18.8140	19.4126	19.8398	19.9898	19.9733	19.7123	18.9956	18.1149	17.3409 (90)
Living area fraction									fLA = Living area / (4) =			
									0.4279 (91)			

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MIT	17.9616	18.2319	18.6504	19.2672	19.8225	20.2286	20.3816	20.3624	20.1022	19.4309	18.6248	17.9213 (92)
Temperature adjustment												0.0000
adjusted MIT	17.9616	18.2319	18.6504	19.2672	19.8225	20.2286	20.3816	20.3624	20.1022	19.4309	18.6248	17.9213 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9144	0.8949	0.8690	0.8120	0.7216	0.5812	0.4423	0.4773	0.6607	0.8161	0.8878	0.9198	(94)
Useful gains	461.6653	488.7055	485.8266	474.8430	430.0915	339.6991	247.1298	254.3896	339.2705	400.6600	431.7201	450.3019	(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	985.3787	959.5475	872.6779	737.2540	576.5416	396.0500	266.0871	278.3533	423.7656	626.8242	821.1392	981.4846	(97)
Space heating kWh	389.6428	316.4058	287.8173	188.9359	108.9589	0.0000	0.0000	0.0000	0.0000	168.2662	280.3818	395.1999	(98a)
Space heating requirement - total per year (kWh/year)												2135.6086	
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	389.6428	316.4058	287.8173	188.9359	108.9589	0.0000	0.0000	0.0000	0.0000	168.2662	280.3818	395.1999	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2135.6086	
Space heating per m2										(98c) / (4) =		31.6856	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.4000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	389.6428	316.4058	287.8173	188.9359	108.9589	0.0000	0.0000	0.0000	0.0000	168.2662	280.3818	395.1999	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	421.6913	342.4305	311.4906	204.4761	117.9208	0.0000	0.0000	0.0000	0.0000	182.1063	303.4435	427.7055	(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	219.6005	194.2945	206.8239	183.0401	178.1953	161.4144	160.0117	165.9534	167.2976	185.5159	195.9588	217.3792	(64)
Efficiency of water heater (217)m	85.5957	85.4196	85.0896	84.4495	83.3599	80.3000	80.3000	80.3000	80.3000	84.1728	85.1485	80.3000	(216)
Fuel for water heating, kWh/month	256.5555	227.4591	243.0660	216.7452	213.7663	201.0142	199.2673	206.6668	208.3407	220.3988	230.1378	253.8140	(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	23.6275	18.9549	17.0667	12.5038	9.6583	7.8909	8.8106	11.4524	14.8755	19.5175	22.0450	24.2842	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-12.8022	-19.3927	-29.9193	-36.1828	-41.2901	-39.3831	-38.9172	-35.6122	-30.1875	-23.2736	-14.5479	-10.9180	(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	-3.6456	-7.9160	-16.2091	-25.0616	-33.8535	-34.2776	-33.8623	-28.3255	-20.3241	-11.5348	-4.9347	-2.8639	(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													2311.2647 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													80.3000
Water heating fuel used													2677.2317 (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)													190.6874 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-555.2356 (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													4709.9482 (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	2311.2647	0.2100	485.3656	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2677.2317	0.2100	562.2187	(264)
Space and water heating			1047.5842	(265)

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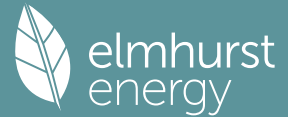


Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	190.6874	0.1443	27.5221 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-332.4268	0.1331	-44.2505
PV Unit electricity exported	-222.8089	0.1251	-27.8654
Total			-72.1159 (269)
Total CO2, kg/year			1014.9197 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.0600 (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	2311.2647	1.1300	2611.7291 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2677.2317	1.1300	3025.2718 (278)
Space and water heating			5637.0009 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	190.6874	1.5338	292.4828 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-332.4268	1.4919	-495.9411
PV Unit electricity exported	-222.8089	0.4590	-102.2761
Total			-598.2172 (283)
Total Primary energy kWh/year			5461.3673 (286)
Target Primary Energy Rate (TPER)			81.0300 (287)

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Property Reference	Flat 1.01				Issued on Date	22/04/2024	
Assessment Reference	Renewables			Prop Type Ref			
Property	Christchurch Hall, , 38, Portland Street, Bristol, BS8 4JB						
SAP Rating	76 C	DER	6.20	TER	14.71		
Environmental	95 A	% DER < TER				57.85	
CO ₂ Emissions (t/year)	0.38	DFEE	67.98	TFEE	36.59		
Compliance Check	See BREL	% DFEE < TFEE				-85.80	
% DPER < TPER	17.60	DPER	65.24	TPER	79.18		
Assessor Details	Mr. Jordan Howlett				Assessor ID	H055-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	67.4000 (1b)	x 3.0000 (2b)	= 202.2000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 202.2000 (5)

2. Ventilation rate

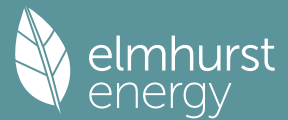
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1484 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8984 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.6962 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.8877	0.8703	0.8529	0.7659	0.7485	0.6614	0.6614	0.6440	0.6962	0.7485	0.7833	0.8181 (22b)
Effective ac	0.8940	0.8787	0.8637	0.7933	0.7801	0.7187	0.7187	0.7074	0.7424	0.7801	0.8068	0.8346 (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
External Door			2.1000	1.4000	2.9400		(26)
Window (Uw = 1.40)			6.0800	1.3258	8.0606		(27)
Exposed Floor Above Office			67.4000	0.1800	12.1320		(28b)
External Wall	31.9800	6.0800	25.9000	0.2600	6.7340		(29a)
Corridor wall	27.3000	2.1000	25.2000	0.2600	6.5520		(29a)
Exposed Ceiling	9.0200		9.0200	0.1600	1.4432		(30)
Total net area of external elements Aum(A, m ²)			135.7000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.8618		(33)
Party Wall			53.7000	0.0000	0.0000		(32)
Party Ceiling			58.3800				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							27.1400 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	65.0018 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	59.6534	58.6325	57.6318	52.9317	52.0523	47.9587	47.9587
Heat transfer coeff						47.2006	49.5355
							52.0523
							53.8313
							55.6911 (38)

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	124.6552	123.6343	122.6337	117.9335	117.0541	112.9605	112.9605	112.2024	114.5373	117.0541	118.8331	120.6930 (39)
Average = Sum(39)m / 12 =												117.9293
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.8495	1.8343	1.8195	1.7498	1.7367	1.6760	1.6760	1.6647	1.6994	1.7367	1.7631	1.7907 (40)
HLP (average)												1.7497
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1814 (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	26.2668	25.8767	25.3273	24.3144	23.5560	22.7150	22.2608	22.8063	23.4002	24.3001	25.3338	26.1780 (42b)
Hot water usage for other uses	36.9696	35.6252	34.2809	32.9365	31.5922	30.2478	30.2478	31.5922	32.9365	34.2809	35.6252	36.9696 (42c)
Average daily hot water use (litres/day)												57.9621 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	63.2363	61.5019	59.6082	57.2510	55.1482	52.9629	52.5086	54.3984	56.3367	58.5810	60.9591	63.1475 (44)
Energy conte	100.1509	87.5779	91.6156	78.3737	74.2401	65.1240	63.5046	67.3566	69.4688	79.4938	86.8474	98.8738 (45)
Energy content (annual)										Total = Sum(45)m =		962.6271
Distribution loss (46)m = 0.15 x (45)m	15.0226	13.1367	13.7423	11.7561	11.1360	9.7686	9.5257	10.1035	10.4203	11.9241	13.0271	14.8311 (46)
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0044 (55)
Total storage loss	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364 (56)
If cylinder contains dedicated solar storage	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364 (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	154.5497	136.7123	146.0144	131.0177	128.6389	117.7680	117.9034	121.7554	122.1128	133.8926	139.4914	153.2726 (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	154.5497	136.7123	146.0144	131.0177	128.6389	117.7680	117.9034	121.7554	122.1128	133.8926	139.4914	153.2726 (64)
									Total per year (kWh/year) = Sum(64)m =			1603.1291 (64)
12Total per year (kWh/year)												1603 (64)
Electric shower(s)	48.6861	43.3797	47.3690	45.2036	46.0519	43.9290	45.3933	46.0519	45.2036	47.3690	46.4783	48.6861 (64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			553.8015 (64a)
Heat gains from water heating, kWh/month	88.9907	79.2721	85.8235	79.4754	79.7168	74.7512	75.9826	77.4281	76.5145	81.7930	82.6115	88.5661 (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	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	113.7139	125.8975	113.7139	117.5043	113.7139	117.5043	113.7139	113.7139	117.5043	113.7139	117.5043	113.7139 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	191.1544	193.1380	188.1394	177.4980	164.0652	151.4403	143.0060	141.0225	146.0210	156.6624	170.0952	182.7201 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069 (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)	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554 (71)
Water heating gains (Table 5)	119.6112	117.9644	115.3541	110.3825	107.1463	103.8211	102.1272	104.0700	106.2701	109.9368	114.7382	119.0405 (72)
Total internal gains	480.2003	492.7207	472.9282	461.1056	440.6462	428.4865	414.5679	414.5271	425.5163	436.0339	458.0585	471.1953 (73)

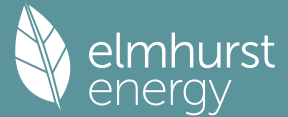
6. Solar gains

[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			2.0200	10.6334	0.6300	0.7000	0.7700	6.5644 (74)				
Northeast			2.0300	11.2829	0.6300	0.7000	0.7700	6.9999 (75)				
Southwest			2.0300	36.7938	0.6300	0.7000	0.7700	22.8267 (79)				
Solar gains	36.3910	65.6756	100.1885	142.3177	176.6290	183.0945	173.2881	146.3956	114.5153	75.3190	44.2468	30.7237 (83)
Total gains	516.5912	558.3963	573.1167	603.4233	617.2752	611.5810	587.8560	560.9228	540.0316	511.3529	502.3053	501.9190 (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	15.0192	15.1432	15.2668	15.8752	15.9945	16.5741	16.5741	16.6861	16.3460	15.9945	15.7551	15.5123
alpha	2.0013	2.0095	2.0178	2.0583	2.0663	2.1049	2.1049	2.1124	2.0897	2.0663	2.0503	2.0342
util living area	0.9531	0.9428	0.9287	0.8943	0.8374	0.7326	0.6196	0.6501	0.7934	0.8961	0.9377	0.9554 (86)
Living	17.1314	17.4209	17.9410	18.7771	19.5625	20.2965	20.6601	20.6110	20.0803	19.0912	18.0536	17.1675
Non living	15.1129	15.4780	16.1339	17.1909	18.1543	19.0224	19.3846	19.3517	18.7871	17.5940	16.2914	15.1677

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24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	19.0218	17.4209	17.9410	18.7771	19.5625	20.2965	20.6601	20.6110	20.0803	19.0912	18.0536	17.7037 (87)
Th 2	19.4356	19.4461	19.4564	19.5054	19.5146	19.5581	19.5581	19.5662	19.5413	19.5146	19.4959	19.4765 (88)
util rest of house												
	0.9445	0.9323	0.9144	0.8706	0.7941	0.6477	0.4781	0.5167	0.7234	0.8684	0.9246	0.9474 (89)
MIT 2	17.6946	15.4780	16.1339	17.1909	18.1543	19.0224	19.3846	19.3517	18.7871	17.5940	16.2914	15.9388 (90)
Living area fraction									FLA = Living area / (4) =			0.4279 (91)
MIT	18.2625	16.3094	16.9071	17.8696	18.7568	19.5676	19.9304	19.8905	19.3404	18.2347	17.0454	16.6940 (92)
Temperature adjustment												0.0000
adjusted MIT	18.2625	16.3094	16.9071	17.8696	18.7568	19.5676	19.9304	19.8905	19.3404	18.2347	17.0454	16.6940 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9365	0.9000	0.8797	0.8351	0.7657	0.6483	0.5199	0.5516	0.7113	0.8353	0.8926	0.9262 (94)
Useful gains	483.7829	502.5646	504.1910	503.9199	472.6170	396.5072	305.6145	309.4295	384.1412	427.1264	448.3662	464.8726 (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	1740.4933	1410.5885	1276.2660	1057.8192	826.0312	561.1393	376.2022	391.6474	600.2246	893.6692	1181.8456	1507.9382 (97)
Space heating kWh	934.9925	610.1921	574.4238	398.8075	262.9402	0.0000	0.0000	0.0000	0.0000	347.1078	528.1052	776.0408 (98a)
Space heating requirement - total per year (kWh/year)												4432.6098
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	934.9925	610.1921	574.4238	398.8075	262.9402	0.0000	0.0000	0.0000	0.0000	347.1078	528.1052	776.0408 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4432.6098
Space heating per m2										(98c) / (4) =		65.7657 (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 %)	354.0789 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

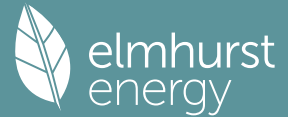
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	934.9925	610.1921	574.4238	398.8075	262.9402	0.0000	0.0000	0.0000	0.0000	347.1078	528.1052	776.0408 (98)
Space heating efficiency (main heating system 1)	354.0789	354.0789	354.0789	354.0789	354.0789	0.0000	0.0000	0.0000	0.0000	354.0789	354.0789	354.0789 (210)
Space heating fuel (main heating system)	264.0633	172.3322	162.2305	112.6324	74.2603	0.0000	0.0000	0.0000	0.0000	98.0312	149.1490	219.1717 (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	154.5497	136.7123	146.0144	131.0177	128.6389	117.7680	117.9034	121.7554	122.1128	133.8926	139.4914	153.2726 (64)
Efficiency of water heater (217)m	187.8874	187.8874	187.8874	187.8874	187.8874	187.8874	187.8874	187.8874	187.8874	187.8874	187.8874	187.8874 (216)
Fuel for water heating, kWh/month	82.2565	72.7629	77.7138	69.7320	68.4659	62.6801	62.7521	64.8023	64.9925	71.2621	74.2420	81.5768 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	23.9458	19.2102	17.2967	12.6723	9.7884	7.9972	8.9293	11.6067	15.0760	19.7805	22.3420	24.6114 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1251.8707 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												187.8874
Water heating fuel used												853.2392 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	193.2565 (232)

Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	2852.1679 (238)

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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	1251.8707	0.1541	192.9243 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	853.2392	0.1404	119.8225 (264)
Energy for instantaneous electric shower(s)	553.8015	0.1391	77.0460 (264a)
Space and water heating			312.7468 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	193.2565	0.1443	27.8929 (268)
Total CO2, kg/year			417.6857 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.2000 (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	1251.8707	1.5705	1966.0493 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	853.2392	1.5192	1296.2792 (278)
Energy for instantaneous electric shower(s)	553.8015	1.5143	838.6406 (278a)
Space and water heating			3262.3285 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	193.2565	1.5338	296.4233 (282)
Total Primary energy kWh/year			4397.3923 (286)
Dwelling Primary energy Rate (DPER)			65.2400 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	67.4000 (1b)	x 3.0000 (2b)	= 202.2000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 202.2000 (5)

2. Ventilation rate

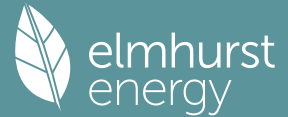
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.0989 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3489 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2704 (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	0.3448	0.3380	0.3312	0.2974	0.2907	0.2569	0.2569	0.2501	0.2704	0.2907	0.3042	0.3177 (22b)
Effective ac	0.5594	0.5571	0.5549	0.5442	0.5422	0.5330	0.5330	0.5313	0.5366	0.5422	0.5463	0.5505 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type (Uw = 1.20)			6.0800	1.1450	6.9618		(27)
Exposed Floor Above Office			67.4000	0.1300	8.7620		(28b)
External Wall	31.9800	6.0800	25.9000	0.1800	4.6620		(29a)
Corridor wall	27.3000	2.1000	25.2000	0.1800	4.5360		(29a)
Exposed Ceiling	9.0200		9.0200	0.1100	0.9922		(30)
Total net area of external elements Aum(A, m ²)			135.7000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.0140		(33)
Party Wall			53.7000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							6.7850 (36)

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Point Thermal bridges
Total fabric heat loss (33) + (36) + (36a) = 0.0000
34.7990 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	37.3287	37.1747	37.0238	36.3148	36.1821	35.5646	35.5646	35.4503	35.8025	36.1821	36.4505	36.7310 (38)
Average = Sum(39)m / 12 =	72.1277	71.9737	71.8228	71.1138	70.9812	70.3637	70.3637	70.2493	70.6015	70.9812	71.2495	71.5301 (39)
	71.1132											
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0701	1.0679	1.0656	1.0551	1.0531	1.0440	1.0440	1.0423	1.0475	1.0531	1.0571	1.0613 (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												2.1814 (42)
Hot water usage for mixer showers	60.7943	59.8807	58.5494	56.0021	54.1223	52.0260	50.8344	52.1556	53.6040	55.8548	58.4568	60.5614 (42a)
Hot water usage for baths	26.2668	25.8767	25.3273	24.3144	23.5560	22.7150	22.2608	22.8063	23.4002	24.3001	25.3338	26.1780 (42b)
Hot water usage for other uses	36.9696	35.6252	34.2809	32.9365	31.5922	30.2478	30.2478	31.5922	32.9365	34.2809	35.6252	36.9696 (42c)
Average daily hot water use (litres/day)												114.0124 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	124.0306	121.3826	118.1576	113.2531	109.2705	104.9888	103.3430	106.5541	109.9407	114.4358	119.4158	123.7089 (44)
Distribution loss (46)m = 0.15 x (45)m	196.4342	172.8472	181.6038	155.0378	147.0991	129.0960	124.9844	131.9362	135.5679	155.2883	170.1297	193.6983 (45)
Store volume	Total = Sum(45)m =											1893.7228
a) If manufacturer declared loss factor is known (kWh/day):	29.4651	25.9271	27.2406	23.2557	22.0649	19.3644	18.7477	19.7904	20.3352	23.2932	25.5195	29.0547 (46)
Temperature factor from Table 2b												180.0000 (47)
Enter (49) or (54) in (55)												1.5520 (48)
Total storage loss												0.5400 (49)
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (56)
Primary loss	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (57)
Combi loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
WWHRS	245.6769	217.3244	230.8464	202.6920	196.3417	176.7502	174.2271	181.1789	183.2221	204.5309	217.7839	242.9409 (62)
PV diverter	-27.7926	-24.5800	-25.7388	-21.3127	-19.8627	-16.9966	-15.9316	-16.9417	-17.5854	-20.7312	-23.4860	-27.2779 (63a)
Solar input	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
12Total per year (kWh/year)	217.8843	192.7444	205.1077	181.3793	176.4791	159.7535	158.2954	164.2372	165.6367	183.7997	194.2980	215.6630 (64)
Electric shower(s)	Total per year (kWh/year) = Sum(64)m =											2215.2782 (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	104.7085	93.0535	99.7774	89.6734	88.3046	81.0478	80.9514	83.2629	83.1997	91.0275	94.6915	103.7988 (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	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693	109.0693 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	113.7139	125.8975	113.7139	117.5043	113.7139	117.5043	113.7139	113.7139	117.5043	113.7139	117.5043	113.7139 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	191.1544	193.1380	188.1394	177.4980	164.0652	151.4403	143.0060	141.0225	146.0210	156.6624	170.0952	182.7201 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069	33.9069 (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)	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554	-87.2554 (71)
Water heating gains (Table 5)	140.7372	138.4724	134.1094	124.5464	118.6890	112.5664	108.8057	111.9125	115.5551	122.3488	131.5160	139.5145 (72)
Total internal gains	504.3263	516.2287	494.6835	478.2696	455.1888	437.2318	421.2464	422.3697	434.8013	451.4458	477.8363	494.6693 (73)

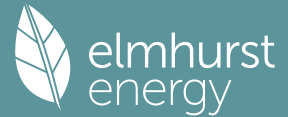
6. Solar gains

[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				2.0200	10.6334	0.6300	0.7000	0.7700	6.5644 (74)			
Northeast				2.0300	11.2829	0.6300	0.7000	0.7700	6.9999 (75)			
Southwest				2.0300	36.7938	0.6300	0.7000	0.7700	22.8267 (79)			
Solar gains	36.3910	65.6756	100.1885	142.3177	176.6290	183.0945	173.2881	146.3956	114.5153	75.3190	44.2468	30.7237 (83)
Total gains	540.7173	581.9043	594.8719	620.5873	631.8178	620.3263	594.5345	568.7653	549.3166	526.7648	522.0831	525.3931 (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	

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tau	25.9570	26.0126	26.0672	26.3271	26.3763	26.6078	26.6078	26.6511	26.5182	26.3763	26.2770	26.1739
alpha	2.7305	2.7342	2.7378	2.7551	2.7584	2.7739	2.7739	2.7767	2.7679	2.7584	2.7518	2.7449
util living area	0.9349	0.9180	0.8944	0.8397	0.7498	0.6093	0.4761	0.5103	0.6891	0.8429	0.9107	0.9392 (86)
MIT	18.8248	19.0550	19.4125	19.9384	20.4165	20.7727	20.9166	20.8965	20.6592	20.0790	19.3903	18.7891 (87)
Th 2	20.0253	20.0272	20.0290	20.0377	20.0393	20.0469	20.0469	20.0483	20.0439	20.0393	20.0360	20.0326 (88)
util rest of house	0.9261	0.9071	0.8796	0.8157	0.7096	0.5437	0.3872	0.4221	0.6297	0.8150	0.8971	0.9310 (89)
MIT 2	17.4960	17.7857	18.2355	18.8904	19.4624	19.8615	19.9970	19.9830	19.7470	19.0723	18.2174	17.4556 (90)
Living area fraction	18.0646	18.3288	18.7391	19.3388	19.8706	20.2514	20.3905	20.3739	20.1374	19.5030	18.7193	18.0262 (91)
MIT	18.0646	18.3288	18.7391	19.3388	19.8706	20.2514	20.3905	20.3739	20.1374	19.5030	18.7193	18.0262 (92)
Temperature adjustment	18.0646	18.3288	18.7391	19.3388	19.8706	20.2514	20.3905	20.3739	20.1374	19.5030	18.7193	18.0262 (93)
adjusted MIT	18.0646	18.3288	18.7391	19.3388	19.8706	20.2514	20.3905	20.3739	20.1374	19.5030	18.7193	18.0262 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9033	0.8830	0.8554	0.7955	0.7018	0.5586	0.4205	0.4537	0.6360	0.7967	0.8737	0.9089 (94)
Useful gains	488.4424	513.8379	508.8675	493.6990	443.3908	346.5267	249.9864	258.0217	349.3577	419.6807	456.1653	477.5238 (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	992.8088	966.5218	879.0478	742.3427	579.9609	397.6524	266.7151	279.1612	426.2472	631.9481	827.8709	988.9897 (97)
Space heating kWh	375.2486	304.2035	275.4142	179.0235	101.6082	0.0000	0.0000	0.0000	0.0000	157.9269	267.6281	380.5306 (98a)
Space heating requirement - total per year (kWh/year)												2041.5835
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	375.2486	304.2035	275.4142	179.0235	101.6082	0.0000	0.0000	0.0000	0.0000	157.9269	267.6281	380.5306 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2041.5835
Space heating per m2										(98c) / (4) =		30.2906 (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	375.2486	304.2035	275.4142	179.0235	101.6082	0.0000	0.0000	0.0000	0.0000	157.9269	267.6281	380.5306 (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)	406.5532	329.5813	298.3902	193.9582	110.0847	0.0000	0.0000	0.0000	0.0000	171.1018	289.9546	412.2759 (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	217.8843 192.7444 205.1077 181.3793 176.4791 159.7535 158.2954 164.2372 165.6367 183.7997 194.2980 215.6630 (64)
Efficiency of water heater (217)m	85.2674 85.0784 84.7215 84.0305 82.8688 79.8000 79.8000 79.8000 79.8000 83.7214 84.7782 85.3192 (216)
Fuel for water heating, kWh/month	255.5306 226.5492 242.0964 215.8494 212.9620 200.1924 198.3652 205.8110 207.5648 219.5373 229.1839 252.7718 (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	23.6275 18.9549 17.0667 12.5038 9.6583 7.8909 8.8106 11.4524 14.8755 19.5175 22.0450 24.2842 (232)

Electricity generated by PVs (Appendix M) (negative quantity)	
(233a)m	-12.8022 -19.3927 -29.9193 -36.1828 -41.2901 -39.3831 -38.9172 -35.6122 -30.1875 -23.2736 -14.5479 -10.9180 (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	-3.6456 -7.9160 -16.2091 -25.0616 -33.8535 -34.2776 -33.8623 -28.3255 -20.3241 -11.5348 -4.9347 -2.8639 (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	2211.8998 (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	2666.4139 (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)	190.6874 (232)

Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-555.2356 (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	4599.7655 (238)

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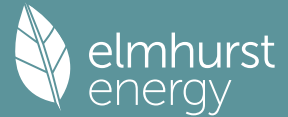
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2211.8998	0.2100	464.4990 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2666.4139	0.2100	559.9469 (264)
Space and water heating			1024.4459 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	190.6874	0.1443	27.5221 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-332.4268	0.1331	-44.2505
PV Unit electricity exported	-222.8089	0.1251	-27.8654
Total			-72.1159 (269)
Total CO2, kg/year			991.7814 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.7100 (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	2211.8998	1.1300	2499.4468 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2666.4139	1.1300	3013.0477 (278)
Space and water heating			5512.4945 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	190.6874	1.5338	292.4828 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-332.4268	1.4919	-495.9411
PV Unit electricity exported	-222.8089	0.4590	-102.2761
Total			-598.2172 (283)
Total Primary energy kWh/year			5336.8609 (286)
Target Primary Energy Rate (TPER)			79.1800 (287)

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Property Reference	Flat 1.02			Issued on Date	22/04/2024
Assessment Reference	Baseline	Prop Type Ref			
Property	Christchurch Hall, , 38, Portland Street, Bristol, BS8 4JB				
SAP Rating	76 C	DER	21.83	TER	13.61
Environmental	81 B	% DER < TER			-60.40
CO ₂ Emissions (t/year)	1.52	DFEE	71.48	TFEE	35.31
Compliance Check	See BREL	% DFEE < TFEE			-102.43
% DPER < TPER	-72.93	DPER	126.13	TPER	72.94
Assessor Details	Mr. Jordan Howlett			Assessor ID	H055-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	83.5300 (1b)	3.0000 (2b)	250.5900 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.5300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	250.5900 (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) = 0.1197 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8697 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7393 (21)

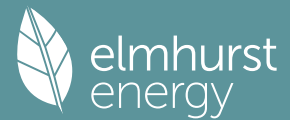
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.9426	0.9241	0.9056	0.8132	0.7947	0.7023	0.7023	0.6838	0.7393	0.7947	0.8317	0.8686 (22b)
Effective ac	0.9442	0.9270	0.9100	0.8306	0.8158	0.7466	0.7466	0.7338	0.7733	0.8158	0.8458	0.8773 (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
Window (Uw = 1.40)			8.8900	1.3258	11.7860		(27)
Exposed Floor Above Office			83.5300	0.2500	20.8825		(28b)
External Wall	64.5000	8.8900	55.6100	0.3000	16.6830		(29a)
Corridor wall	3.7500		3.7500	0.3000	1.1250		(29a)
Total net area of external elements Aum(A, m ²)			151.7800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.4765		(33)
Party Wall			46.9500	0.0000	0.0000		(32)
Party Ceiling			83.5300				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							30.3560 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	80.8325 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	78.0808	76.6544	75.2563	68.6892	67.4605	61.7407	61.7407	60.6815	63.9439	67.4605	69.9461	72.5447 (38)
Heat transfer coeff	158.9133	157.4869	156.0888	149.5216	148.2930	142.5732	142.5732	141.5140	144.7764	148.2930	150.7786	153.3772 (39)
Average = Sum(39)m / 12 =												149.5158

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HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.9025	1.8854	1.8687	1.7900	1.7753	1.7069	1.7069	1.6942	1.7332	1.7753	1.8051	1.8362	(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													2.5264 (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	28.7547	28.3276	27.7263	26.6175	25.7872	24.8665	24.3693	24.9664	25.6166	26.6017	27.7334	28.6575	(42b)
Hot water usage for other uses	40.5032	39.0304	37.5575	36.0847	34.6119	33.1390	33.1390	34.6119	36.0847	37.5575	39.0304	40.5032	(42c)
Average daily hot water use (litres/day)												63.4813	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	69.2579	67.3580	65.2838	62.7022	60.3990	58.0055	57.5083	59.5783	61.7013	64.1593	66.7638	69.1607	(44)
Energy content (annual)	109.6876	95.9169	100.3388	85.8361	81.3087	71.3246	69.5513	73.7703	76.0839	87.0635	95.1173	108.2890	(45)
Distribution loss (46)m = 0.15 x (45)m	16.4531	14.3875	15.0508	12.8754	12.1963	10.6987	10.4327	11.0656	11.4126	13.0595	14.2676	16.2433	(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													
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	(57)
Combi loss	25.3427	22.8842	25.3270	24.4956	25.3024	24.4770	25.2887	25.2947	24.4853	25.3125	24.5102	25.3411	(61)
Total heat required for water heating calculated for each month	135.0303	118.8011	125.6658	110.3317	106.6111	95.8015	94.8400	99.0650	100.5692	112.3761	119.6274	133.6300	(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	135.0303	118.8011	125.6658	110.3317	106.6111	95.8015	94.8400	99.0650	100.5692	112.3761	119.6274	133.6300	(64)
12Total per year (kWh/year)												1352.3493	(64)
Electric shower(s)	53.3193	47.5079	51.8768	49.5054	50.4344	48.1095	49.7132	50.4344	49.5054	51.8768	50.9013	53.3193	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												606.5038	(64a)
Heat gains from water heating, kWh/month	56.1366	49.4904	52.6636	47.0408	45.9693	41.8620	41.8763	43.4609	43.7956	48.2460	50.4794	55.6712	(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	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	130.2727	144.2305	130.2727	134.6152	130.2727	134.6152	130.2727	130.2727	134.6152	130.2727	134.6152	130.2727	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	226.6598	229.0118	223.0848	210.4669	194.5390	179.5691	169.5683	167.2162	173.1433	185.7612	201.6890	216.6589	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322	(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)	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	(71)
Water heating gains (Table 5)	75.4525	73.6464	70.7844	65.3344	61.7867	58.1417	56.2853	58.4152	60.8272	64.8467	70.1102	74.8268	(72)
Total internal gains	496.2815	510.7853	488.0385	474.3130	450.4951	433.2225	417.0228	416.8007	429.4822	444.7772	470.3109	485.6551	(73)

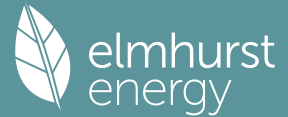
6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Northeast				4.0500	11.2829		0.6300		0.7000		0.7700		13.9653 (75)
Southwest				4.8400	36.7938		0.6300		0.7000		0.7700		54.4242 (79)
Solar gains	68.3895	121.1313	178.0583	241.2751	289.0986	295.2997	281.2498	244.3037	199.7509	137.1980	82.7596		57.9805 (83)
Total gains	564.6710	631.9166	666.0968	715.5881	739.5937	728.5222	698.2727	661.1044	629.2331	581.9752	553.0705		543.6356 (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	14.6009	14.7331	14.8651	15.5180	15.6466	16.2743	16.2743	16.3961	16.0266	15.6466	15.3886	15.1279	
alpha	1.9734	1.9822	1.9910	2.0345	2.0431	2.0850	2.0850	2.0931	2.0684	2.0431	2.0259	2.0085	
util living area	0.9625	0.9514	0.9366	0.9026	0.8472	0.7482	0.6390	0.6715	0.8123	0.9104	0.9496	0.9650	(86)
MIT	16.9178	17.2400	17.7978	18.6757	19.4901	20.2482	20.6293	20.5747	20.0092	18.9686	17.8756	16.9542	(87)
Th 2	19.3991	19.4108	19.4223	19.4770	19.4873	19.5359	19.5359	19.5450	19.5171	19.4873	19.4664	19.4448	(88)
util rest of house	0.9554	0.9421	0.9234	0.8801	0.8051	0.6641	0.4954	0.5371	0.7448	0.8854	0.9385	0.9585	(89)
MIT 2	15.8013	16.1259	16.6841	17.5756	18.3650	19.0858	19.3872	19.3602	18.8762	17.8768	16.7898	15.8623	(90)
Living area fraction	16.3023	16.6258	17.1838	18.0692	18.8699	19.6074	19.9446	19.9051	19.3846	18.3667	17.2770	16.3522	(91)
MIT	16.3023	16.6258	17.1838	18.0692	18.8699	19.6074	19.9446	19.9051	19.3846	18.3667	17.2770	16.3522	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.3023	16.6258	17.1838	18.0692	18.8699	19.6074	19.9446	19.9051	19.3846	18.3667	17.2770	16.3522	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9345	0.9181	0.8968	0.8521	0.7831	0.6690	0.5415	0.5759	0.7373	0.8598	0.9152	0.9389	(94)
Useful gains	527.6933	580.1920	597.3256	609.7468	579.2086	487.3654	378.1475	380.7218	463.9260	500.3750	506.1783	510.4033	(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	1907.3265	1846.6627	1667.6239	1370.9991	1063.2407	713.9174	476.8438	496.0229	765.0831	1151.7503	1534.4691	1863.8717	(97)
Space heating kWh	1026.4471	851.0683	796.3019	548.1017	360.1198	0.0000	0.0000	0.0000	0.0000	484.6232	740.3694	1006.9805	(98a)
Space heating requirement - total per year (kWh/year)												5814.0120	
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	1026.4471	851.0683	796.3019	548.1017	360.1198	0.0000	0.0000	0.0000	0.0000	484.6232	740.3694	1006.9805	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5814.0120	
Space heating per m2											(98c) / (4) =	69.6039	(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 %)													89.2000	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement	1026.4471	851.0683	796.3019	548.1017	360.1198	0.0000	0.0000	0.0000	0.0000	484.6232	740.3694	1006.9805	(98)	
Space heating efficiency (main heating system 1)	89.2000	89.2000	89.2000	89.2000	89.2000	0.0000	0.0000	0.0000	0.0000	89.2000	89.2000	89.2000	(210)	
Space heating fuel (main heating system)	1150.7254	954.1125	892.7152	614.4637	403.7218	0.0000	0.0000	0.0000	0.0000	543.2996	830.0105	1128.9019	(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 requirement	135.0303	118.8011	125.6658	110.3317	106.6111	95.8015	94.8400	99.0650	100.5692	112.3761	119.6274	133.6300	(64)	
Efficiency of water heater (217)m	88.9628	88.9501	88.9220	88.8585	88.7351	87.2000	87.2000	87.2000	87.2000	88.8166	88.9163	88.9610	(216)	
Fuel for water heating, kWh/month	151.7829	133.5593	141.3213	124.1657	120.1453	109.8642	108.7615	113.6067	115.3317	126.5260	134.5393	150.2120	(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	31.7811	25.4959	22.9563	16.8187	12.9913	10.6140	11.8511	15.4045	20.0089	26.2528	29.6524	32.6643	(232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)	
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)	
Annual totals kWh/year														
Space heating fuel - main system 1												6517.9506	(211)	
Space heating fuel - main system 2												0.0000	(213)	
Space heating fuel - secondary												0.0000	(215)	
Efficiency of water heater												87.2000		
Water heating fuel used												1529.8158	(219)	
Space cooling fuel												0.0000	(221)	
Electricity for pumps and fans:														
central heating pump												41.0000	(230c)	
main heating flue fan												45.0000	(230e)	
Total electricity for the above, kWh/year												86.0000	(231)	
Electricity for lighting (calculated in Appendix L)												256.4913	(232)	
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation												0.0000	(233)	
Wind generation												0.0000	(234)	
Hydro-electric generation (Appendix N)												0.0000	(235a)	
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)	
Appendix Q - special features														
Energy saved or generated												-0.0000	(236)	
Energy used												0.0000	(237)	
Total delivered energy for all uses												8996.7615	(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	6517.9506	0.2100	1368.7696	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1529.8158	0.2100	321.2613	(264)
Energy for instantaneous electric shower(s)	606.5038	0.1391	84.3781	(264a)
Space and water heating			1690.0310	(265)

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Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	256.4913	0.1443	37.0196 (268)
Total CO ₂ , kg/year			1823.3579 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			21.8300 (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	6517.9506	1.1300	7365.2842 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	1529.8158	1.1300	1728.6919 (278)
Energy for instantaneous electric shower(s)	606.5038	1.5143	918.4494 (278a)
Space and water heating			9093.9761 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	256.4913	1.5338	393.4149 (282)
Total Primary energy kWh/year			10535.9412 (286)
Dwelling Primary energy Rate (DPER)			126.1300 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	83.5300 (1b)	3.0000 (2b)	250.5900 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.5300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	250.5900 (5)

2. Ventilation rate

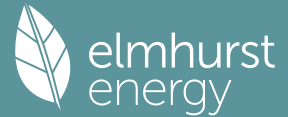
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1197 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3697 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3143 (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	0.4007	0.3928	0.3850	0.3457	0.3378	0.2985	0.2985	0.2907	0.3143	0.3378	0.3535	0.3693 (22b)
Effective ac	0.5803	0.5772	0.5741	0.5597	0.5571	0.5446	0.5446	0.5423	0.5494	0.5571	0.5625	0.5682 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opening Type (U _w = 1.20)			8.8900	1.1450	10.1794		(27)
Exposed Floor Above Office			83.5300	0.1300	10.8589		(28b)
External Wall	64.5000	8.8900	55.6100	0.1800	10.0098		(29a)
Corridor wall	3.7500		3.7500	0.1800	0.6750		(29a)
Total net area of external elements A _{um} (A, m ²)			151.7800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.7231		(33)
Party Wall			46.9500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							7.5890 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	39.3121 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	47.9855	47.7277	47.4751	46.2883	46.0663	45.0326	45.0326
Heat transfer coeff	87.2976	87.0398	86.7871	85.6004	85.3784	84.3447	84.3447
Average = Sum(39)m / 12 =						84.1533	84.7429
						85.3784	85.8275
						86.2971	86.2971 (39)
						85.5993	
HLP	1.0451	1.0420	1.0390	1.0248	1.0221	1.0098	1.0098
						1.0075	1.0145
						1.0221	1.0275
							1.0331 (40)

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HLP (average)	31	28	31	30	31	30	31	31	30	31	30	1,0248
Days in mont												31

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.5264 (42)
Hot water usage for mixer showers												
66.5798	65.5792	64.1212	61.3315	59.2728	56.9770	55.6720	57.1190	58.7052	61.1702	64.0198	66.3247	(42a)
Hot water usage for baths												
28.7547	28.3276	27.7263	26.6175	25.7872	24.8665	24.3693	24.9664	25.6166	26.6017	27.7334	28.6575	(42b)
Hot water usage for other uses												
40.5032	39.0304	37.5575	36.0847	34.6119	33.1390	33.1390	34.6119	36.0847	37.5575	39.0304	40.5032	(42c)
Average daily hot water use (litres/day)												124.8656 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	135.8377	132.9372	129.4050	124.0337	119.6719	114.9825	113.1803	116.6973	120.4065	125.3295	130.7836	135.4854 (44)
Energy conte	215.1337	189.3008	198.8906	169.7959	161.1013	141.3844	136.8818	144.4956	148.4732	170.0709	186.3252	212.1374 (45)
Energy content (annual)										Total = Sum(45)m =		2073.9909
Distribution loss	(46)m = 0.15 x (45)m											
32.2701	28.3951	29.8336	25.4694	24.1652	21.2077	20.5323	21.6743	22.2710	25.5106	27.9488	31.8206	(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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
266.0926	235.3282	249.8496	219.1110	212.0602	190.6995	187.8407	195.4545	197.7883	221.0298	235.6402	263.0963	(62)
WWHRS	-30.4375	-26.9192	-28.1882	-23.3409	-21.7529	-18.6141	-17.4478	-18.5540	-19.2589	-22.7041	-25.7210	-29.8738 (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	235.6551	208.4091	221.6614	195.7700	190.3073	172.0854	170.3929	176.9006	178.5294	198.3257	209.9192	233.2224 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2391.1785 (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	84.2717	74.4494	78.8709	68.7859	66.3059	59.3391	58.2529	60.7845	61.6961	69.2883	74.2819	83.2754 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	130.2727	144.2305	130.2727	134.6152	130.2727	134.6152	130.2727	130.2727	134.6152	130.2727	134.6152	130.2727 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	226.6598	229.0118	223.0848	210.4669	194.5390	179.5691	169.5683	167.2162	173.1433	185.7612	201.6890	216.6589 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322 (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)	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574 (71)
Water heating gains (Table 5)	113.2684	110.7878	106.0092	95.5360	89.1209	82.4154	78.2969	81.6996	85.6891	93.1295	103.1693	111.9293 (72)
Total internal gains	534.0974	547.9266	523.2633	504.5145	477.8292	457.4962	439.0345	440.0852	454.3440	473.0599	503.3700	522.7575 (73)

6. Solar gains												

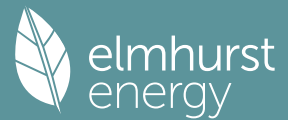
[Jan]												
	Area											
	m2											
	Solar flux											
	Table 6a											
	W/m2											
	Specific data											
	or Table 6b											
	Specific data											
	or Table 6c											
	FF											
	factor											
	Table 6d											
	Access											
	factor											
	Table 6d											
	Gains											
	W											
Northeast	4.0500											13.9653 (75)
Southwest	4.8400											54.4242 (79)

Solar gains	68.3895	121.1313	178.0583	241.2751	289.0986	295.2997	281.2498	244.3037	199.7509	137.1980	82.7596	57.9805 (83)
Total gains	602.4869	669.0579	701.3216	745.7897	766.9278	752.7959	720.2843	684.3888	654.0949	610.2579	586.1296	580.7380 (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	26.5790	26.6577	26.7353	27.1059	27.1764	27.5095	27.5095	27.5720	27.3802	27.1764	27.0342	26.8871
alpha	2.7719	2.7772	2.7824	2.8071	2.8118	2.8340	2.8340	2.8381	2.8253	2.8118	2.8023	2.7925
util living area	0.9475	0.9286	0.9023	0.8440	0.7503	0.6074	0.4738	0.5107	0.6959	0.8568	0.9256	0.9519 (86)
MIT	18.7528	19.0216	19.4115	19.9630	20.4416	20.7881	20.9235	20.9035	20.6682	20.0674	19.3416	18.7178 (87)
Th 2	20.0459	20.0485	20.0510	20.0627	20.0649	20.0752	20.0752	20.0771	20.0713	20.0649	20.0605	20.0558 (88)
util rest of house	0.9403	0.9189	0.8884	0.8207	0.7108	0.5433	0.3874	0.4248	0.6380	0.8308	0.9139	0.9453 (89)
MIT 2	17.4190	17.7582	18.2494	18.9381	19.5109	19.9014	20.0290	20.0155	19.7797	19.0780	18.1738	17.3808 (90)
Living area fraction									fLA = Living area / (4) =			0.4487 (91)
MIT	18.0175	18.3251	18.7708	19.3980	19.9285	20.2992	20.4303	20.4139	20.1784	19.5220	18.6978	17.9807 (92)
Temperature adjustment												0.0000
adjusted MIT	18.0175	18.3251	18.7708	19.3980	19.9285	20.2992	20.4303	20.4139	20.1784	19.5220	18.6978	17.9807 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9200	0.8966	0.8655	0.8017	0.7045	0.5597	0.4218	0.4575	0.6453	0.8131	0.8924	0.9260	(94)
Useful gains	554.2828	599.8541	606.9883	597.8988	540.3121	421.3296	303.8127	313.0834	422.0566	496.2201	523.0787	537.7493	(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	1197.5018	1168.5179	1064.9501	898.6304	702.5385	480.7003	323.0686	337.7845	515.0982	761.7420	995.4093	1189.2364	(97)
Space heating kWh	478.5550	382.1421	340.7236	216.5267	120.6964	0.0000	0.0000	0.0000	0.0000	197.5482	340.0780	484.7064	(98a)
Space heating requirement - total per year (kWh/year)												2560.9765	
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	478.5550	382.1421	340.7236	216.5267	120.6964	0.0000	0.0000	0.0000	0.0000	197.5482	340.0780	484.7064	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2560.9765	
Space heating per m2												(98c) / (4) =	30.6594 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	478.5550	382.1421	340.7236	216.5267	120.6964	0.0000	0.0000	0.0000	0.0000	197.5482	340.0780	484.7064	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	517.9166	413.5737	368.7485	234.3363	130.6239	0.0000	0.0000	0.0000	0.0000	213.7968	368.0498	524.5740	(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	235.6551	208.4091	221.6614	195.7700	190.3073	172.0854	170.3929	176.9006	178.5294	198.3257	209.9192	233.2224	(64)
Efficiency of water heater (217)m	85.8657	85.6623	85.2993	84.5979	83.4323	80.3000	80.3000	80.3000	80.3000	84.3730	85.4088	80.3000	(216)
Fuel for water heating, kWh/month	274.4460	243.2914	259.8630	231.4123	228.0979	214.3031	212.1954	220.2996	222.3281	235.0582	245.7818	271.4697	(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	27.0681	21.7150	19.5520	14.3246	11.0647	9.0400	10.0936	13.1201	17.0417	22.3596	25.2551	27.8204	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-15.7442	-23.7833	-36.5914	-44.1204	-50.2235	-47.8474	-47.2676	-43.3045	-36.7940	-28.4744	-17.8642	-13.4333	(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	-4.6399	-10.0609	-20.5764	-31.7809	-42.9033	-43.4416	-42.9293	-35.9346	-25.8059	-14.6644	-6.2809	-3.6470	(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												2771.6196	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2858.5465	(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)												218.4551	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-688.1133	(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												5246.5080	(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	2771.6196	0.2100	582.0401	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2858.5465	0.2100	600.2948	(264)
Space and water heating			1182.3349	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	218.4551	0.1443	31.5298	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-405.4481	0.1332	-53.9958	
PV Unit electricity exported	-282.6651	0.1251	-35.3574	

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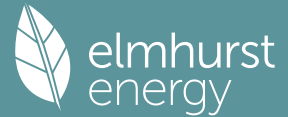


Total	-89.3532 (269)
Total CO2, kg/year	1136.4408 (272)
EPC Target Carbon Dioxide Emission Rate (TER)	13.6100 (273)

----- 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	2771.6196	1.1300	3131.9301 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2858.5465	1.1300	3230.1576 (278)
Space and water heating			6362.0877 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	218.4551	1.5338	335.0737 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-405.4481	1.4921	-604.9749
PV Unit electricity exported	-282.6651	0.4591	-129.7745
Total			-734.7494 (283)
Total Primary energy kWh/year			6092.5128 (286)
Target Primary Energy Rate (TPER)			72.9400 (287)

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Property Reference	Flat 1.02			Issued on Date	22/04/2024
Assessment Reference	Additional Measures		Prop Type Ref		
Property	Christchurch Hall, , 38, Portland Street, Bristol, BS8 4JB				
SAP Rating	77 C	DER	19.96	TER	13.61
Environmental	83 B	% DER < TER			-46.66
CO ₂ Emissions (t/year)	1.39	DFEE	67.39	TFEE	35.31
Compliance Check	See BREL	% DFEE < TFEE			-90.86
% DPER < TPER	-58.63	DPER	115.71	TPER	72.94
Assessor Details	Mr. Jordan Howlett			Assessor ID	H055-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	83.5300 (1b)	3.0000 (2b)	250.5900 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.5300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	250.5900 (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) = 0.1197 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8697 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7393 (21)

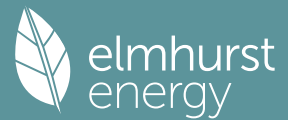
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.9426	0.9241	0.9056	0.8132	0.7947	0.7023	0.7023	0.6838	0.7393	0.7947	0.8317	0.8686 (22b)
Effective ac	0.9442	0.9270	0.9100	0.8306	0.8158	0.7466	0.7466	0.7338	0.7733	0.8158	0.8458	0.8773 (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
Window (Uw = 1.40)			8.8900	1.3258	11.7860		(27)
Exposed Floor Above Office			83.5300	0.1800	15.0354		(28b)
External Wall	64.5000	8.8900	55.6100	0.2600	14.4586		(29a)
Corridor wall	3.7500		3.7500	0.2600	0.9750		(29a)
Total net area of external elements Aum(A, m ²)			151.7800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.2550		(33)
Party Wall			46.9500	0.0000	0.0000		(32)
Party Ceiling			83.5300				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							30.3560 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	72.6110 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	78.0808	76.6544	75.2563	68.6892	67.4605	61.7407	61.7407	60.6815	63.9439	67.4605	69.9461	72.5447 (38)
Heat transfer coeff	150.6918	149.2654	147.8673	141.3001	140.0715	134.3517	134.3517	133.2925	136.5549	140.0715	142.5571	145.1557 (39)
Average = Sum(39)m / 12 =												141.2943

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HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.8040	1.7870	1.7702	1.6916	1.6769	1.6084	1.6084	1.5957	1.6348	1.6769	1.7067	1.7378 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	1.6915 (40)
												31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5264 (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	28.7547	28.3276	27.7263	26.6175	25.7872	24.8665	24.3693	24.9664	25.6166	26.6017	27.7334	28.6575 (42b)
Hot water usage for other uses	40.5032	39.0304	37.5575	36.0847	34.6119	33.1390	33.1390	34.6119	36.0847	37.5575	39.0304	40.5032 (42c)
Average daily hot water use (litres/day)												63.4813 (43)
Daily hot water use	69.2579	67.3580	65.2838	62.7022	60.3990	58.0055	57.5083	59.5783	61.7013	64.1593	66.7638	69.1607 (44)
Energy conte	109.6876	95.9169	100.3388	85.8361	81.3087	71.3246	69.5513	73.7703	76.0839	87.0635	95.1173	108.2890 (45)
Energy content (annual)										Total = Sum	(45)m =	1054.2880
Distribution loss (46)m = 0.15 x (45)m	16.4531	14.3875	15.0508	12.8754	12.1963	10.6987	10.4327	11.0656	11.4126	13.0595	14.2676	16.2433 (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												
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 (57)
Combi loss	25.3427	22.8842	25.3270	24.4956	25.3024	24.4770	25.2887	25.2947	24.4853	25.3125	24.5102	25.3411 (61)
Total heat required for water heating calculated for each month	135.0303	118.8011	125.6658	110.3317	106.6111	95.8015	94.8400	99.0650	100.5692	112.3761	119.6274	133.6300 (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	135.0303	118.8011	125.6658	110.3317	106.6111	95.8015	94.8400	99.0650	100.5692	112.3761	119.6274	133.6300 (64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum	(64)m =			1352.3493 (64)
Electric shower(s)	53.3193	47.5079	51.8768	49.5054	50.4344	48.1095	49.7132	50.4344	49.5054	51.8768	50.9013	53.3193 (64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum	(64a)m =			606.5038 (64a)
Heat gains from water heating, kWh/month	56.1366	49.4904	52.6636	47.0408	45.9693	41.8620	41.8763	43.4609	43.7956	48.2460	50.4794	55.6712 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	130.2727	144.2305	130.2727	134.6152	130.2727	134.6152	130.2727	130.2727	134.6152	130.2727	134.6152	130.2727 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	226.6598	229.0118	223.0848	210.4669	194.5390	179.5691	169.5683	167.2162	173.1433	185.7612	201.6890	216.6589 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322 (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)	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574 (71)
Water heating gains (Table 5)	75.4525	73.6464	70.7844	65.3344	61.7867	58.1417	56.2853	58.4152	60.8272	64.8467	70.1102	74.8268 (72)
Total internal gains	496.2815	510.7853	488.0385	474.3130	450.4951	433.2225	417.0228	416.8007	429.4822	444.7772	470.3109	485.6551 (73)

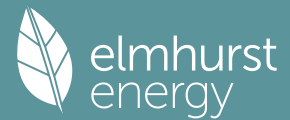
6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Northeast				4.0500	11.2829		0.6300		0.7000		0.7700		13.9653 (75)
Southwest				4.8400	36.7938		0.6300		0.7000		0.7700		54.4242 (79)
Solar gains	68.3895	121.1313	178.0583	241.2751	289.0986	295.2997	281.2498	244.3037	199.7509	137.1980	82.7596		57.9805 (83)
Total gains	564.6710	631.9166	666.0968	715.5881	739.5937	728.5222	698.2727	661.1044	629.2331	581.9752	553.0705		543.6356 (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	15.3975	15.5446	15.6916	16.4209	16.5650	17.2702	17.2702	17.4074	16.9915	16.5650	16.2761	15.9848
alpha	2.0265	2.0363	2.0461	2.0947	2.1043	2.1513	2.1513	2.1605	2.1328	2.1043	2.0851	2.0657
util living area	0.9621	0.9506	0.9351	0.8994	0.8413	0.7372	0.6243	0.6575	0.8044	0.9076	0.9486	0.9647 (86)
MIT	17.0734	17.3956	17.9434	18.8085	19.5952	20.3200	20.6730	20.6226	20.0885	19.0830	18.0184	17.1175 (87)
Th 2	19.4672	19.4791	19.4909	19.5469	19.5574	19.6072	19.6072	19.6165	19.5879	19.5574	19.5361	19.5139 (88)
util rest of house	0.9551	0.9414	0.9221	0.8771	0.7995	0.6551	0.4872	0.5286	0.7380	0.8827	0.9376	0.9583 (89)
MIT 2	15.0488	15.4563	16.1486	17.2470	18.2152	19.0804	19.4351	19.4019	18.8265	17.6046	16.2619	15.1151 (90)
Living area fraction	15.9572	16.3265	16.9539	17.9477	18.8344	19.6366	19.9906	19.9496	19.3927	18.2680	17.0500	16.0136 (92)
MIT												0.0000
Temperature adjustment												0.0000
adjusted MIT	15.9572	16.3265	16.9539	17.9477	18.8344	19.6366	19.9906	19.9496	19.3927	18.2680	17.0500	16.0136 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9297	0.9123	0.8899	0.8435	0.7728	0.6571	0.5301	0.5643	0.7266	0.8517	0.9094	0.9344	(94)
Useful gains	524.9732	576.5278	592.7442	603.5676	571.5418	478.7450	370.1272	373.0758	457.1821	495.6597	502.9811	507.9767	(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	1756.6486	1705.5749	1545.7924	1278.4384	999.3317	676.6789	455.5273	473.1394	722.7466	1074.0655	1418.4456	1714.8131	(97)
Space heating kWh	916.3665	758.7197	709.0678	485.9070	318.2757	0.0000	0.0000	0.0000	0.0000	430.3339	659.1345	897.8863	(98a)
Space heating requirement - total per year (kWh/year)												5175.6914	
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	916.3665	758.7197	709.0678	485.9070	318.2757	0.0000	0.0000	0.0000	0.0000	430.3339	659.1345	897.8863	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5175.6914	
Space heating per m2											(98c) / (4) =	61.9621	(99)

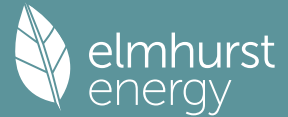
9a. Energy requirements - Individual heating systems, including micro-CHP

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 %)													89.2000	(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	916.3665	758.7197	709.0678	485.9070	318.2757	0.0000	0.0000	0.0000	0.0000	430.3339	659.1345	897.8863	(98)	
Space heating efficiency (main heating system 1)	89.2000	89.2000	89.2000	89.2000	89.2000	0.0000	0.0000	0.0000	0.0000	89.2000	89.2000	89.2000	(210)	
Space heating fuel (main heating system)	1027.3167	850.5826	794.9191	544.7388	356.8113	0.0000	0.0000	0.0000	0.0000	482.4371	738.9400	1006.5990	(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	135.0303	118.8011	125.6658	110.3317	106.6111	95.8015	94.8400	99.0650	100.5692	112.3761	119.6274	133.6300	(64)	
Efficiency of water heater (217)m	88.9380	88.9239	88.8931	88.8230	88.6896	87.2000	87.2000	87.2000	87.2000	88.7784	88.8868	88.9357	(216)	
Fuel for water heating, kWh/month	151.8252	133.5986	141.3674	124.2153	120.2070	109.8642	108.7615	113.6067	115.3317	126.5804	134.5839	150.2546	(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	26.7099	21.4277	19.2932	14.1350	10.9183	8.9204	9.9601	12.9465	16.8162	22.0637	24.9209	27.4522	(232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)	
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)	
Annual totals kWh/year														
Space heating fuel - main system 1												5802.3446	(211)	
Space heating fuel - main system 2												0.0000	(213)	
Space heating fuel - secondary												0.0000	(215)	
Efficiency of water heater												87.2000		
Water heating fuel used												1530.1964	(219)	
Space cooling fuel												0.0000	(221)	
Electricity for pumps and fans:														
central heating pump												41.0000	(230c)	
main heating flue fan												45.0000	(230e)	
Total electricity for the above, kWh/year												86.0000	(231)	
Electricity for lighting (calculated in Appendix L)												215.5640	(232)	
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation												0.0000	(233)	
Wind generation												0.0000	(234)	
Hydro-electric generation (Appendix N)												0.0000	(235a)	
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)	
Appendix Q - special features														
Energy saved or generated												-0.0000	(236)	
Energy used												0.0000	(237)	
Total delivered energy for all uses												8240.6087	(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	5802.3446	0.2100	1218.4924	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1530.1964	0.2100	321.3412	(264)
Energy for instantaneous electric shower(s)	606.5038	0.1391	84.3781	(264a)
Space and water heating			1539.8336	(265)

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Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	215.5640	0.1443	31.1125 (268)
Total CO ₂ , kg/year			1667.2535 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			19.9600 (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	5802.3446	1.1300	6556.6494 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	1530.1964	1.1300	1729.1219 (278)
Energy for instantaneous electric shower(s)	606.5038	1.5143	918.4494 (278a)
Space and water heating			8285.7713 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	215.5640	1.5338	330.6392 (282)
Total Primary energy kWh/year			9664.9606 (286)
Dwelling Primary energy Rate (DPER)			115.7100 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	83.5300 (1b)	3.0000 (2b)	250.5900 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.5300		250.5900 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 250.5900 (5)

2. Ventilation rate

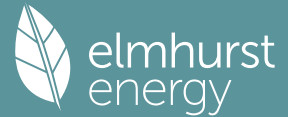
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1197 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3697 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3143 (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	0.4007	0.3928	0.3850	0.3457	0.3378	0.2985	0.2985	0.2907	0.3143	0.3378	0.3535	0.3693 (22b)
Effective ac	0.5803	0.5772	0.5741	0.5597	0.5571	0.5446	0.5446	0.5423	0.5494	0.5571	0.5625	0.5682 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opening Type (U _w = 1.20)			8.8900	1.1450	10.1794		(27)
Exposed Floor Above Office			83.5300	0.1300	10.8589		(28b)
External Wall	64.5000	8.8900	55.6100	0.1800	10.0098		(29a)
Corridor wall	3.7500		3.7500	0.1800	0.6750		(29a)
Total net area of external elements A _{um} (A, m ²)			151.7800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.7231		(33)
Party Wall			46.9500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							7.5890 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	39.3121 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	47.9855	47.7277	47.4751	46.2883	46.0663	45.0326	45.0326
Heat transfer coeff	87.2976	87.0398	86.7871	85.6004	85.3784	84.3447	84.3447
Average = Sum(39)m / 12 =						84.1533	84.1533
HLP	1.0451	1.0420	1.0390	1.0248	1.0221	1.0098	1.0098

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HLP (average)	31	28	31	30	31	30	31	31	30	31	30	1,0248
Days in mont												31

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.5264 (42)
Hot water usage for mixer showers												
66.5798	65.5792	64.1212	61.3315	59.2728	56.9770	55.6720	57.1190	58.7052	61.1702	64.0198	66.3247	(42a)
Hot water usage for baths												
28.7547	28.3276	27.7263	26.6175	25.7872	24.8665	24.3693	24.9664	25.6166	26.6017	27.7334	28.6575	(42b)
Hot water usage for other uses												
40.5032	39.0304	37.5575	36.0847	34.6119	33.1390	33.1390	34.6119	36.0847	37.5575	39.0304	40.5032	(42c)
Average daily hot water use (litres/day)												124.8656 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	135.8377	132.9372	129.4050	124.0337	119.6719	114.9825	113.1803	116.6973	120.4065	125.3295	130.7836	135.4854 (44)
Energy conte	215.1337	189.3008	198.8906	169.7959	161.1013	141.3844	136.8818	144.4956	148.4732	170.0709	186.3252	212.1374 (45)
Energy content (annual)										Total = Sum(45)m =		2073.9909
Distribution loss	(46)m = 0.15 x (45)m											
32.2701	28.3951	29.8336	25.4694	24.1652	21.2077	20.5323	21.6743	22.2710	25.5106	27.9488	31.8206	(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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
266.0926	235.3282	249.8496	219.1110	212.0602	190.6995	187.8407	195.4545	197.7883	221.0298	235.6402	263.0963	(62)
WWHRS	-30.4375	-26.9192	-28.1882	-23.3409	-21.7529	-18.6141	-17.4478	-18.5540	-19.2589	-22.7041	-25.7210	-29.8738 (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	235.6551	208.4091	221.6614	195.7700	190.3073	172.0854	170.3929	176.9006	178.5294	198.3257	209.9192	233.2224 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2391.1785 (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	84.2717	74.4494	78.8709	68.7859	66.3059	59.3391	58.2529	60.7845	61.6961	69.2883	74.2819	83.2754 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	130.2727	144.2305	130.2727	134.6152	130.2727	134.6152	130.2727	130.2727	134.6152	130.2727	134.6152	130.2727 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	226.6598	229.0118	223.0848	210.4669	194.5390	179.5691	169.5683	167.2162	173.1433	185.7612	201.6890	216.6589 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322 (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)	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574 (71)
Water heating gains (Table 5)	113.2684	110.7878	106.0092	95.5360	89.1209	82.4154	78.2969	81.6996	85.6891	93.1295	103.1693	111.9293 (72)
Total internal gains	534.0974	547.9266	523.2633	504.5145	477.8292	457.4962	439.0345	440.0852	454.3440	473.0599	503.3700	522.7575 (73)

6. Solar gains												

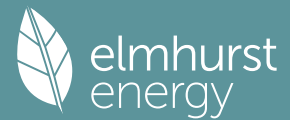
[Jan]												
	Area											
	m2											
	Solar flux											
	Table 6a											
	W/m2											
	Specific data											
	or Table 6b											
	Specific data											
	or Table 6c											
	FF											
	factor											
	Table 6d											
	Access											
	factor											
	Table 6d											
	Gains											
	W											
Northeast	4.0500											13.9653 (75)
Southwest	4.8400											54.4242 (79)

Solar gains	68.3895	121.1313	178.0583	241.2751	289.0986	295.2997	281.2498	244.3037	199.7509	137.1980	82.7596	57.9805 (83)
Total gains	602.4869	669.0579	701.3216	745.7897	766.9278	752.7959	720.2843	684.3888	654.0949	610.2579	586.1296	580.7380 (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	26.5790	26.6577	26.7353	27.1059	27.1764	27.5095	27.5095	27.5720	27.3802	27.1764	27.0342	26.8871
alpha	2.7719	2.7772	2.7824	2.8071	2.8118	2.8340	2.8340	2.8381	2.8253	2.8118	2.8023	2.7925
util living area	0.9475	0.9286	0.9023	0.8440	0.7503	0.6074	0.4738	0.5107	0.6959	0.8568	0.9256	0.9519 (86)
MIT	18.7528	19.0216	19.4115	19.9630	20.4416	20.7881	20.9235	20.9035	20.6682	20.0674	19.3416	18.7178 (87)
Th 2	20.0459	20.0485	20.0510	20.0627	20.0649	20.0752	20.0752	20.0771	20.0713	20.0649	20.0605	20.0558 (88)
util rest of house	0.9403	0.9189	0.8884	0.8207	0.7108	0.5433	0.3874	0.4248	0.6380	0.8308	0.9139	0.9453 (89)
MIT 2	17.4190	17.7582	18.2494	18.9381	19.5109	19.9014	20.0290	20.0155	19.7797	19.0780	18.1738	17.3808 (90)
Living area fraction									fLA = Living area / (4) =			0.4487 (91)
MIT	18.0175	18.3251	18.7708	19.3980	19.9285	20.2992	20.4303	20.4139	20.1784	19.5220	18.6978	17.9807 (92)
Temperature adjustment												0.0000
adjusted MIT	18.0175	18.3251	18.7708	19.3980	19.9285	20.2992	20.4303	20.4139	20.1784	19.5220	18.6978	17.9807 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9200	0.8966	0.8655	0.8017	0.7045	0.5597	0.4218	0.4575	0.6453	0.8131	0.8924	0.9260	(94)
Useful gains	554.2828	599.8541	606.9883	597.8988	540.3121	421.3296	303.8127	313.0834	422.0566	496.2201	523.0787	537.7493	(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	1197.5018	1168.5179	1064.9501	898.6304	702.5385	480.7003	323.0686	337.7845	515.0982	761.7420	995.4093	1189.2364	(97)
Space heating kWh	478.5550	382.1421	340.7236	216.5267	120.6964	0.0000	0.0000	0.0000	0.0000	197.5482	340.0780	484.7064	(98a)
Space heating requirement - total per year (kWh/year)												2560.9765	
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	478.5550	382.1421	340.7236	216.5267	120.6964	0.0000	0.0000	0.0000	0.0000	197.5482	340.0780	484.7064	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2560.9765	
Space heating per m2												30.6594	(99)
												(98c) / (4) =	

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	478.5550	382.1421	340.7236	216.5267	120.6964	0.0000	0.0000	0.0000	0.0000	197.5482	340.0780	484.7064	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	517.9166	413.5737	368.7485	234.3363	130.6239	0.0000	0.0000	0.0000	0.0000	213.7968	368.0498	524.5740	(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	235.6551	208.4091	221.6614	195.7700	190.3073	172.0854	170.3929	176.9006	178.5294	198.3257	209.9192	233.2224	(64)
Efficiency of water heater (217)m	85.8657	85.6623	85.2993	84.5979	83.4323	80.3000	80.3000	80.3000	80.3000	84.3730	85.4088	80.3000	(216)
Fuel for water heating, kWh/month	274.4460	243.2914	259.8630	231.4123	228.0979	214.3031	212.1954	220.2996	222.3281	235.0582	245.7818	271.4697	(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	27.0681	21.7150	19.5520	14.3246	11.0647	9.0400	10.0936	13.1201	17.0417	22.3596	25.2551	27.8204	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-15.7442	-23.7833	-36.5914	-44.1204	-50.2235	-47.8474	-47.2676	-43.3045	-36.7940	-28.4744	-17.8642	-13.4333	(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	-4.6399	-10.0609	-20.5764	-31.7809	-42.9033	-43.4416	-42.9293	-35.9346	-25.8059	-14.6644	-6.2809	-3.6470	(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												2771.6196	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2858.5465	(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)												218.4551	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-688.1133	(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												5246.5080	(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	2771.6196	0.2100	582.0401	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2858.5465	0.2100	600.2948	(264)
Space and water heating			1182.3349	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	218.4551	0.1443	31.5298	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-405.4481	0.1332	-53.9958	
PV Unit electricity exported	-282.6651	0.1251	-35.3574	

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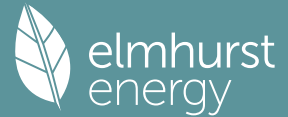


Total	-89.3532 (269)
Total CO2, kg/year	1136.4408 (272)
EPC Target Carbon Dioxide Emission Rate (TER)	13.6100 (273)

----- 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	2771.6196	1.1300	3131.9301 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2858.5465	1.1300	3230.1576 (278)
Space and water heating			6362.0877 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	218.4551	1.5338	335.0737 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-405.4481	1.4921	-604.9749
PV Unit electricity exported	-282.6651	0.4591	-129.7745
Total			-734.7494 (283)
Total Primary energy kWh/year			6092.5128 (286)
Target Primary Energy Rate (TPER)			72.9400 (287)

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Property Reference	Flat 1.02				Issued on Date	22/04/2024	
Assessment Reference	Renewables			Prop Type Ref			
Property	Christchurch Hall, , 38, Portland Street, Bristol, BS8 4JB						
SAP Rating	76 C	DER	5.62	TER	13.33		
Environmental	95 A	% DER < TER				57.84	
CO ₂ Emissions (t/year)	0.42	DFEE	67.39	TFEE	35.31		
Compliance Check	See BREL	% DFEE < TFEE				-90.86	
% DPER < TPER	17.36	DPER	59.05	TPER	71.45		
Assessor Details	Mr. Jordan Howlett				Assessor ID	H055-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	83.5300 (1b)	3.0000 (2b)	250.5900 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.5300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	250.5900 (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) = 0.1197 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8697 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7393 (21)

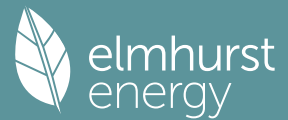
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.9426	0.9241	0.9056	0.8132	0.7947	0.7023	0.7023	0.6838	0.7393	0.7947	0.8317	0.8686 (22b)
Effective ac	0.9442	0.9270	0.9100	0.8306	0.8158	0.7466	0.7466	0.7338	0.7733	0.8158	0.8458	0.8773 (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
Window (Uw = 1.40)			8.8900	1.3258	11.7860		(27)
Exposed Floor Above Office			83.5300	0.1800	15.0354		(28b)
External Wall	64.5000	8.8900	55.6100	0.2600	14.4586		(29a)
Corridor wall	3.7500		3.7500	0.2600	0.9750		(29a)
Total net area of external elements Aum(A, m ²)			151.7800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.2550		(33)
Party Wall			46.9500	0.0000	0.0000		(32)
Party Ceiling			83.5300				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							30.3560 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	72.6110 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	78.0808	76.6544	75.2563	68.6892	67.4605	61.7407	61.7407	60.6815	63.9439	67.4605	69.9461	72.5447 (38)
Heat transfer coeff	150.6918	149.2654	147.8673	141.3001	140.0715	134.3517	134.3517	133.2925	136.5549	140.0715	142.5571	145.1557 (39)
Average = Sum(39)m / 12 =												141.2943

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HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.8040	1.7870	1.7702	1.6916	1.6769	1.6084	1.6084	1.5957	1.6348	1.6769	1.7067	1.7378 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	1.6915 31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5264 (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	28.7547	28.3276	27.7263	26.6175	25.7872	24.8665	24.3693	24.9664	25.6166	26.6017	27.7334	28.6575 (42b)
Hot water usage for other uses	40.5032	39.0304	37.5575	36.0847	34.6119	33.1390	33.1390	34.6119	36.0847	37.5575	39.0304	40.5032 (42c)
Average daily hot water use (litres/day)												63.4813 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	69.2579	67.3580	65.2838	62.7022	60.3990	58.0055	57.5083	59.5783	61.7013	64.1593	66.7638	69.1607 (44)
Energy content (annual)	109.6876	95.9169	100.3388	85.8361	81.3087	71.3246	69.5513	73.7703	76.0839	87.0635	95.1173	108.2890 (45)
Distribution loss (46)m = 0.15 x (45)m	16.4531	14.3875	15.0508	12.8754	12.1963	10.6987	10.4327	11.0656	11.4126	13.0595	14.2676	16.2433 (46)
Water storage loss:												180.0000 (47)
Store volume												1.8600 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												1.0044 (55)
Enter (49) or (54) in (55)												
Total storage loss	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364 (56)
If cylinder contains dedicated solar storage	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364 (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	164.0864	145.0513	154.7376	138.4801	135.7075	123.9686	123.9501	128.1691	128.7279	141.4623	147.7613	162.6878 (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	164.0864	145.0513	154.7376	138.4801	135.7075	123.9686	123.9501	128.1691	128.7279	141.4623	147.7613	162.6878 (64)
12Total per year (kWh/year)												1694.7900 (64a)
Electric shower(s)	53.3193	47.5079	51.8768	49.5054	50.4344	48.1095	49.7132	50.4344	49.5054	51.8768	50.9013	53.3193 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												606.5038 (64a)
Heat gains from water heating, kWh/month	93.3200	83.0769	89.8509	83.0321	83.1628	77.8580	79.0731	80.6563	79.7895	85.4369	86.4670	92.8549 (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	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	130.2727	144.2305	130.2727	134.6152	130.2727	134.6152	130.2727	130.2727	134.6152	130.2727	134.6152	130.2727 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	226.6598	229.0118	223.0848	210.4669	194.5390	179.5691	169.5683	167.2162	173.1433	185.7612	201.6890	216.6589 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322 (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)	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574 (71)
Water heating gains (Table 5)	125.4301	123.6263	120.7673	115.3223	111.7779	108.1361	106.2811	108.4090	110.8187	114.8345	120.0931	124.8050 (72)
Total internal gains	543.2592	557.7652	535.0214	521.3009	497.4862	483.2169	467.0186	466.7945	479.4737	491.7650	517.2938	532.6333 (73)

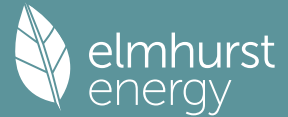
6. Solar gains

[Jan]													
					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
Northeast					4.0500	11.2829		0.6300	0.7000	0.7700		13.9653 (75)	
Southwest					4.8400	36.7938		0.6300	0.7000	0.7700		54.4242 (79)	
Solar gains	68.3895	121.1313	178.0583	241.2751	289.0986	295.2997	281.2498	244.3037	199.7509	137.1980	82.7596	57.9805 (83)	
Total gains	611.6486	678.8965	713.0797	762.5760	786.5849	778.5166	748.2684	711.0982	679.2245	628.9630	600.0534	590.6138 (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, n11,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	15.3975	15.5446	15.6916	16.4209	16.5650	17.2702	17.2702	17.4074	16.9915	16.5650	16.2761	15.9848
alpha	2.0265	2.0363	2.0461	2.0947	2.1043	2.1513	2.1513	2.1605	2.1328	2.1043	2.0851	2.0657
util living area	0.9563	0.9441	0.9273	0.8888	0.8268	0.7159	0.5994	0.6317	0.7834	0.8952	0.9408	0.9590 (86)
Living	17.1563	17.4761	18.0204	18.8787	19.6533	20.3627	20.6996	20.6533	20.1428	19.1551	18.0999	17.2027
Non living	15.1520	15.5558	16.2428	17.3303	18.2793	19.1195	19.4519	19.4230	18.8807	17.6894	16.3623	15.2214
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10

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MIT	19.0340	17.4761	18.0204	18.8787	19.6533	20.3627	20.6996	20.6533	20.1428	19.1551	18.0999	17.7338 (87)	
Th 2	19.4672	19.4791	19.4909	19.5469	19.5574	19.6072	19.6072	19.6165	19.5879	19.5574	19.5361	19.5139 (88)	
util rest of house													
	0.9484	0.9339	0.9130	0.8647	0.7827	0.6316	0.4629	0.5024	0.7136	0.8679	0.9284	0.9517 (89)	
MIT 2	17.7314	15.5558	16.2428	17.3303	18.2793	19.1195	19.4519	19.4230	18.8807	17.6894	16.3623	15.9906 (90)	
Living area fraction									fLA = Living area / (4) =				0.4487 (91)
MIT	18.3159	16.4174	17.0404	18.0251	18.8958	19.6773	20.0117	19.9750	19.4470	18.3470	17.1420	16.7728 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.3159	16.4174	17.0404	18.0251	18.8958	19.6773	20.0117	19.9750	19.4470	18.3470	17.1420	16.7728 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9410	0.9030	0.8793	0.8307	0.7572	0.6366	0.5074	0.5404	0.7050	0.8365	0.8983	0.9321	(94)
Useful gains	575.5360	613.0374	627.0244	633.4699	595.6356	495.5799	379.7064	384.2999	478.8872	526.1316	539.0085	550.5003	(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													
	2112.0762	1719.1544	1558.5804	1289.3717	1007.9309	682.1434	458.3702	476.5240	730.1599	1085.1373	1431.5575	1825.0140	(97)
Space heating kWh													
	1143.1859	743.3106	693.0776	472.2494	306.7477	0.0000	0.0000	0.0000	0.0000	415.9003	642.6353	948.2382	(98a)
Space heating requirement - total per year (kWh/year)												5365.3450	
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													
	1143.1859	743.3106	693.0776	472.2494	306.7477	0.0000	0.0000	0.0000	0.0000	415.9003	642.6353	948.2382	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5365.3450	
Space heating per m2												64.2326	(99)
											(98c) / (4) =		

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 %)													366.1052 (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													
	1143.1859	743.3106	693.0776	472.2494	306.7477	0.0000	0.0000	0.0000	0.0000	415.9003	642.6353	948.2382	(98)
Space heating efficiency (main heating system 1)													
	366.1052	366.1052	366.1052	366.1052	366.1052	0.0000	0.0000	0.0000	0.0000	366.1052	366.1052	366.1052	(210)
Space heating fuel (main heating system)													
	312.2561	203.0320	189.3110	128.9928	83.7868	0.0000	0.0000	0.0000	0.0000	113.6013	175.5329	259.0070	(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													
	164.0864	145.0513	154.7376	138.4801	135.7075	123.9686	123.9501	128.1691	128.7279	141.4623	147.7613	162.6878	(64)
Efficiency of water heater (217)m													186.4645 (216)
	186.4645	186.4645	186.4645	186.4645	186.4645	186.4645	186.4645	186.4645	186.4645	186.4645	186.4645	186.4645	(217)
Fuel for water heating, kWh/month													
	87.9987	77.7903	82.9850	74.2662	72.7793	66.4837	66.4738	68.7365	69.0361	75.8656	79.2436	87.2486	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	26.7099	21.4277	19.2932	14.1350	10.9183	8.9204	9.9601	12.9465	16.8162	22.0637	24.9209	27.4522	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1465.5199	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												186.4645	
Water heating fuel used												908.9075	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												215.5640	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												3196.4952	(238)

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

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	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1465.5199	0.1542	226.0267 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	908.9075	0.1405	127.6965 (264)
Energy for instantaneous electric shower(s)	606.5038	0.1391	84.3781 (264a)
Space and water heating			353.7231 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	215.5640	0.1443	31.1125 (268)
Total CO2, kg/year			469.2137 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.6200 (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	1465.5199	1.5709	2302.2377 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	908.9075	1.5195	1381.0639 (278)
Energy for instantaneous electric shower(s)	606.5038	1.5143	918.4494 (278a)
Space and water heating			3683.3016 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	215.5640	1.5338	330.6392 (282)
Total Primary energy kWh/year			4932.3902 (286)
Dwelling Primary energy Rate (DPER)			59.0500 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	83.5300 (1b)	x 3.0000 (2b)	= 250.5900 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.5300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 250.5900 (5)

2. Ventilation rate

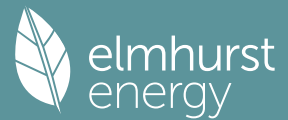
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1197 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3697 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3143 (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	0.4007	0.3928	0.3850	0.3457	0.3378	0.2985	0.2985	0.2907	0.3143	0.3378	0.3535	0.3693 (22b)
Effective ac	0.5803	0.5772	0.5741	0.5597	0.5571	0.5446	0.5446	0.5423	0.5494	0.5571	0.5625	0.5682 (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					
TER Opening Type (Uw = 1.20)			8.8900	1.1450	10.1794		(27)					
Exposed Floor Above Office			83.5300	0.1300	10.8589		(28b)					
External Wall	64.5000	8.8900	55.6100	0.1800	10.0098		(29a)					
Corridor wall	3.7500		3.7500	0.1800	0.6750		(29a)					
Total net area of external elements Aum(A, m2)			151.7800				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		31.7231		(33)					
Party Wall			46.9500	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)					
Thermal bridges (User defined value 0.050 * total exposed area)							7.5890 (36)					
Point Thermal bridges						(36a) =	0.0000					
Total fabric heat loss						(33) + (36) + (36a) =	39.3121 (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	47.9855	47.7277	47.4751	46.2883	46.0663	45.0326	45.0326	44.8412	45.4308	46.0663	46.5154	46.9850 (38)
Heat transfer coeff	87.2976	87.0398	86.7871	85.6004	85.3784	84.3447	84.3447	84.1533	84.7429	85.3784	85.8275	86.2971 (39)
Average = Sum(39)m / 12 =												85.5993
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0451	1.0420	1.0390	1.0248	1.0221	1.0098	1.0098	1.0075	1.0145	1.0221	1.0275	1.0331 (40)
HLP (average)												1.0248
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5264 (42)
Hot water usage for mixer showers												
66.5798	65.5792	64.1212	61.3315	59.2728	56.9770	55.6720	57.1190	58.7052	61.1702	64.0198	66.3247 (42a)	
Hot water usage for baths												
28.7547	28.3276	27.7263	26.6175	25.7872	24.8665	24.3693	24.9664	25.6166	26.6017	27.7334	28.6575 (42b)	
Hot water usage for other uses												
40.5032	39.0304	37.5575	36.0847	34.6119	33.1390	33.1390	34.6119	36.0847	37.5575	39.0304	40.5032 (42c)	
Average daily hot water use (litres/day)												124.8656 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	135.8377	132.9372	129.4050	124.0337	119.6719	114.9825	113.1803	116.6973	120.4065	125.3295	130.7836	135.4854 (44)
Energy content	215.1337	189.3008	198.8906	169.7959	161.1013	141.3844	136.8818	144.4956	148.4732	170.0709	186.3252	212.1374 (45)
Energy content (annual)										Total = Sum(45)m =		2073.9909
Distribution loss (46)m = 0.15 x (45)m												
32.2701	28.3951	29.8336	25.4694	24.1652	21.2077	20.5323	21.6743	22.2710	25.5106	27.9488	31.8206 (46)	
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8381 (55)
Total storage loss												
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (56)	
If cylinder contains dedicated solar storage												
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (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												
264.3764	233.7781	248.1333	217.4501	210.3440	189.0386	186.1244	193.7383	196.1274	219.3136	233.9794	261.3800 (62)	
WWHRS	-30.4375	-26.9192	-28.1882	-23.3409	-21.7529	-18.6141	-17.4478	-18.5540	-19.2589	-22.7041	-25.7210	-29.8738 (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												
233.9389	206.8589	219.9451	194.1091	188.5911	170.4245	168.6766	175.1843	176.8686	196.6095	208.2584	231.5062 (64)	
Total per year (kWh/year)												2370.9712 (64)
Electric shower(s)												2371 (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												
110.9261	98.5243	105.5253	94.5805	92.9603	85.1337	84.9073	87.4389	87.4907	95.9427	100.0765	109.9298 (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	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218	126.3218 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	130.2727	144.2305	130.2727	134.6152	130.2727	134.6152	130.2727	130.2727	134.6152	130.2727	134.6152	130.2727 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	226.6598	229.0118	223.0848	210.4669	194.5390	179.5691	169.5683	167.2162	173.1433	185.7612	201.6890	216.6589 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322	35.6322 (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)	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574	-101.0574 (71)
Water heating gains (Table 5)	149.0942	146.6136	141.8350	131.3618	124.9467	118.2412	114.1227	117.5254	121.5149	128.9553	138.9951	147.7551 (72)
Total internal gains	569.9232	583.7524	559.0891	540.3404	513.6550	493.3220	474.8603	475.9110	490.1698	508.8857	539.1958	558.5833 (73)

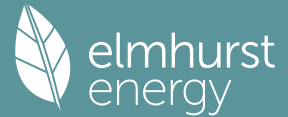
6. Solar gains

[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											
Northeast	4.0500											13.9653 (75)
Southwest	4.8400											54.4242 (79)
Solar gains	68.3895	121.1313	178.0583	241.2751	289.0986	295.2997	281.2498	244.3037	199.7509	137.1980	82.7596	57.9805 (83)
Total gains	638.3127	704.8837	737.1474	781.6155	802.7536	788.6217	756.1101	720.2146	689.9207	646.0837	621.9554	616.5639 (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	26.5790	26.6577	26.7353	27.1059	27.1764	27.5095	27.5095	27.5720	27.3802	27.1764	27.0342	26.8871
alpha	2.7719	2.7772	2.7824	2.8071	2.8118	2.8340	2.8340	2.8381	2.8253	2.8118	2.8023	2.7925
util living area												
	0.9404	0.9203	0.8922	0.8307	0.7336	0.5882	0.4552	0.4905	0.6748	0.8414	0.9158	0.9451 (86)
MIT	18.8274	19.0912	19.4748	20.0137	20.4760	20.8052	20.9310	20.9130	20.6948	20.1204	19.4106	18.7938 (87)

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Th 2	20.0459	20.0485	20.0510	20.0627	20.0649	20.0752	20.0752	20.0771	20.0713	20.0649	20.0605	20.0558 (88)
util rest of house	0.9324	0.9098	0.8773	0.8063	0.6932	0.5245	0.3710	0.4065	0.6162	0.8138	0.9029	0.9377 (89)
MIT 2	17.5121	17.8445	18.3264	18.9974	19.5479	19.9165	20.0338	20.0221	19.8054	19.1394	18.2585	17.4760 (90)
Living area fraction									fLA = Living area / (4) =			0.4487 (91)
MIT	18.1023	18.4039	18.8417	19.4534	19.9643	20.3153	20.4364	20.4219	20.2045	19.5796	18.7754	18.0673 (92)
Temperature adjustment												0.0000
adjusted MIT	18.1023	18.4039	18.8417	19.4534	19.9643	20.3153	20.4364	20.4219	20.2045	19.5796	18.7754	18.0673 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9111	0.8868	0.8543	0.7881	0.6884	0.5419	0.4050	0.4390	0.6252	0.7971	0.8809	0.9172	(94)
Useful gains	581.5609	625.1196	629.7476	616.0190	552.6283	427.3174	306.2038	316.1863	431.3709	515.0026	547.8881	565.5270	(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	1204.9042	1175.3761	1071.0969	903.3765	705.5951	482.0534	323.5778	338.4521	517.3101	766.6652	1002.0750	1196.7075	(97)
Space heating kWh	463.7674	369.7724	328.3639	206.8974	113.8073	0.0000	0.0000	0.0000	0.0000	187.2370	327.0146	469.5983	(98a)
Space heating requirement - total per year (kWh/year)												2466.4583	
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	463.7674	369.7724	328.3639	206.8974	113.8073	0.0000	0.0000	0.0000	0.0000	187.2370	327.0146	469.5983	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2466.4583	
Space heating per m2										(98c) / (4) =		29.5278	(99)

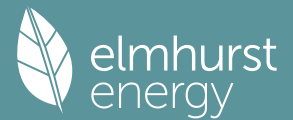
9a. Energy requirements - Individual heating systems, including micro-CHP

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	463.7674	369.7724	328.3639	206.8974	113.8073	0.0000	0.0000	0.0000	0.0000	187.2370	327.0146	469.5983	(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)	502.4566	400.6201	355.7572	224.1576	123.3015	0.0000	0.0000	0.0000	0.0000	202.8570	354.2953	508.7739	(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	233.9389	206.8589	219.9451	194.1091	188.5911	170.4245	168.6766	175.1843	176.8686	196.6095	208.2584	231.5062	(64)
Efficiency of water heater	85.5643	85.3469	84.9565	84.2031	82.9646	79.8000	79.8000	79.8000	79.8000	83.9504	85.0672	85.6117	(216)
Fuel for water heating, kWh/month	273.4070	242.3741	258.8914	230.5249	227.3152	213.5645	211.3742	219.5292	221.6398	234.1973	244.8162	270.4141	(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	27.0681	21.7150	19.5520	14.3246	11.0647	9.0400	10.0936	13.1201	17.0417	22.3596	25.2551	27.8204	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-15.7442	-23.7833	-36.5914	-44.1204	-50.2235	-47.8474	-47.2676	-43.3045	-36.7940	-28.4744	-17.8642	-13.4333	(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)	-4.6399	-10.0609	-20.5764	-31.7809	-42.9033	-43.4416	-42.9293	-35.9346	-25.8059	-14.6644	-6.2809	-3.6470	(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													2672.2192 (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													2848.0480 (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)													218.4551 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-688.1133 (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													5136.6090 (238)

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

Energy	Emission factor	Emissions
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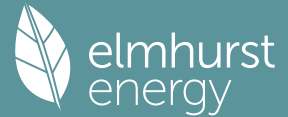


	kWh/year	kg CO2/kWh	kg CO2/year
Space heating - main system 1	2672.2192	0.2100	561.1660 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2848.0480	0.2100	598.0901 (264)
Space and water heating			1159.2561 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	218.4551	0.1443	31.5298 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-405.4481	0.1332	-53.9958
PV Unit electricity exported	-282.6651	0.1251	-35.3574
Total			-89.3532 (269)
Total CO2, kg/year			1113.3620 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.3300 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2672.2192	1.1300	3019.6077 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2848.0480	1.1300	3218.2942 (278)
Space and water heating			6237.9019 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	218.4551	1.5338	335.0737 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-405.4481	1.4921	-604.9749
PV Unit electricity exported	-282.6651	0.4591	-129.7745
Total			-734.7494 (283)
Total Primary energy kWh/year			5968.3270 (286)
Target Primary Energy Rate (TPER)			71.4500 (287)

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Property Reference	Flat 1.03			Issued on Date	22/04/2024
Assessment Reference	Baseline	Prop Type Ref			
Property	Christchurch Hall, , 38, Portland Street, Bristol, BS8 4JB				
SAP Rating	74 C	DER	26.30	TER	17.13
Environmental	80 C	% DER < TER			-53.53
CO ₂ Emissions (t/year)	1.33	DFEE	84.91	TFEE	42.51
Compliance Check	See BREL	% DFEE < TFEE			-99.73
% DPER < TPER	-64.68	DPER	152.07	TPER	92.34
Assessor Details	Mr. Jordan Howlett			Assessor ID	H055-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	59.0900 (1b)	3.0000 (2b)	177.2700 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.0900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	177.2700 (5)

2. Ventilation rate

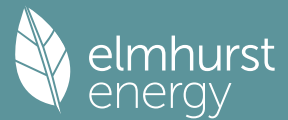
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1128 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8628 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7334 (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)
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	0.9351	0.9167	0.8984	0.8067	0.7884	0.6967	0.6967	0.6784	0.7334	0.7884	0.8251	0.8617 (22b)
Effective ac	0.9372	0.9202	0.9036	0.8254	0.8108	0.7427	0.7427	0.7301	0.7689	0.8108	0.8404	0.8713 (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
External Door			2.1000	1.4000	2.9400		(26)
Window (Uw = 1.40)			4.8500	1.3258	6.4299		(27)
Exposed Floor Above Office			59.0900	0.2500	14.7725		(28b)
External Wall	46.8000	4.8500	41.9500	0.3000	12.5850		(29a)
Corridor wall	34.2000	2.1000	32.1000	0.3000	9.6300		(29a)
Total net area of external elements Aum(A, m ²)			140.0900				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	46.3574	(33)
Party Wall			19.8000	0.0000	0.0000		(32)
Party Ceiling			59.0900				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							28.0180 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	74.3754 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	54.8248	53.8317	52.8582	48.2860	47.4305	43.4482	43.4482
Heat transfer coeff	129.2002	128.2071	127.2337	122.6614	121.8059	117.8236	117.8236
						117.0862	119.3575
							121.8059
							123.5365
							125.3458 (39)

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Average = Sum(39)m / 12 =

122.6573

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	2.1865	2.1697	2.1532	2.0758	2.0614	1.9940	1.9940	1.9815	2.0199	2.0614	2.0907	2.1213	(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													1.9558 (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													
24.6401	24.2742	23.7589	22.8087	22.0973	21.3083	20.8822	21.3939	21.9511	22.7953	23.7650	24.5568	24.5568	(42b)
Hot water usage for other uses													
34.6593	33.3989	32.1386	30.8782	29.6179	28.3576	28.3576	29.6179	30.8782	32.1386	33.3989	34.6593	34.6593	(42c)
Average daily hot water use (litres/day)													54.3537 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	59.2994	57.6731	55.8975	53.6870	51.7152	49.6659	49.2398	51.0118	52.8294	54.9338	57.1639	59.2161	(44)
Energy conte	93.9158	82.1258	85.9123	73.4948	69.6186	61.0700	59.5513	63.1633	65.1439	74.5447	81.4405	92.7181	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													902.6990
14.0874	12.3189	12.8868	11.0242	10.4428	9.1605	8.9327	9.4745	9.7716	11.1817	12.2161	13.9077	13.9077	(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	25.3123	22.8583	25.3008	24.4741	25.2827	24.4604	25.2727	25.2771	24.4665	25.2902	24.4847	25.3111	(61)
Total heat required for water heating calculated for each month													
119.2280	104.9840	111.2131	97.9689	94.9013	85.5304	84.8240	88.4404	89.6104	99.8349	105.9252	118.0292	118.0292	(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													
119.2280	104.9840	111.2131	97.9689	94.9013	85.5304	84.8240	88.4404	89.6104	99.8349	105.9252	118.0292	118.0292	(64)
12Total per year (kWh/year)													1200.4898 (64)
Electric shower(s)													1200 (64)
45.6569	40.6807	44.4217	42.3911	43.1866	41.1958	42.5690	43.1866	42.3911	44.4217	43.5864	45.6569	45.6569	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													519.3447 (64a)
Heat gains from water heating, kWh/month													
48.9693	43.1916	45.9965	41.1533	40.2655	36.7198	36.7612	38.1177	38.3748	42.2141	44.0967	48.5708	48.5708	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	97.7896	97.7896	97.7896	97.7896	97.7896	97.7896	97.7896	97.7896	97.7896	97.7896	97.7896	97.7896	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
103.3976	114.4759	103.3976	106.8442	103.3976	106.8442	103.3976	103.3976	106.8442	103.3976	106.8442	103.3976	103.3976	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
170.6462	172.4170	167.9547	158.4550	146.4633	135.1929	127.6635	125.8927	130.3550	139.8547	151.8464	163.1168	163.1168	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
32.7790	32.7790	32.7790	32.7790	32.7790	32.7790	32.7790	32.7790	32.7790	32.7790	32.7790	32.7790	32.7790	(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)													
-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	(71)
Water heating gains (Table 5)													
65.8189	64.2732	61.8232	57.1574	54.1203	50.9998	49.4102	51.2335	53.2983	56.7394	61.2455	65.2833	65.2833	(72)
Total internal gains													
395.1996	406.5029	388.5124	377.7934	359.3181	345.3737	332.8082	332.8607	342.8344	355.3286	375.2729	387.1346	387.1346	(73)

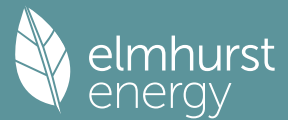
6. Solar gains

[Jan]													
	Area	Solar flux	g	FF	Access	Gains							
	m2	Table 6a	or Table 6b	Specific data	factor	W							
		W/m2		or Table 6c	Table 6d								
Northwest	4.8500	11.2829	0.6300	0.7000	0.7700	16.7238 (81)							
Solar gains	16.7238	34.0419	61.3326	100.7257	135.3951	144.3456	135.0323	107.6493	74.7347	41.6018	21.0429	13.6575	(83)
Total gains	411.9234	440.5448	449.8450	478.5192	494.7133	489.7193	467.8405	440.5100	417.5691	396.9304	396.3158	400.7921	(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	12.7042	12.8026	12.9006	13.3815	13.4754	13.9309	13.9309	14.0186	13.7519	13.4754	13.2867	13.0949	
alpha	1.8469	1.8535	1.8600	1.8921	1.8984	1.9287	1.9287	1.9346	1.9168	1.8984	1.8858	1.8730	
util living area													
0.9617	0.9545	0.9442	0.9173	0.8715	0.7875	0.6918	0.7230	0.8444	0.9214	0.9508	0.9635	0.9635	(86)
MIT	16.5541	16.8323	17.3826	18.2792	19.1662	20.0186	20.4811	20.4116	19.7546	18.6451	17.5257	16.5804	(87)
Th 2	19.2119	19.2226	19.2331	19.2833	19.2927	19.3374	19.3374	19.3457	19.3201	19.2927	19.2736	19.2537	(88)
util rest of house													
0.9539	0.9451	0.9316	0.8959	0.8305	0.7006	0.5319	0.5763	0.7776	0.8969	0.9391	0.9562	0.9562	(89)
MIT 2	15.3411	15.6223	16.1739	17.0840	17.9495	18.7645	19.1411	19.1024	18.5312	17.4559	16.3401	15.3892	(90)
Living area fraction													
16.0136	16.2931	16.8440	17.7466	18.6240	19.4598	19.8840	19.8282	19.2095	18.1152	16.9974	16.0496	16.0496	(91)
MIT													
Temperature adjustment													0.0000
adjusted MIT	16.0136	16.2931	16.8440	17.7466	18.6240	19.4598	19.8840	19.8282	19.2095	18.1152	16.9974	16.0496	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9325	0.9217	0.9063	0.8690	0.8092	0.7086	0.5946	0.6282	0.7719	0.8728	0.9160	0.9357	(94)
Useful gains	384.1340	406.0575	407.6892	415.8231	400.3047	347.0132	278.1644	276.7221	322.3125	346.4310	363.0197	375.0291	(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	1513.3990	1460.6815	1316.1020	1085.1417	843.3861	572.5952	386.9335	401.3961	609.8549	915.3941	1222.6892	1485.3025	(97)
Space heating kWh	840.1732	708.7073	675.8591	481.9094	329.6525	0.0000	0.0000	0.0000	0.0000	423.3086	618.9620	826.0434	(98a)
Space heating requirement - total per year (kWh/year)												4904.6155	
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	840.1732	708.7073	675.8591	481.9094	329.6525	0.0000	0.0000	0.0000	0.0000	423.3086	618.9620	826.0434	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4904.6155	
Space heating per m2												83.0025	(99)
													(98c) / (4) =

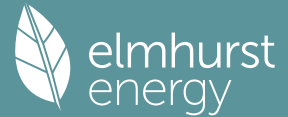
9a. Energy requirements - Individual heating systems, including micro-CHP

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 %)													89.2000	(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	840.1732	708.7073	675.8591	481.9094	329.6525	0.0000	0.0000	0.0000	0.0000	423.3086	618.9620	826.0434	(98)	
Space heating efficiency (main heating system 1)	89.2000	89.2000	89.2000	89.2000	89.2000	0.0000	0.0000	0.0000	0.0000	89.2000	89.2000	89.2000	(210)	
Space heating fuel (main heating system)	941.8982	794.5149	757.6896	540.2571	369.5656	0.0000	0.0000	0.0000	0.0000	474.5612	693.9036	926.0576	(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	119.2280	104.9840	111.2131	97.9689	94.9013	85.5304	84.8240	88.4404	89.6104	99.8349	105.9252	118.0292	(64)	
Efficiency of water heater (217)m	88.9465	88.9368	88.9119	88.8557	88.7450	87.2000	87.2000	87.2000	87.2000	88.8113	88.9020	88.9450	(216)	
Fuel for water heating, kWh/month	134.0447	118.0434	125.0824	110.2562	106.9370	98.0854	97.2752	101.4225	102.7642	112.4124	119.1482	132.6991	(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	25.9356	20.8065	18.7340	13.7253	10.6018	8.6618	9.6713	12.5712	16.3287	21.4241	24.1985	26.6565	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)														
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)														
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)														
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)	
Electricity generated by PVs (Appendix M) (negative quantity)														
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)														
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)														
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)	
Annual totals kWh/year														
Space heating fuel - main system 1												5498.4478	(211)	
Space heating fuel - main system 2												0.0000	(213)	
Space heating fuel - secondary												0.0000	(215)	
Efficiency of water heater												87.2000		
Water heating fuel used												1358.1707	(219)	
Space cooling fuel												0.0000	(221)	
Electricity for pumps and fans:														
central heating pump												41.0000	(230c)	
main heating flue fan												45.0000	(230e)	
Total electricity for the above, kWh/year												86.0000	(231)	
Electricity for lighting (calculated in Appendix L)												209.3154	(232)	
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation												0.0000	(233)	
Wind generation												0.0000	(234)	
Hydro-electric generation (Appendix N)												0.0000	(235a)	
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)	
Appendix Q - special features														
Energy saved or generated												-0.0000	(236)	
Energy used												0.0000	(237)	
Total delivered energy for all uses												7671.2785	(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	5498.4478	0.2100	1154.6740	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1358.1707	0.2100	285.2158	(264)
Energy for instantaneous electric shower(s)	519.3447	0.1391	72.2523	(264a)
Space and water heating			1439.8899	(265)

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Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	209.3154	0.1443	30.2107 (268)
Total CO2, kg/year			1554.2822 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			26.3000 (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	5498.4478	1.1300	6213.2460 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1358.1707	1.1300	1534.7329 (278)
Energy for instantaneous electric shower(s)	519.3447	1.5143	786.4614 (278a)
Space and water heating			7747.9789 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	209.3154	1.5338	321.0549 (282)
Total Primary energy kWh/year			8985.5960 (286)
Dwelling Primary energy Rate (DPER)			152.0700 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	59.0900 (1b)	3.0000 (2b)	177.2700 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.0900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	177.2700 (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) = 0.1128 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3628 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3084 (21)

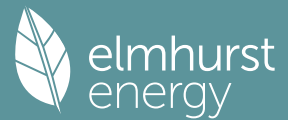
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3932	0.3855	0.3778	0.3392	0.3315	0.2930	0.2930	0.2853	0.3084	0.3315	0.3469	0.3624 (22b)
Effective ac	0.5773	0.5743	0.5714	0.5575	0.5550	0.5429	0.5429	0.5407	0.5476	0.5550	0.5602	0.5657 (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
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type (Uw = 1.20)			4.8500	1.1450	5.5534		(27)
Exposed Floor Above Office			59.0900	0.1300	7.6817		(28b)
External Wall	46.8000	4.8500	41.9500	0.1800	7.5510		(29a)
Corridor wall	34.2000	2.1000	32.1000	0.1800	5.7780		(29a)
Total net area of external elements Aum(A, m2)			140.0900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	28.6641			(33)
Party Wall			19.8000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							7.0045 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	35.6686 (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	33.7719	33.5963	33.4242	32.6157	32.4644	31.7602	31.7602	31.6298	32.0315	32.4644	32.7704	33.0903 (38)
Heat transfer coeff	69.4405	69.2649	69.0928	68.2843	68.1330	67.4289	67.4289	67.2985	67.7001	68.1330	68.4391	68.7590 (39)
Average = Sum(39)m / 12 =												68.2836

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HLP	1.1752	1.1722	1.1693	1.1556	1.1530	1.1411	1.1411	1.1389	1.1457	1.1530	1.1582	1.1636 (40)
HLP (average)												1.1556
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9558 (42)
Hot water usage for mixer showers												
57.0117	56.1550	54.9065	52.5177	50.7549	48.7890	47.6715	48.9106	50.2688	52.3796	54.8197	56.7933	(42a)
Hot water usage for baths												
24.6401	24.2742	23.7589	22.8087	22.0973	21.3083	20.8822	21.3939	21.9511	22.7953	23.7650	24.5568	(42b)
Hot water usage for other uses												
34.6593	33.3989	32.1386	30.8782	29.6179	28.3576	28.3576	29.6179	30.8782	32.1386	33.3989	34.6593	(42c)
Average daily hot water use (litres/day)												106.9166 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use												
116.3112	113.8281	110.8039	106.2047	102.4700	98.4549	96.9113	99.9224	103.0982	107.3134	111.9836	116.0094	(44)
Energy conte	184.2084	162.0897	170.3015	145.3889	137.9444	121.0618	117.2059	123.7248	127.1303	145.6233	159.5411	181.6427 (45)
Energy content (annual)												Total = Sum(45)m = 1775.8630
Distribution loss (46)m = 0.15 x (45)m												
27.6313	24.3135	25.5452	21.8083	20.6917	18.1593	17.5809	18.5587	19.0696	21.8435	23.9312	27.2464	(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	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	48.5531	49.3850	50.9194	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
235.1673	208.1171	221.2604	194.7040	188.9033	169.6149	166.5908	174.6442	176.4454	196.5822	208.8562	232.6016	(62)
WWHRS	-26.0634	-23.0507	-24.1373	-19.9867	-18.6269	-15.9391	-14.9404	-15.8876	-16.4912	-19.4414	-22.0247	-25.5807 (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												
209.1039	185.0664	197.1231	174.7173	170.2764	153.6757	151.6504	158.7566	159.9542	177.1409	186.8315	207.0209	(64)
12Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m = 2131.3174 (64)
Electric shower(s)												2131 (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												
73.9890	65.4017	69.3650	60.6706	58.6062	52.3913	51.3172	53.8684	54.5996	61.1595	65.3762	73.1359	(65)

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

Metabolic gains (Table 5), Watts												
(66)m	97.7896	97.7896	97.7896	97.7896	97.7896	97.7896	97.7896	97.7896	97.7896	97.7896	97.7896	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
103.3976	114.4759	103.3976	106.8442	103.3976	106.8442	103.3976	103.3976	106.8442	103.3976	106.8442	103.3976	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
170.6462	172.4170	167.9547	158.4550	146.4633	135.1929	127.6635	125.8927	130.3550	139.8547	151.8464	163.1168	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
32.7790	32.7790	32.7790	32.7790	32.7790	32.7790	32.7790	32.7790	32.7790	32.7790	32.7790	32.7790	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	(71)
Water heating gains (Table 5)												
99.4476	97.3239	93.2325	84.2647	78.7718	72.7657	68.9747	72.4037	75.8328	82.2036	90.8003	98.3010	(72)
Total internal gains												
428.8283	439.5537	419.9217	404.9008	383.9696	367.1397	352.3727	354.0309	365.3689	380.7928	404.8277	420.1523	(73)

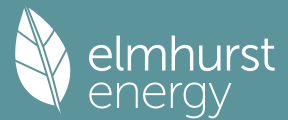
6. Solar gains

[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												
Northwest	4.8500	11.2829	0.6300	0.7000	0.7700	16.7238	(81)					
Solar gains	16.7238	34.0419	61.3326	100.7257	135.3951	144.3456	135.0323	107.6493	74.7347	41.6018	21.0429	13.6575 (83)
Total gains	445.5521	473.5955	481.2543	505.6265	519.3648	511.4852	487.4050	461.6802	440.1036	422.3946	425.8706	433.8098 (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	23.6373	23.6973	23.7563	24.0376	24.0909	24.3425	24.3425	24.3897	24.2450	24.0909	23.9832	23.8716
alpha	2.5758	2.5798	2.5838	2.6025	2.6061	2.6228	2.6228	2.6260	2.6163	2.6061	2.5989	2.5914
util living area	0.9458	0.9338	0.9158	0.8697	0.7902	0.6600	0.5311	0.5695	0.7447	0.8759	0.9276	0.9491 (86)
MIT	18.4743	18.6954	19.0764	19.6687	20.2304	20.6748	20.8690	20.8383	20.5182	19.8327	19.0857	18.4465 (87)
Th 2	19.9399	19.9423	19.9447	19.9557	19.9578	19.9674	19.9674	19.9692	19.9637	19.9578	19.9536	19.9492 (88)
util rest of house												
0.9380	0.9241	0.9027	0.8477	0.7509	0.5907	0.4300	0.4708	0.6852	0.8508	0.9155	0.9418	(89)
MIT 2	17.0069	17.2870	17.7693	18.5135	19.1942	19.7018	19.8899	19.8676	19.5406	18.7270	17.7907	16.9771 (90)
Living area fraction									fLA = Living area / (4) =			0.5544 (91)
MIT	17.8204	18.0678	18.4939	19.1540	19.7686	20.2412	20.4327	20.4058	20.0826	19.3400	18.5087	17.7918 (92)
Temperature adjustment												0.0000
adjusted MIT	17.8204	18.0678	18.4939	19.1540	19.7686	20.2412	20.4327	20.4058	20.0826	19.3400	18.5087	17.7918 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9172	0.9020	0.8799	0.8275	0.7429	0.6104	0.4778	0.5150	0.6928	0.8328	0.8940	0.9217	(94)
Useful gains	408.6601	427.1691	423.4625	418.4185	385.8370	312.2330	232.8789	237.7471	304.9045	351.7530	380.7159	399.8416	(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	938.8668	912.0673	828.6954	700.1851	549.7410	380.3817	258.4356	269.5825	405.0216	595.4834	780.7990	934.5566	(97)
Space heating kWh	394.4738	325.8516	301.4933	202.8720	121.9446	0.0000	0.0000	0.0000	0.0000	181.3354	288.0598	397.8279	(98a)
Space heating requirement - total per year (kWh/year)												2213.8585	
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	394.4738	325.8516	301.4933	202.8720	121.9446	0.0000	0.0000	0.0000	0.0000	181.3354	288.0598	397.8279	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2213.8585	
Space heating per m2											(98c) / (4) =	37.4659	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	394.4738	325.8516	301.4933	202.8720	121.9446	0.0000	0.0000	0.0000	0.0000	181.3354	288.0598	397.8279	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	426.9197	352.6532	326.2914	219.5585	131.9746	0.0000	0.0000	0.0000	0.0000	196.2505	311.7531	430.5497	(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	209.1039	185.0664	197.1231	174.7173	170.2764	153.6757	151.6504	158.7566	159.9542	177.1409	186.8315	207.0209	(64)
Efficiency of water heater (217)m	85.7195	85.5800	85.2888	84.7025	83.6780	80.3000	80.3000	80.3000	80.3000	84.4317	85.3057	80.3000	(216)
Fuel for water heating, kWh/month	243.9397	216.2495	231.1241	206.2718	203.4901	191.3770	188.8548	197.7044	199.1957	209.8039	219.0141	241.4055	(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	21.4840	17.2353	15.5184	11.3695	8.7821	7.1751	8.0113	10.4134	13.5260	17.7469	20.0450	22.0811	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-11.2647	-17.0859	-26.3953	-31.9675	-36.5256	-34.8610	-34.4552	-31.5110	-26.6797	-20.5307	-12.8103	-9.6048	(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	-3.1552	-6.8559	-14.0458	-21.7259	-29.3533	-29.7178	-29.3510	-24.5435	-17.6042	-9.9861	-4.2702	-2.4779	(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												2395.9507	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2548.4307	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												173.3881	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-486.7785	(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												4716.9909	(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	2395.9507	0.2100	503.1496	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2548.4307	0.2100	535.1704	(264)
Space and water heating			1038.3201	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	173.3881	0.1443	25.0253	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-293.6916	0.1331	-39.0852	
PV Unit electricity exported	-193.0869	0.1251	-24.1470	

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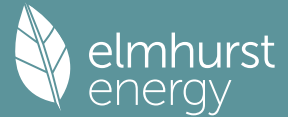


Total	-63.2322 (269)
Total CO2, kg/year	1012.0424 (272)
EPC Target Carbon Dioxide Emission Rate (TER)	17.1300 (273)

----- 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	2395.9507	1.1300	2707.4243 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2548.4307	1.1300	2879.7267 (278)
Space and water heating			5587.1510 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	173.3881	1.5338	265.9484 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-293.6916	1.4918	-438.1186
PV Unit electricity exported	-193.0869	0.4590	-88.6283
Total			-526.7470 (283)
Total Primary energy kWh/year			5456.4532 (286)
Target Primary Energy Rate (TPER)			92.3400 (287)

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Property Reference	Flat 1.03			Issued on Date	22/04/2024
Assessment Reference	Additional Measures		Prop Type Ref		
Property	Christchurch Hall, , 38, Portland Street, Bristol, BS8 4JB				
SAP Rating	75 C	DER	24.23	TER	17.13
Environmental	82 B	% DER < TER			-41.45
CO ₂ Emissions (t/year)	1.22	DFEE	79.98	TFEE	42.51
Compliance Check	See BREL	% DFEE < TFEE			-88.12
% DPER < TPER	-52.15	DPER	140.50	TPER	92.34
Assessor Details	Mr. Jordan Howlett			Assessor ID	H055-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	59.0900 (1b)	3.0000 (2b)	177.2700 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.0900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	177.2700 (5)

2. Ventilation rate

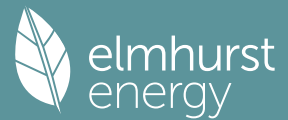
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1128 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8628 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7334 (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)
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	0.9351	0.9167	0.8984	0.8067	0.7884	0.6967	0.6967	0.6784	0.7334	0.7884	0.8251	0.8617 (22b)
Effective ac	0.9372	0.9202	0.9036	0.8254	0.8108	0.7427	0.7427	0.7301	0.7689	0.8108	0.8404	0.8713 (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
External Door			2.1000	1.4000	2.9400		(26)
Window (Uw = 1.40)			4.8500	1.3258	6.4299		(27)
Exposed Floor Above Office			59.0900	0.1800	10.6362		(28b)
External Wall	46.8000	4.8500	41.9500	0.2600	10.9070		(29a)
Corridor wall	34.2000	2.1000	32.1000	0.2600	8.3460		(29a)
Total net area of external elements Aum(A, m ²)			140.0900				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 39.2591		(33)
Party Wall			19.8000	0.0000	0.0000		(32)
Party Ceiling			59.0900				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							28.0180 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	67.2771 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	54.8248	53.8317	52.8582	48.2860	47.4305	43.4482	43.4482
Heat transfer coeff	122.1019	121.1088	120.1354	115.5631	114.7076	110.7253	110.7253
						109.9879	112.2592
							114.7076
							116.4382
							118.2475 (39)

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Average = Sum(39)m / 12 =

115.5590

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	2.0664	2.0496	2.0331	1.9557	1.9412	1.8738	1.8738	1.8614	1.8998	1.9412	1.9705	2.0011	(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													1.9558 (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													
24.6401	24.2742	23.7589	22.8087	22.0973	21.3083	20.8822	21.3939	21.9511	22.7953	23.7650	24.5568		(42b)
Hot water usage for other uses													
34.6593	33.3989	32.1386	30.8782	29.6179	28.3576	28.3576	29.6179	30.8782	32.1386	33.3989	34.6593		(42c)
Average daily hot water use (litres/day)													54.3537 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	59.2994	57.6731	55.8975	53.6870	51.7152	49.6659	49.2398	51.0118	52.8294	54.9338	57.1639	59.2161	(44)
Energy conte	93.9158	82.1258	85.9123	73.4948	69.6186	61.0700	59.5513	63.1633	65.1439	74.5447	81.4405	92.7181	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													902.6990
14.0874	12.3189	12.8868	11.0242	10.4428	9.1605	8.9327	9.4745	9.7716	11.1817	12.2161	13.9077		(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	25.3123	22.8583	25.3008	24.4741	25.2827	24.4604	25.2727	25.2771	24.4665	25.2902	24.4847	25.3111	(61)
Total heat required for water heating calculated for each month													
119.2280	104.9840	111.2131	97.9689	94.9013	85.5304	84.8240	88.4404	89.6104	99.8349	105.9252	118.0292		(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													
119.2280	104.9840	111.2131	97.9689	94.9013	85.5304	84.8240	88.4404	89.6104	99.8349	105.9252	118.0292		(64)
12Total per year (kWh/year)													1200.4898 (64)
Electric shower(s)													1200 (64)
45.6569	40.6807	44.4217	42.3911	43.1866	41.1958	42.5690	43.1866	42.3911	44.4217	43.5864	45.6569		(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													519.3447 (64a)
Heat gains from water heating, kWh/month													
48.9693	43.1916	45.9965	41.1533	40.2655	36.7198	36.7612	38.1177	38.3748	42.2141	44.0967	48.5708		(65)

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

Metabolic gains (Table 5), Watts													
(66)m	97.7896	97.7896	97.7896	97.7896	97.7896	97.7896	97.7896	97.7896	97.7896	97.7896	97.7896	97.7896	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
103.3976	114.4759	103.3976	106.8442	103.3976	106.8442	103.3976	103.3976	106.8442	103.3976	106.8442	103.3976	103.3976	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
170.6462	172.4170	167.9547	158.4550	146.4633	135.1929	127.6635	125.8927	130.3550	139.8547	151.8464	163.1168	163.1168	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
32.7790	32.7790	32.7790	32.7790	32.7790	32.7790	32.7790	32.7790	32.7790	32.7790	32.7790	32.7790	32.7790	(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)													
-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	(71)
Water heating gains (Table 5)													
65.8189	64.2732	61.8232	57.1574	54.1203	50.9998	49.4102	51.2335	53.2983	56.7394	61.2455	65.2833	65.2833	(72)
Total internal gains													
395.1996	406.5029	388.5124	377.7934	359.3181	345.3737	332.8082	332.8607	342.8344	355.3286	375.2729	387.1346	387.1346	(73)

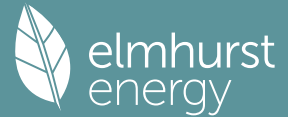
6. Solar gains

[Jan]												Gains
				Area	Solar flux		g		FF	Access		W
				m2	Table 6a	Specific data	or Table 6b	Specific data	or Table 6c	factor		
					W/m2					Table 6d		
Northwest				4.8500	11.2829		0.6300		0.7000	0.7700		16.7238 (81)
Solar gains	16.7238	34.0419	61.3326	100.7257	135.3951	144.3456	135.0323	107.6493	74.7347	41.6018	21.0429	13.6575 (83)
Total gains	411.9234	440.5448	449.8450	478.5192	494.7133	489.7193	467.8405	440.5100	417.5691	396.9304	396.3158	400.7921 (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	13.4428	13.5530	13.6628	14.2034	14.3093	14.8240	14.8240	14.9234	14.6214	14.3093	14.0967	13.8810
alpha	1.8962	1.9035	1.9109	1.9469	1.9540	1.9883	1.9883	1.9949	1.9748	1.9540	1.9398	1.9254
util living area	0.9612	0.9538	0.9431	0.9148	0.8668	0.7784	0.6787	0.7110	0.8382	0.9192	0.9499	0.9630 (86)
MIT	16.7115	16.9888	17.5284	18.4132	19.2747	20.0972	20.5323	20.4667	19.8381	18.7606	17.6692	16.7449 (87)
Th 2	19.2895	19.3005	19.3114	19.3630	19.3728	19.4188	19.4188	19.4274	19.4010	19.3728	19.3531	19.3326 (88)
util rest of house	0.9536	0.9445	0.9306	0.8937	0.8262	0.6934	0.5256	0.5698	0.7725	0.8949	0.9384	0.9559 (89)
MIT 2	14.5612	14.9092	15.5868	16.7005	17.7594	18.7404	19.1872	19.1396	18.4558	17.1443	15.7763	14.6104 (90)
Living area fraction									fLA = Living area / (4) =			0.5544 (91)
MIT	15.7533	16.0622	16.6633	17.6500	18.5995	19.4926	19.9329	19.8754	19.2222	18.0404	16.8258	15.7938 (92)
Temperature adjustment												0.0000
adjusted MIT	15.7533	16.0622	16.6633	17.6500	18.5995	19.4926	19.9329	19.8754	19.2222	18.0404	16.8258	15.7938 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9284	0.9170	0.9009	0.8620	0.8005	0.6983	0.5841	0.6179	0.7629	0.8662	0.9111	0.9318	(94)
Useful gains	382.4452	403.9931	405.2513	412.5012	396.0260	341.9840	273.2772	272.1923	318.5627	343.8228	361.0965	373.4742	(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	1398.4733	1351.8349	1220.9663	1011.1806	791.4278	541.7355	369.0400	382.2486	575.0111	853.4705	1132.4491	1370.9350	(97)
Space heating kWh	755.9249	636.9497	606.8919	431.0492	294.1790	0.0000	0.0000	0.0000	0.0000	379.1778	555.3739	742.1108	(98a)
Space heating requirement - total per year (kWh/year)												4401.6573	
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	755.9249	636.9497	606.8919	431.0492	294.1790	0.0000	0.0000	0.0000	0.0000	379.1778	555.3739	742.1108	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4401.6573	
Space heating per m2											(98c) / (4) =	74.4907	(99)

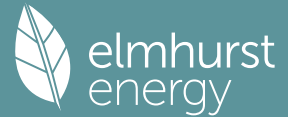
9a. Energy requirements - Individual heating systems, including micro-CHP

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 %)													89.2000	(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	755.9249	636.9497	606.8919	431.0492	294.1790	0.0000	0.0000	0.0000	0.0000	379.1778	555.3739	742.1108	(98)	
Space heating efficiency (main heating system 1)	89.2000	89.2000	89.2000	89.2000	89.2000	0.0000	0.0000	0.0000	0.0000	89.2000	89.2000	89.2000	(210)	
Space heating fuel (main heating system)	847.4495	714.0692	680.3721	483.2390	329.7971	0.0000	0.0000	0.0000	0.0000	425.0872	622.6165	831.9628	(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	119.2280	104.9840	111.2131	97.9689	94.9013	85.5304	84.8240	88.4404	89.6104	99.8349	105.9252	118.0292	(64)	
Efficiency of water heater	88.9221	88.9114	88.8843	88.8227	88.7038	87.2000	87.2000	87.2000	87.2000	88.7756	88.8735	88.9201	(216)	
Fuel for water heating, kWh/month	134.0814	118.0771	125.1212	110.2971	106.9868	98.0854	97.2752	101.4225	102.7642	112.4575	119.1865	132.7362	(217)	
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	(219)	
(221)m	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)	
Pumps and Fa	22.1476	17.7676	15.9978	11.7207	9.0534	7.3967	8.2588	10.7351	13.9438	18.2951	20.6642	22.7632	(231)	
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	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)	
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)	
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	(235a)	
(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	(235a)	
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	(235c)	
(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	(235c)	
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)	
(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	(235d)	
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)	
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)	
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	(235b)	
(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	(235b)	
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	(235d)	
(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	(235d)	
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												4934.5933	(211)	
Space heating fuel - main system 2												0.0000	(213)	
Space heating fuel - secondary												0.0000	(215)	
Efficiency of water heater												87.2000		
Water heating fuel used												1358.4909	(219)	
Space cooling fuel												0.0000	(221)	
Electricity for pumps and fans:														
central heating pump													41.0000	(230c)
main heating flue fan													45.0000	(230e)
Total electricity for the above, kWh/year													86.0000	(231)
Electricity for lighting (calculated in Appendix L)													178.7440	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													0.0000	(233)
Wind generation													0.0000	(234)
Hydro-electric generation (Appendix N)													0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)													0.0000	(235)
Appendix Q - special features														
Energy saved or generated													-0.0000	(236)
Energy used													0.0000	(237)
Total delivered energy for all uses													7077.1729	(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	4934.5933	0.2100	1036.2646	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1358.4909	0.2100	285.2831	(264)
Energy for instantaneous electric shower(s)	519.3447	0.1391	72.2523	(264a)
Space and water heating			1321.5477	(265)

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Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	178.7440	0.1443	25.7983 (268)
Total CO2, kg/year			1431.5276 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			24.2300 (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	4934.5933	1.1300	5576.0905 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1358.4909	1.1300	1535.0947 (278)
Energy for instantaneous electric shower(s)	519.3447	1.5143	786.4614 (278a)
Space and water heating			7111.1852 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	178.7440	1.5338	274.1634 (282)
Total Primary energy kWh/year			8301.9108 (286)
Dwelling Primary energy Rate (DPER)			140.5000 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	59.0900 (1b)	x 3.0000 (2b)	= 177.2700 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.0900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 177.2700 (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) = 0.1128 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3628 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3084 (21)

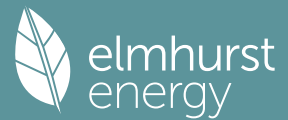
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3932	0.3855	0.3778	0.3392	0.3315	0.2930	0.2930	0.2853	0.3084	0.3315	0.3469	0.3624 (22b)
Effective ac	0.5773	0.5743	0.5714	0.5575	0.5550	0.5429	0.5429	0.5407	0.5476	0.5550	0.5602	0.5657 (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
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type (Uw = 1.20)			4.8500	1.1450	5.5534		(27)
Exposed Floor Above Office			59.0900	0.1300	7.6817		(28b)
External Wall	46.8000	4.8500	41.9500	0.1800	7.5510		(29a)
Corridor wall	34.2000	2.1000	32.1000	0.1800	5.7780		(29a)
Total net area of external elements Aum(A, m2)			140.0900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.6641		(33)
Party Wall			19.8000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							7.0045 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	35.6686 (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	33.7719	33.5963	33.4242	32.6157	32.4644	31.7602	31.7602	31.6298	32.0315	32.4644	32.7704	33.0903 (38)
Heat transfer coeff	69.4405	69.2649	69.0928	68.2843	68.1330	67.4289	67.4289	67.2985	67.7001	68.1330	68.4391	68.7590 (39)
Average = Sum(39)m / 12 =												68.2836

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HLP	1.1752	1.1722	1.1693	1.1556	1.1530	1.1411	1.1411	1.1389	1.1457	1.1530	1.1582	1.1636 (40)
HLP (average)												1.1556
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9558 (42)
Hot water usage for mixer showers												
57.0117	56.1550	54.9065	52.5177	50.7549	48.7890	47.6715	48.9106	50.2688	52.3796	54.8197	56.7933	(42a)
Hot water usage for baths												
24.6401	24.2742	23.7589	22.8087	22.0973	21.3083	20.8822	21.3939	21.9511	22.7953	23.7650	24.5568	(42b)
Hot water usage for other uses												
34.6593	33.3989	32.1386	30.8782	29.6179	28.3576	28.3576	29.6179	30.8782	32.1386	33.3989	34.6593	(42c)
Average daily hot water use (litres/day)												106.9166 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use												
116.3112	113.8281	110.8039	106.2047	102.4700	98.4549	96.9113	99.9224	103.0982	107.3134	111.9836	116.0094	(44)
Energy conte	184.2084	162.0897	170.3015	145.3889	137.9444	121.0618	117.2059	123.7248	127.1303	145.6233	159.5411	181.6427 (45)
Energy content (annual)												Total = Sum(45)m = 1775.8630
Distribution loss (46)m = 0.15 x (45)m												
27.6313	24.3135	25.5452	21.8083	20.6917	18.1593	17.5809	18.5587	19.0696	21.8435	23.9312	27.2464	(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	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	48.5531	49.3850	50.9194	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
235.1673	208.1171	221.2604	194.7040	188.9033	169.6149	166.5908	174.6442	176.4454	196.5822	208.8562	232.6016	(62)
WWHRS	-26.0634	-23.0507	-24.1373	-19.9867	-18.6269	-15.9391	-14.9404	-15.8876	-16.4912	-19.4414	-22.0247	-25.5807 (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												
209.1039	185.0664	197.1231	174.7173	170.2764	153.6757	151.6504	158.7566	159.9542	177.1409	186.8315	207.0209	(64)
12Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m = 2131.3174 (64)
Electric shower(s)												2131 (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)
												0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												
Heat gains from water heating, kWh/month												
73.9890	65.4017	69.3650	60.6706	58.6062	52.3913	51.3172	53.8684	54.5996	61.1595	65.3762	73.1359	(65)

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

Metabolic gains (Table 5), Watts												
(66)m	97.7896	97.7896	97.7896	97.7896	97.7896	97.7896	97.7896	97.7896	97.7896	97.7896	97.7896	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
103.3976	114.4759	103.3976	106.8442	103.3976	106.8442	103.3976	103.3976	106.8442	103.3976	106.8442	103.3976	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
170.6462	172.4170	167.9547	158.4550	146.4633	135.1929	127.6635	125.8927	130.3550	139.8547	151.8464	163.1168	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
32.7790	32.7790	32.7790	32.7790	32.7790	32.7790	32.7790	32.7790	32.7790	32.7790	32.7790	32.7790	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	(71)
Water heating gains (Table 5)												
99.4476	97.3239	93.2325	84.2647	78.7718	72.7657	68.9747	72.4037	75.8328	82.2036	90.8003	98.3010	(72)
Total internal gains												
428.8283	439.5537	419.9217	404.9008	383.9696	367.1397	352.3727	354.0309	365.3689	380.7928	404.8277	420.1523	(73)

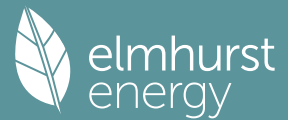
6. Solar gains

[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							
Northwest	4.8500	11.2829	0.6300	0.7000	0.7700	16.7238	(81)					
Solar gains	16.7238	34.0419	61.3326	100.7257	135.3951	144.3456	135.0323	107.6493	74.7347	41.6018	21.0429	13.6575 (83)
Total gains	445.5521	473.5955	481.2543	505.6265	519.3648	511.4852	487.4050	461.6802	440.1036	422.3946	425.8706	433.8098 (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	23.6373	23.6973	23.7563	24.0376	24.0909	24.3425	24.3425	24.3897	24.2450	24.0909	23.9832	23.8716
alpha	2.5758	2.5798	2.5838	2.6025	2.6061	2.6228	2.6228	2.6260	2.6163	2.6061	2.5989	2.5914
util living area	0.9458	0.9338	0.9158	0.8697	0.7902	0.6600	0.5311	0.5695	0.7447	0.8759	0.9276	0.9491 (86)
MIT	18.4743	18.6954	19.0764	19.6687	20.2304	20.6748	20.8690	20.8383	20.5182	19.8327	19.0857	18.4465 (87)
Th 2	19.9399	19.9423	19.9447	19.9557	19.9578	19.9674	19.9674	19.9692	19.9637	19.9578	19.9536	19.9492 (88)
util rest of house												
0.9380	0.9241	0.9027	0.8477	0.7509	0.5907	0.4300	0.4708	0.6852	0.8508	0.9155	0.9418	(89)
MIT 2	17.0069	17.2870	17.7693	18.5135	19.1942	19.7018	19.8899	19.8676	19.5406	18.7270	17.7907	16.9771 (90)
Living area fraction									fLA = Living area / (4) =			0.5544 (91)
MIT	17.8204	18.0678	18.4939	19.1540	19.7686	20.2412	20.4327	20.4058	20.0826	19.3400	18.5087	17.7918 (92)
Temperature adjustment												0.0000
adjusted MIT	17.8204	18.0678	18.4939	19.1540	19.7686	20.2412	20.4327	20.4058	20.0826	19.3400	18.5087	17.7918 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9172	0.9020	0.8799	0.8275	0.7429	0.6104	0.4778	0.5150	0.6928	0.8328	0.8940	0.9217	(94)
Useful gains	408.6601	427.1691	423.4625	418.4185	385.8370	312.2330	232.8789	237.7471	304.9045	351.7530	380.7159	399.8416	(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	938.8668	912.0673	828.6954	700.1851	549.7410	380.3817	258.4356	269.5825	405.0216	595.4834	780.7990	934.5566	(97)
Space heating kWh	394.4738	325.8516	301.4933	202.8720	121.9446	0.0000	0.0000	0.0000	0.0000	181.3354	288.0598	397.8279	(98a)
Space heating requirement - total per year (kWh/year)												2213.8585	
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	394.4738	325.8516	301.4933	202.8720	121.9446	0.0000	0.0000	0.0000	0.0000	181.3354	288.0598	397.8279	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2213.8585	
Space heating per m2											(98c) / (4) =	37.4659	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	394.4738	325.8516	301.4933	202.8720	121.9446	0.0000	0.0000	0.0000	0.0000	181.3354	288.0598	397.8279	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	426.9197	352.6532	326.2914	219.5585	131.9746	0.0000	0.0000	0.0000	0.0000	196.2505	311.7531	430.5497	(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	209.1039	185.0664	197.1231	174.7173	170.2764	153.6757	151.6504	158.7566	159.9542	177.1409	186.8315	207.0209	(64)
Efficiency of water heater (217)m	85.7195	85.5800	85.2888	84.7025	83.6780	80.3000	80.3000	80.3000	80.3000	84.4317	85.3057	80.3000	(216)
Fuel for water heating, kWh/month	243.9397	216.2495	231.1241	206.2718	203.4901	191.3770	188.8548	197.7044	199.1957	209.8039	219.0141	241.4055	(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	21.4840	17.2353	15.5184	11.3695	8.7821	7.1751	8.0113	10.4134	13.5260	17.7469	20.0450	22.0811	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-11.2647	-17.0859	-26.3953	-31.9675	-36.5256	-34.8610	-34.4552	-31.5110	-26.6797	-20.5307	-12.8103	-9.6048	(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	-3.1552	-6.8559	-14.0458	-21.7259	-29.3533	-29.7178	-29.3510	-24.5435	-17.6042	-9.9861	-4.2702	-2.4779	(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												2395.9507	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2548.4307	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												173.3881	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-486.7785	(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												4716.9909	(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	2395.9507	0.2100	503.1496	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2548.4307	0.2100	535.1704	(264)
Space and water heating			1038.3201	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	173.3881	0.1443	25.0253	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-293.6916	0.1331	-39.0852	
PV Unit electricity exported	-193.0869	0.1251	-24.1470	

Full SAP Calculation Printout

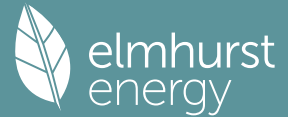


Total	-63.2322 (269)
Total CO2, kg/year	1012.0424 (272)
EPC Target Carbon Dioxide Emission Rate (TER)	17.1300 (273)

----- 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	2395.9507	1.1300	2707.4243 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2548.4307	1.1300	2879.7267 (278)
Space and water heating			5587.1510 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	173.3881	1.5338	265.9484 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-293.6916	1.4918	-438.1186
PV Unit electricity exported	-193.0869	0.4590	-88.6283
Total			-526.7470 (283)
Total Primary energy kWh/year			5456.4532 (286)
Target Primary Energy Rate (TPER)			92.3400 (287)

Full SAP Calculation Printout



Property Reference	Flat 1.03				Issued on Date	22/04/2024	
Assessment Reference	Renewables			Prop Type Ref			
Property	Christchurch Hall, , 38, Portland Street, Bristol, BS8 4JB						
SAP Rating	74 C	DER	6.96	TER	16.73		
Environmental	95 A	% DER < TER				58.40	
CO ₂ Emissions (t/year)	0.37	DFEE	79.98	TFEE	42.51		
Compliance Check	See BREL	% DFEE < TFEE				-88.12	
% DPER < TPER	18.79	DPER	73.26	TPER	90.21		
Assessor Details	Mr. Jordan Howlett				Assessor ID	H055-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	59.0900 (1b)	3.0000 (2b)	177.2700 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.0900		177.2700 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	177.2700 (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) = 0.1128 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8628 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7334 (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)
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	0.9351	0.9167	0.8984	0.8067	0.7884	0.6967	0.6967	0.6784	0.7334	0.7884	0.8251	0.8617 (22b)
Effective ac	0.9372	0.9202	0.9036	0.8254	0.8108	0.7427	0.7427	0.7301	0.7689	0.8108	0.8404	0.8713 (25)

3. Heat losses and heat loss parameter

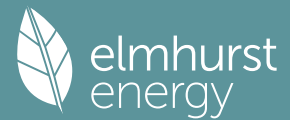
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
External Door			2.1000	1.4000	2.9400		(26)
Window (Uw = 1.40)			4.8500	1.3258	6.4299		(27)
Exposed Floor Above Office			59.0900	0.1800	10.6362		(28b)
External Wall	46.8000	4.8500	41.9500	0.2600	10.9070		(29a)
Corridor wall	34.2000	2.1000	32.1000	0.2600	8.3460		(29a)
Total net area of external elements Aum(A, m ²)			140.0900				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 39.2591		(33)
Party Wall			19.8000	0.0000	0.0000		(32)
Party Ceiling			59.0900				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							28.0180 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	67.2771 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	54.8248	53.8317	52.8582	48.2860	47.4305	43.4482	43.4482
Heat transfer coeff	122.1019	121.1088	120.1354	115.5631	114.7076	110.7253	110.7253
						109.9879	112.2592
							114.7076
							116.4382
							118.2475 (39)

elmhurst
energy

115.5590

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Full SAP Calculation Printout



MIT	18.8677	17.0956	17.6323	18.5103	19.3583	20.1636	20.5775	20.5181	19.9190	18.8590	17.7769	17.4373 (87)
Th 2	19.2895	19.3005	19.3114	19.3630	19.3728	19.4188	19.4188	19.4274	19.4010	19.3728	19.3531	19.3326 (88)
util rest of house												
	0.9446	0.9347	0.9189	0.8779	0.8044	0.6615	0.4905	0.5322	0.7400	0.8760	0.9262	0.9470 (89)
MIT 2	17.4298	15.0402	15.7129	16.8153	17.8518	18.8014	19.2155	19.1748	18.5371	17.2595	15.9075	15.5649 (90)
Living area fraction									fLA = Living area / (4) =			0.5544 (91)
MIT	18.2270	16.1798	16.7770	17.7550	18.6870	19.5566	19.9706	19.9195	19.3033	18.1463	16.9439	16.6029 (92)
Temperature adjustment												0.0000
adjusted MIT	18.2270	16.1798	16.7770	17.7550	18.6870	19.5566	19.9706	19.9195	19.3033	18.1463	16.9439	16.6029 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9377	0.9047	0.8871	0.8454	0.7801	0.6709	0.5526	0.5849	0.7345	0.8465	0.8965	0.9270	(94)
Useful gains	430.3108	441.0946	440.7272	444.2669	422.5945	362.1010	286.1415	286.9101	343.4158	375.7945	397.4386	415.0834	(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													
Space heating	1700.5152	1366.0775	1234.6346	1023.3156	801.4676	548.8219	373.2123	387.1052	584.1140	865.6167	1146.2081	1466.6167	(97)
Space heating requirement - total per year (kWh/year)	945.0321	621.5885	590.6671	416.9151	281.8815	0.0000	0.0000	0.0000	0.0000	364.4277	539.1140	782.3407	(98a)
Solar heating kWh												4541.9668	
Solar heating contribution - total per year (kWh/year)	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	945.0321	621.5885	590.6671	416.9151	281.8815	0.0000	0.0000	0.0000	0.0000	364.4277	539.1140	782.3407	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4541.9668	
Space heating per m2											(98c) / (4) =	76.8652	(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 %)													352.6420 (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	945.0321	621.5885	590.6671	416.9151	281.8815	0.0000	0.0000	0.0000	0.0000	364.4277	539.1140	782.3407 (98)	
Space heating efficiency (main heating system 1)	352.6420	352.6420	352.6420	352.6420	352.6420	0.0000	0.0000	0.0000	0.0000	352.6420	352.6420	352.6420 (210)	
Space heating fuel (main heating system)	267.9862	176.2661	167.4977	118.2262	79.9342	0.0000	0.0000	0.0000	0.0000	103.3421	152.8786	221.8513 (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	148.3146	131.2602	140.3111	126.1388	124.0174	113.7140	113.9501	117.5621	117.7879	128.9435	134.0845	147.1169 (64)	
Efficiency of water heater (217)m	188.0654	188.0654	188.0654	188.0654	188.0654	188.0654	188.0654	188.0654	188.0654	188.0654	188.0654	188.0654 (216)	
Fuel for water heating, kWh/month	78.8633	69.7949	74.6076	67.0717	65.9437	60.4651	60.5906	62.5113	62.6313	68.5631	71.2967	78.2264 (219)	
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)	
Lighting	22.1476	17.7676	15.9978	11.7207	9.0534	7.3967	8.2588	10.7351	13.9438	18.2951	20.6642	22.7632 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1													1287.9824 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													188.0654
Water heating fuel used													820.5660 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year													0.0000 (231)
Electricity for lighting (calculated in Appendix L)													178.7440 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													0.0000 (233)
Wind generation													0.0000 (234)
Hydro-electric generation (Appendix N)													0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (235)
Appendix Q - special features													
Energy saved or generated													-0.0000 (236)
Energy used													0.0000 (237)
Total delivered energy for all uses													2806.6370 (238)

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

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	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1287.9824	0.1539	198.2701 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	820.5660	0.1404	115.1977 (264)
Energy for instantaneous electric shower(s)	519.3447	0.1391	72.2523 (264a)
Space and water heating			313.4678 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	178.7440	0.1443	25.7983 (268)
Total CO2, kg/year			411.5184 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.9600 (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	1287.9824	1.5699	2021.9513 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	820.5660	1.5191	1246.5039 (278)
Energy for instantaneous electric shower(s)	519.3447	1.5143	786.4614 (278a)
Space and water heating			3268.4551 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	178.7440	1.5338	274.1634 (282)
Total Primary energy kWh/year			4329.0799 (286)
Dwelling Primary energy Rate (DPER)			73.2600 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	59.0900 (1b)	x 3.0000 (2b)	= 177.2700 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.0900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 177.2700 (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) = 0.1128 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3628 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3084 (21)

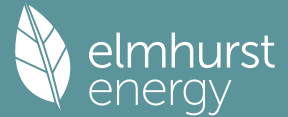
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3932	0.3855	0.3778	0.3392	0.3315	0.2930	0.2930	0.2853	0.3084	0.3315	0.3469	0.3624 (22b)
Effective ac	0.5773	0.5743	0.5714	0.5575	0.5550	0.5429	0.5429	0.5407	0.5476	0.5550	0.5602	0.5657 (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
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type (Uw = 1.20)			4.8500	1.1450	5.5534		(27)
Exposed Floor Above Office			59.0900	0.1300	7.6817		(28b)
External Wall	46.8000		41.9500	0.1800	7.5510		(29a)
Corridor wall	34.2000	2.1000	32.1000	0.1800	5.7780		(29a)
Total net area of external elements Aum(A, m2)			140.0900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.6641		(33)
Party Wall			19.8000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							7.0045 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	35.6686 (37)

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

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(38)m	Jan 33.7719	Feb 33.5963	Mar 33.4242	Apr 32.6157	May 32.4644	Jun 31.7602	Jul 31.7602	Aug 31.6298	Sep 32.0315	Oct 32.4644	Nov 32.7704	Dec 33.0903	(38)
Heat transfer coeff	69.4405	69.2649	69.0928	68.2843	68.1330	67.4289	67.4289	67.2985	67.7001	68.1330	68.4391	68.7590	(39)
Average = Sum(39)m / 12 =												68.2836	
HLP	Jan 1.1752	Feb 1.1722	Mar 1.1693	Apr 1.1556	May 1.1530	Jun 1.1411	Jul 1.1411	Aug 1.1389	Sep 1.1457	Oct 1.1530	Nov 1.1582	Dec 1.1636	(40)
HLP (average)												1.1556	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.9558	(42)
Hot water usage for mixer showers														
57.0117	56.1550	54.9065	52.5177	50.7549	48.7890	47.6715	48.9106	50.2688	52.3796	54.8197	56.7933	56.7933	(42a)	
Hot water usage for baths														
24.6401	24.2742	23.7589	22.8087	22.0973	21.3083	20.8822	21.3939	21.9511	22.7953	23.7650	24.5568	24.5568	(42b)	
Hot water usage for other uses														
34.6593	33.3989	32.1386	30.8782	29.6179	28.3576	28.3576	29.6179	30.8782	32.1386	33.3989	34.6593	34.6593	(42c)	
Average daily hot water use (litres/day)												106.9166	(43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
116.3112	113.8281	110.8039	106.2047	102.4700	98.4549	96.9113	99.9224	103.0982	107.3134	111.9836	116.0094	116.0094	(44)	
Energy content (annual)	184.2084	162.0897	170.3015	145.3889	137.9444	121.0618	117.2059	123.7248	127.1303	145.6233	159.5411	181.6427	(45)	
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1775.8630		
27.6313	24.3135	25.5452	21.8083	20.6917	18.1593	17.5809	18.5587	19.0696	21.8435	23.9312	27.2464	27.2464	(46)	
Water storage loss:														
Store volume												180.0000	(47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.5520	(48)	
Temperature factor from Table 2b												0.5400	(49)	
Enter (49) or (54) in (55)												0.8381	(55)	
Total storage loss														
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	(56)	
If cylinder contains dedicated solar storage														
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	(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														
233.4511	206.5669	219.5442	193.0431	187.1870	168.7160	166.4485	172.9675	174.7845	194.8660	207.1953	230.8854	230.8854	(62)	
WWHRS	-26.0634	-23.0507	-24.1373	-19.9867	-18.6269	-15.9391	-14.9404	-15.8876	-16.4912	-19.4414	-22.0247	-25.5807	(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	207.3877	183.5163	195.4069	173.0564	168.5602	152.7768	151.5081	157.0799	158.2933	175.4246	185.1706	205.3046	(64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2113.4856	(64)	
Electric shower(s)												2113	(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														
100.6434	89.4766	96.0194	86.4652	85.2606	78.3764	78.3651	80.5326	80.3942	87.8139	91.1708	99.7903	99.7903	(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	97.7896	97.7896	97.7896	97.7896	97.7896	97.7896	97.7896	97.7896	97.7896	97.7896	97.7896	97.7896	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	103.3976	114.4759	103.3976	106.8442	103.3976	106.8442	103.3976	103.3976	106.8442	103.3976	106.8442	103.3976	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	170.6462	172.4170	167.9547	158.4550	146.4633	135.1929	127.6635	125.8927	130.3550	139.8547	151.8464	163.1168	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.7790	32.7790	32.7790	32.7790	32.7790	32.7790	32.7790	32.7790	32.7790	32.7790	32.7790	32.7790	(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)	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	-78.2316	(71)
Water heating gains (Table 5)	135.2734	133.1497	129.0583	120.0905	114.5976	108.8561	105.3294	108.2428	111.6586	118.0294	126.6261	134.1268	(72)
Total internal gains	464.6541	475.3795	455.7475	440.7266	419.7955	403.2300	388.7274	389.8700	401.1947	416.6186	440.6535	455.9781	(73)

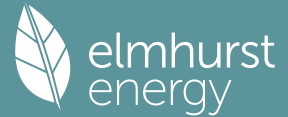
6. Solar gains

[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	
Northwest	4.8500				11.2829		0.6300		0.7000		0.7700		16.7238 (81)	
Solar gains	16.7238	34.0419	61.3326	100.7257	135.3951	144.3456	135.0323	107.6493	74.7347	41.6018	21.0429	13.6575	(83)	
Total gains	481.3780	509.4214	517.0801	541.4523	555.1906	547.5756	523.7597	497.5193	475.9294	458.2205	461.6964	469.6356	(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	23.6373	23.6973	23.7563	24.0376	24.0909	24.3425	24.3425	24.3897	24.2450	24.0909	23.9832	23.8716
alpha	2.5758	2.5798	2.5838	2.6025	2.6061	2.6228	2.6228	2.6260	2.6163	2.6061	2.5989	2.5914
util living area												
	0.9365	0.9234	0.9034	0.8532	0.7686	0.6334	0.5031	0.5399	0.7167	0.8568	0.9151	0.9400 (86)
MIT	18.5749	18.7919	19.1668	19.7454	20.2866	20.7067	20.8851	20.8580	20.5644	19.9107	19.1802	18.5486 (87)

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Th 2	19.9399	19.9423	19.9447	19.9557	19.9578	19.9674	19.9674	19.9692	19.9637	19.9578	19.9536	19.9492 (88)
util rest of house	0.9276	0.9126	0.8888	0.8294	0.7275	0.5636	0.4047	0.4431	0.6552	0.8291	0.9013	0.9316 (89)
MIT 2	17.1324	17.4066	17.8800	18.6040	19.2556	19.7306	19.9003	19.8813	19.5860	18.8180	17.9067	17.1047 (90)
Living area fraction									fLA = Living area / (4) =			0.5544 (91)
MIT	17.9321	18.1746	18.5934	19.2368	19.8272	20.2718	20.4463	20.4228	20.1284	19.4238	18.6127	17.9052 (92)
Temperature adjustment												0.0000
adjusted MIT	17.9321	18.1746	18.5934	19.2368	19.8272	20.2718	20.4463	20.4228	20.1284	19.4238	18.6127	17.9052 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9055	0.8894	0.8656	0.8101	0.7217	0.5855	0.4522	0.4878	0.6659	0.8123	0.8791	0.9101 (94)	
Useful gains	435.8772	453.1027	447.6011	438.6487	400.7017	320.6042	236.8665	242.6732	316.9119	372.2245	405.8870	427.4165 (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	946.6227	919.4630	835.5693	705.8395	553.7309	382.4403	259.3501	270.7289	408.1248	601.1939	787.9211	942.3573 (97)	
Space heating kWh	379.9947	313.3941	288.6484	192.3774	113.8537	0.0000	0.0000	0.0000	0.0000	170.3533	275.0645	383.1159 (98a)	
Space heating requirement - total per year (kWh/year)												2116.8019	
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	379.9947	313.3941	288.6484	192.3774	113.8537	0.0000	0.0000	0.0000	0.0000	170.3533	275.0645	383.1159 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												2116.8019	
Space heating per m2											(98c) / (4) =	35.8234 (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	379.9947	313.3941	288.6484	192.3774	113.8537	0.0000	0.0000	0.0000	0.0000	170.3533	275.0645	383.1159 (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)	411.6952	339.5385	312.7285	208.4262	123.3518	0.0000	0.0000	0.0000	0.0000	184.5647	298.0114	415.0768 (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	207.3877	183.5163	195.4069	173.0564	168.5602	152.7768	151.5081	157.0799	158.2933	175.4246	185.1706	205.3046 (64)	
Efficiency of water heater	85.3994	85.2492	84.9331	84.2977	83.1995	79.8000	79.8000	79.8000	79.8000	83.9940	84.9455	85.4380 (216)	
Fuel for water heating, kWh/month	242.8445	215.2704	230.0715	205.2920	202.5977	191.4497	189.8598	196.8420	198.3625	208.8537	217.9877	240.2967 (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	21.4840	17.2353	15.5184	11.3695	8.7821	7.1751	8.0113	10.4134	13.5260	17.7469	20.0450	22.0811 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-11.2647	-17.0859	-26.3953	-31.9675	-36.5256	-34.8610	-34.4552	-31.5110	-26.6797	-20.5307	-12.8103	-9.6048 (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	-3.1552	-6.8559	-14.0458	-21.7259	-29.3533	-29.7178	-29.3510	-24.5435	-17.6042	-9.9861	-4.2702	-2.4779 (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												2293.3932 (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												2539.7281 (219)	
Space cooling fuel												0.0000 (221)	
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000 (231)	
Electricity for lighting (calculated in Appendix L)												173.3881 (232)	
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-486.7785 (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												4605.7308 (238)	

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

Energy	Emission factor	Emissions
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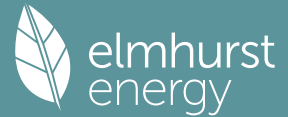


	kWh/year	kg CO2/kWh	kg CO2/year
Space heating - main system 1	2293.3932	0.2100	481.6126 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2539.7281	0.2100	533.3429 (264)
Space and water heating			1014.9555 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	173.3881	0.1443	25.0253 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-293.6916	0.1331	-39.0852
PV Unit electricity exported	-193.0869	0.1251	-24.1470
Total			-63.2322 (269)
Total CO2, kg/year			988.6778 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.7300 (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	2293.3932	1.1300	2591.5343 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2539.7281	1.1300	2869.8927 (278)
Space and water heating			5461.4270 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	173.3881	1.5338	265.9484 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-293.6916	1.4918	-438.1186
PV Unit electricity exported	-193.0869	0.4590	-88.6283
Total			-526.7470 (283)
Total Primary energy kWh/year			5330.7293 (286)
Target Primary Energy Rate (TPER)			90.2100 (287)

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Property Reference	Flat 2.01			Issued on Date	22/04/2024
Assessment Reference	Baseline	Prop Type Ref			
Property	Christchurch Hall, , 38, Portland Street, Bristol, BS8 4JB				
SAP Rating	77 C	DER	19.50	TER	13.30
Environmental	84 B	% DER < TER			-46.62
CO ₂ Emissions (t/year)	1.19	DFEE	60.11	TFEE	31.19
Compliance Check	See BREL	% DFEE < TFEE			-92.71
% DPER < TPER	-59.81	DPER	114.09	TPER	71.39
Assessor Details	Mr. Jordan Howlett			Assessor ID	H055-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	74.6100 (1b)	3.0000 (2b)	223.8300 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.6100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	223.8300 (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) = 0.1340 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8840 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7514 (21)

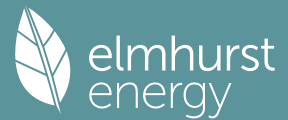
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.9581	0.9393	0.9205	0.8266	0.8078	0.7139	0.7139	0.6951	0.7514	0.8078	0.8454	0.8829 (22b)
Effective ac	0.9589	0.9411	0.9237	0.8416	0.8263	0.7548	0.7548	0.7416	0.7823	0.8263	0.8573	0.8898 (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
External Door			2.1000	1.4000	2.9400		(26)
Window (Uw = 1.40)			8.7200	1.3258	11.5606		(27)
Exposed Floor above Stairway			9.1100	0.2500	2.2775		(28b)
External Wall	36.7500	8.7200	28.0300	0.3000	8.4090		(29a)
Corridor wall	33.8000	2.1000	31.7000	0.3000	9.5100		(29a)
Total net area of external elements Aum(A, m ²)			79.6600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 34.6971		(33)
Party Wall			48.0000	0.0000	0.0000		(32)
Party Floor			65.5000				(32d)
Party Ceiling			74.6100				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							15.9320 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	50.6291 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	70.8316	69.5152	68.2249	62.1644	61.0305	55.7520	55.7520	54.7745	57.7852	61.0305	63.3244	65.7225 (38)
Heat transfer coeff												

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Average = Sum(39)m / 12 =	121.4607	120.1443	118.8540	112.7935	111.6596	106.3811	106.3811	105.4036	108.4143	111.6596	113.9535	116.3516 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.6279	1.6103	1.5930	1.5118	1.4966	1.4258	1.4258	1.4127	1.4531	1.4966	1.5273	1.5595 (40)
HLP (average)												1.5117
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

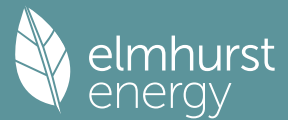
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.3527 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	27.5017	27.0932	26.5181	25.4576	24.6635	23.7830	23.3073	23.8785	24.5004	25.4425	26.5249	27.4087 (42b)
Hot water usage for other uses	38.7235	37.3154	35.9073	34.4992	33.0910	31.6829	31.6829	33.0910	34.4992	35.9073	37.3154	38.7235 (42c)
Average daily hot water use (litres/day)												60.7016 (43)
Daily hot water use	66.2252	64.4087	62.4254	59.9567	57.7545	55.4659	54.9902	56.9695	58.9995	61.3498	63.8403	66.1323 (44)
Energy conte	104.8846	91.7171	95.9455	82.0778	77.7487	68.2017	66.5059	70.5402	72.7523	83.2511	90.9522	103.5471 (45)
Energy content (annual)										Total = Sum(45)m =		1008.1241
Distribution loss (46)m = 0.15 x (45)m	15.7327	13.7576	14.3918	12.3117	11.6623	10.2303	9.9759	10.5810	10.9128	12.4877	13.6428	15.5321 (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	25.3329	22.8759	25.3186	24.4887	25.2961	24.4716	25.2836	25.2890	24.4793	25.3053	24.5020	25.3314 (61)
Total heat required for water heating calculated for each month	130.2175	114.5929	121.2640	106.5665	103.0448	92.6734	91.7895	95.8292	97.2316	108.5565	115.4542	128.8786 (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	130.2175	114.5929	121.2640	106.5665	103.0448	92.6734	91.7895	95.8292	97.2316	108.5565	115.4542	128.8786 (64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				1306.0986 (64)
Electric shower(s)	50.9858	45.4288	49.6065	47.3389	48.2272	46.0041	47.5375	48.2272	47.3389	49.6065	48.6737	50.9858 (64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				579.9609 (64a)
Heat gains from water heating, kWh/month	53.9538	47.5721	50.6331	45.2478	44.2322	40.2960	40.3185	41.8337	42.1447	46.4090	48.5355	53.5087 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	117.0224	129.5605	117.0224	120.9232	117.0224	120.9232	117.0224	117.0224	120.9232	117.0224	120.9232	117.0224 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	207.8091	209.9655	204.5315	192.9629	178.3598	164.6349	155.4658	153.3094	158.7434	170.3119	184.9151	198.6400 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.7633	34.7633	34.7633	34.7633	34.7633	34.7633	34.7633	34.7633	34.7633	34.7633	34.7633	34.7633 (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)	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062 (71)
Water heating gains (Table 5)	72.5186	70.7918	68.0553	62.8441	59.4519	55.9667	54.1915	56.2280	58.5343	62.3776	67.4105	71.9204 (72)
Total internal gains	458.6399	471.6077	450.8990	438.0201	416.1240	399.8145	384.9696	384.8496	396.4907	411.0019	434.5386	448.8726 (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			4.6600	10.6334	0.6300	0.7000	0.7700			15.1436	(74)	
Northeast			2.0300	11.2829	0.6300	0.7000	0.7700			6.9999	(75)	
Southwest			2.0300	36.7938	0.6300	0.7000	0.7700			22.8267	(79)	
Solar gains	44.9702	82.0710	128.0481	187.0675	236.9110	247.6282	233.5385	194.1967	148.0117	94.8355	54.8304	37.8758 (83)
Total gains	503.6101	553.6787	578.9471	625.0875	653.0350	647.4427	618.5081	579.0463	544.5024	505.8374	489.3690	486.7485 (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	17.0631	17.2501	17.4374	18.3743	18.5609	19.4818	19.4818	19.6625	19.1165	18.5609	18.1872	17.8124
alpha	2.1375	2.1500	2.1625	2.2250	2.2374	2.2988	2.2988	2.3108	2.2744	2.2374	2.2125	2.1875
util living area	0.9613	0.9506	0.9352	0.8963	0.8308	0.7142	0.5954	0.6340	0.7956	0.9057	0.9474	0.9637 (86)
MIT	17.3788	17.6810	18.1994	19.0459	19.7900	20.4550	20.7511	20.7050	20.2213	19.2843	18.2920	17.4440 (87)
Th 2	19.5929	19.6058	19.6185	19.6787	19.6901	19.7436	19.7436	19.7536	19.7229	19.6901	19.6671	19.6432 (88)
util rest of house	0.9545	0.9418	0.9228	0.8748	0.7903	0.6364	0.4711	0.5160	0.7328	0.8820	0.9368	0.9575 (89)
MIT 2	16.3645	16.6702	17.1900	18.0539	18.7723	19.4065	19.6362	19.6166	19.2020	18.3020	17.3137	16.4578 (90)
Living area fraction									fLA = Living area / (4) =			0.4391 (91)

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MIT	16.8099	17.1140	17.6332	18.4895	19.2192	19.8669	20.1257	20.0945	19.6495	18.7333	17.7432	16.8908 (92)
Temperature adjustment												0.0000
adjusted MIT	16.8099	17.1140	17.6332	18.4895	19.2192	19.8669	20.1257	20.0945	19.6495	18.7333	17.7432	16.8908 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9349	0.9197	0.8984	0.8498	0.7725	0.6451	0.5129	0.5521	0.7285	0.8592	0.9153	0.9391	(94)
Useful gains	470.8094	509.2093	520.1379	531.1718	504.4794	417.6798	317.2094	319.6792	396.6521	434.6235	447.9351	457.0896	(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	1519.4570	1467.4477	1323.2240	1081.6351	839.5899	560.2969	375.0723	389.4151	601.6493	908.1616	1212.8342	1476.5989	(97)
Space heating kWh	780.1938	643.9362	597.4961	396.3336	249.3223	0.0000	0.0000	0.0000	0.0000	352.3124	550.7274	758.5149	(98a)
Space heating requirement - total per year (kWh/year)												4328.8366	
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	780.1938	643.9362	597.4961	396.3336	249.3223	0.0000	0.0000	0.0000	0.0000	352.3124	550.7274	758.5149	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4328.8366	
Space heating per m2										(98c) / (4) =		58.0195	(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 %)													89.2000 (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	780.1938	643.9362	597.4961	396.3336	249.3223	0.0000	0.0000	0.0000	0.0000	352.3124	550.7274	758.5149	(98)
Space heating efficiency (main heating system 1)	89.2000	89.2000	89.2000	89.2000	89.2000	0.0000	0.0000	0.0000	0.0000	89.2000	89.2000	89.2000	(210)
Space heating fuel (main heating system)	874.6568	721.9015	669.8386	444.3202	279.5093	0.0000	0.0000	0.0000	0.0000	394.9690	617.4074	850.3530	(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	130.2175	114.5929	121.2640	106.5665	103.0448	92.6734	91.7895	95.8292	97.2316	108.5565	115.4542	128.8786	(64)
Efficiency of water heater	88.9083	88.8920	88.8562	88.7686	88.6057	87.2000	87.2000	87.2000	87.2000	88.7207	88.8468	88.9039	(216)
Fuel for water heating, kWh/month	146.4626	128.9125	136.4723	120.0498	116.2959	106.2768	105.2632	109.8958	111.5041	122.3576	129.9475	144.9640	(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	28.2061	22.6279	20.3740	14.9268	11.5299	9.4200	10.5180	13.6717	17.7581	23.2996	26.3169	28.9900	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1													4852.9559 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													87.2000
Water heating fuel used													1478.4021 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
central heating pump													41.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													86.0000 (231)
Electricity for lighting (calculated in Appendix L)													227.6390 (232)

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

PV generation													0.0000 (233)
Wind generation													0.0000 (234)
Hydro-electric generation (Appendix N)													0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (235)
Appendix Q - special features													
Energy saved or generated													-0.0000 (236)
Energy used													0.0000 (237)
Total delivered energy for all uses													7224.9579 (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	4852.9559	0.2100	1019.1207	(261)
Total CO2 associated with community systems			0.0000	(373)

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Water heating (other fuel)	1478.4021	0.2100	310.4644 (264)
Energy for instantaneous electric shower(s)	579.9609	0.1391	80.6854 (264a)
Space and water heating			1329.5852 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	227.6390	0.1443	32.8553 (268)
Total CO ₂ , kg/year			1455.0552 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			19.5000 (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	4852.9559	1.1300	5483.8401 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	1478.4021	1.1300	1670.5944 (278)
Energy for instantaneous electric shower(s)	579.9609	1.5143	878.2547 (278a)
Space and water heating			7154.4345 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	227.6390	1.5338	349.1604 (282)
Total Primary energy kWh/year			8511.9503 (286)
Dwelling Primary energy Rate (DPER)			114.0900 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	74.6100 (1b)	x 3.0000 (2b)	= 223.8300 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.6100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 223.8300 (5)

2. Ventilation rate

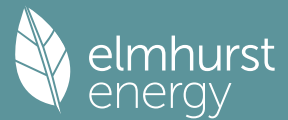
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1340 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3840 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3264 (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	0.4162	0.4080	0.3999	0.3591	0.3509	0.3101	0.3101	0.3019	0.3264	0.3509	0.3672	0.3836 (22b)
Effective ac	0.5866	0.5832	0.5799	0.5645	0.5616	0.5481	0.5481	0.5456	0.5533	0.5616	0.5674	0.5736 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type (Uw = 1.20)			8.7200	1.1450	9.9847		(27)
Exposed Floor above Stairway			9.1100	0.1300	1.1843		(28b)
External Wall	36.7500	8.7200	28.0300	0.1800	5.0454		(29a)
Corridor wall	33.8000	2.1000	31.7000	0.1800	5.7060		(29a)
Total net area of external elements Aum(A, m ²)			79.6600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.0204		(33)
Party Wall			48.0000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							3.9830 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	28.0034 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	43.3292	43.0808	42.8373	41.6936	41.4796	40.4835	40.4835
Heat transfer coeff	71.3326	71.0842	70.8407	69.6970	69.4830	68.4869	68.4869
						68.3025	68.8706
							69.4830
							69.9159
							70.3685 (39)

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Average = Sum(39)m / 12 =

69.6960

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9561	0.9527	0.9495	0.9342	0.9313	0.9179	0.9179	0.9155	0.9231	0.9313	0.9371	0.9432 (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												2.3527 (42)
Hot water usage for mixer showers	63.6660	62.7092	61.3150	58.6474	56.6788	54.4835	53.2356	54.6193	56.1360	58.4932	61.2180	63.4220 (42a)
Hot water usage for baths	27.5017	27.0932	26.5181	25.4576	24.6635	23.7830	23.3073	23.8785	24.5004	25.4425	26.5249	27.4087 (42b)
Hot water usage for other uses	38.7235	37.3154	35.9073	34.4992	33.0910	31.6829	31.6829	33.0910	34.4992	35.9073	37.3154	38.7235 (42c)
Average daily hot water use (litres/day)												119.3995 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	129.8912	127.1179	123.7404	118.6042	114.4333	109.9493	108.2259	111.5888	115.1355	119.8430	125.0583	129.5543 (44)
Energy content (annual)	205.7159	181.0141	190.1843	162.3632	154.0493	135.1955	130.8898	138.1702	141.9736	162.6258	178.1685	202.8507 (45)
Distribution loss (46)m = 0.15 x (45)m	30.8574	27.1521	28.5276	24.3545	23.1074	20.2793	19.6335	20.7255	21.2960	24.3939	26.7253	30.4276 (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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	256.6748	227.0415	241.1432	211.6782	205.0082	184.5106	181.8487	189.1291	191.2887	213.5847	227.4836	253.8096 (62)
WWHRS	-29.1054	-25.7411	-26.9546	-22.3195	-20.8009	-17.7995	-16.6842	-17.7420	-18.4161	-21.7105	-24.5954	-28.5664 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	227.5694	201.3005	214.1886	189.3588	184.2072	166.7111	165.1645	171.3872	172.8726	191.8742	202.8883	225.2432 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											2312.7656 (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	81.1403	71.6941	75.9760	66.3145	63.9611	57.2813	56.2606	58.6813	59.5350	66.8128	71.5698	80.1876 (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	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	117.0224	129.5605	117.0224	120.9232	117.0224	120.9232	117.0224	117.0224	120.9232	117.0224	120.9232	117.0224 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	207.8091	209.9655	204.5315	192.9629	178.3598	164.6349	155.4658	153.3094	158.7434	170.3119	184.9151	198.6400 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.7633	34.7633	34.7633	34.7633	34.7633	34.7633	34.7633	34.7633	34.7633	34.7633	34.7633	34.7633 (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)	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062 (71)
Water heating gains (Table 5)	109.0595	106.6876	102.1183	92.1035	85.9692	79.5573	75.6191	78.8728	82.6875	89.8022	99.4025	107.7790 (72)
Total internal gains	495.1809	507.5035	484.9620	467.2794	442.6413	423.4052	406.3971	407.4944	420.6439	438.4264	466.5306	484.7313 (73)

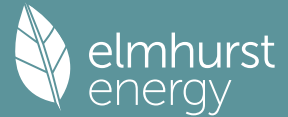
6. Solar gains

[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			4.6600	10.6334	0.6300	0.7000	0.7700	15.1436 (74)				
Northeast			2.0300	11.2829	0.6300	0.7000	0.7700	6.9999 (75)				
Southwest			2.0300	36.7938	0.6300	0.7000	0.7700	22.8267 (79)				
Solar gains	44.9702	82.0710	128.0481	187.0675	236.9110	247.6282	233.5385	194.1967	148.0117	94.8355	54.8304	37.8758 (83)
Total gains	540.1511	589.5745	613.0101	654.3469	679.5523	671.0334	639.9356	601.6910	568.6556	533.2619	521.3610	522.6071 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)											21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	29.0540	29.1556	29.2558	29.7358	29.8274	30.2612	30.2612	30.3430	30.0927	29.8274	29.6427	29.4521
alpha	2.9369	2.9437	2.9504	2.9824	2.9885	3.0174	3.0174	3.0229	3.0062	2.9885	2.9762	2.9635
util living area	0.9439	0.9258	0.8989	0.8347	0.7301	0.5767	0.4439	0.4844	0.6796	0.8495	0.9207	0.9483 (86)
MIT	19.0035	19.2438	19.6015	20.1221	20.5563	20.8475	20.9487	20.9324	20.7367	20.2027	19.5487	18.9785 (87)
Th 2	20.1201	20.1229	20.1256	20.1386	20.1410	20.1523	20.1523	20.1544	20.1479	20.1410	20.1361	20.1310 (88)
util rest of house	0.9366	0.9162	0.8853	0.8118	0.6917	0.5174	0.3672	0.4070	0.6246	0.8241	0.9089	0.9415 (89)
MIT 2	17.7794	18.0828	18.5331	19.1829	19.6992	20.0262	20.1206	20.1103	19.9145	19.2930	18.4793	17.7547 (90)
Living area fraction	fLA = Living area / (4) = 0.4391 (91)											
MIT	18.3169	18.5925	19.0022	19.5953	20.0755	20.3868	20.4842	20.4713	20.2755	19.6924	18.9489	18.2921 (92)

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Temperature adjustment												0.0000
adjusted MIT	18.3169	18.5925	19.0022	19.5953	20.0755	20.3868	20.4842	20.4713	20.2755	19.6924	18.9489	18.2921 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9173	0.8954	0.8643	0.7954	0.6886	0.5345	0.3980	0.4369	0.6334	0.8088	0.8890	0.9231	(94)
Useful gains	495.4912	527.8916	529.8421	520.4687	467.9293	358.6576	254.6862	262.8918	360.1982	431.3074	463.4764	482.3933	(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	999.8598	973.3224	885.6633	745.4283	581.9561	396.3192	266.0149	278.0780	425.3113	631.7703	828.4253	991.6384	(97)
Space heating kWh	375.2502	299.3295	264.7309	161.9709	84.8359	0.0000	0.0000	0.0000	0.0000	149.1444	262.7632	378.8784	(98a)
Space heating requirement - total per year (kWh/year)												1976.9035	
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	375.2502	299.3295	264.7309	161.9709	84.8359	0.0000	0.0000	0.0000	0.0000	149.1444	262.7632	378.8784	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1976.9035	
Space heating per m2											(98c) / (4) =	26.4965	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.4000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	375.2502	299.3295	264.7309	161.9709	84.8359	0.0000	0.0000	0.0000	0.0000	149.1444	262.7632	378.8784	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	406.1149	323.9497	286.5053	175.2932	91.8138	0.0000	0.0000	0.0000	0.0000	161.4117	284.3757	410.0416	(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	227.5694	201.3005	214.1886	189.3588	184.2072	166.7111	165.1645	171.3872	172.8726	191.8742	202.8883	225.2432	(64)
Efficiency of water heater													80.3000 (216)
(217)m	85.4454	85.2297	84.8365	84.0484	82.8265	80.3000	80.3000	80.3000	80.3000	83.8474	84.9365	85.4864	(217)
Fuel for water heating, kWh/month	266.3331	236.1858	252.4723	225.2972	222.4013	207.6103	205.6843	213.4336	215.2835	228.8373	238.8704	263.4841	(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	24.3149	19.5064	17.5633	12.8676	9.9393	8.1205	9.0670	11.7856	15.3083	20.0854	22.6864	24.9907	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.1188	-21.3597	-32.9136	-39.7533	-45.3176	-43.2028	-42.6829	-39.0731	-33.1522	-25.6028	-16.0317	-12.0432	(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	-4.0885	-8.8703	-18.1494	-28.0427	-37.8644	-38.3377	-37.8821	-31.7042	-22.7629	-12.9292	-5.5350	-3.2130	(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												2139.5059	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2775.8932	(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)												196.2356	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-614.6310	(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												4583.0037	(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	2139.5059	0.2100	449.2962	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2775.8932	0.2100	582.9376	(264)
Space and water heating			1032.2338	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)

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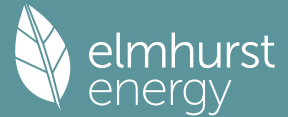


Energy for lighting	196.2356	0.1443	28.3229 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-365.2517	0.1331	-48.6300
PV Unit electricity exported	-249.3793	0.1251	-31.1919
Total			-79.8219 (269)
Total CO2, kg/year			992.6640 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.3000 (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	2139.5059	1.1300	2417.6417 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2775.8932	1.1300	3136.7593 (278)
Space and water heating			5554.4010 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	196.2356	1.5338	300.9927 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-365.2517	1.4920	-544.9499
PV Unit electricity exported	-249.3793	0.4591	-114.4856
Total			-659.4355 (283)
Total Primary energy kWh/year			5326.0590 (286)
Target Primary Energy Rate (TPER)			71.3900 (287)

Full SAP Calculation Printout



Property Reference	Flat 2.01			Issued on Date	22/04/2024
Assessment Reference	Additional Measures	Prop Type Ref			
Property	Christchurch Hall, , 38, Portland Street, Bristol, BS8 4JB				
SAP Rating	78 C	DER	18.34	TER	13.30
Environmental	85 B	% DER < TER			-37.89
CO ₂ Emissions (t/year)	1.13	DFEE	58.34	TFEE	31.19
Compliance Check	See BREL	% DFEE < TFEE			-87.05
% DPER < TPER	-50.48	DPER	107.43	TPER	71.39
Assessor Details	Mr. Jordan Howlett			Assessor ID	H055-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	74.6100 (1b)	3.0000 (2b)	223.8300 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.6100		223.8300 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	223.8300 (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) = 0.1340 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8840 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7514 (21)

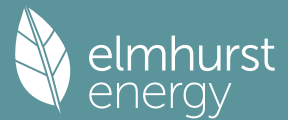
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.9581	0.9393	0.9205	0.8266	0.8078	0.7139	0.7139	0.6951	0.7514	0.8078	0.8454	0.8829 (22b)
Effective ac	0.9589	0.9411	0.9237	0.8416	0.8263	0.7548	0.7548	0.7416	0.7823	0.8263	0.8573	0.8898 (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
External Door			2.1000	1.4000	2.9400		(26)
Window (Uw = 1.40)			8.7200	1.3258	11.5606		(27)
Exposed Floor above Stairway			9.1100	0.1800	1.6398		(28b)
External Wall	36.7500	8.7200	28.0300	0.2600	7.2878		(29a)
Corridor wall	33.8000	2.1000	31.7000	0.2600	8.2420		(29a)
Total net area of external elements Aum(A, m ²)			79.6600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 31.6702		(33)
Party Wall			48.0000	0.0000	0.0000		(32)
Party Floor			65.5000				(32d)
Party Ceiling			74.6100				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							15.9320 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	47.6022 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	70.8316	69.5152	68.2249	62.1644	61.0305	55.7520	55.7520	54.7745	57.7852	61.0305	63.3244	65.7225 (38)
Heat transfer coeff												

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Average = Sum(39)m / 12 =	118.4338	117.1174	115.8271	109.7666	108.6327	103.3542	103.3542	102.3767	105.3874	108.6327	110.9266	113.3247 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.5874	1.5697	1.5524	1.4712	1.4560	1.3853	1.3853	1.3722	1.4125	1.4560	1.4868	1.5189 (40)
HLP (average)												1.4711
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3527 (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	27.5017	27.0932	26.5181	25.4576	24.6635	23.7830	23.3073	23.8785	24.5004	25.4425	26.5249	27.4087 (42b)
Hot water usage for other uses	38.7235	37.3154	35.9073	34.4992	33.0910	31.6829	31.6829	33.0910	34.4992	35.9073	37.3154	38.7235 (42c)
Average daily hot water use (litres/day)												60.7016 (43)
Daily hot water use	66.2252	64.4087	62.4254	59.9567	57.7545	55.4659	54.9902	56.9695	58.9995	61.3498	63.8403	66.1323 (44)
Energy conte	104.8846	91.7171	95.9455	82.0778	77.7487	68.2017	66.5059	70.5402	72.7523	83.2511	90.9522	103.5471 (45)
Energy content (annual)										Total = Sum(45)m =		1008.1241
Distribution loss (46)m = 0.15 x (45)m	15.7327	13.7576	14.3918	12.3117	11.6623	10.2303	9.9759	10.5810	10.9128	12.4877	13.6428	15.5321 (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	25.3329	22.8759	25.3186	24.4887	25.2961	24.4716	25.2836	25.2890	24.4793	25.3053	24.5020	25.3314 (61)
Total heat required for water heating calculated for each month	130.2175	114.5929	121.2640	106.5665	103.0448	92.6734	91.7895	95.8292	97.2316	108.5565	115.4542	128.8786 (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	130.2175	114.5929	121.2640	106.5665	103.0448	92.6734	91.7895	95.8292	97.2316	108.5565	115.4542	128.8786 (64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				1306.0986 (64)
Electric shower(s)	50.9858	45.4288	49.6065	47.3389	48.2272	46.0041	47.5375	48.2272	47.3389	49.6065	48.6737	50.9858 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												579.9609 (64a)
Heat gains from water heating, kWh/month	53.9538	47.5721	50.6331	45.2478	44.2322	40.2960	40.3185	41.8337	42.1447	46.4090	48.5355	53.5087 (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	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	117.0224	129.5605	117.0224	120.9232	117.0224	120.9232	117.0224	117.0224	120.9232	117.0224	120.9232	117.0224 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	207.8091	209.9655	204.5315	192.9629	178.3598	164.6349	155.4658	153.3094	158.7434	170.3119	184.9151	198.6400 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.7633	34.7633	34.7633	34.7633	34.7633	34.7633	34.7633	34.7633	34.7633	34.7633	34.7633	34.7633 (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)	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062 (71)
Water heating gains (Table 5)	72.5186	70.7918	68.0553	62.8441	59.4519	55.9667	54.1915	56.2280	58.5343	62.3776	67.4105	71.9204 (72)
Total internal gains	458.6399	471.6077	450.8990	438.0201	416.1240	399.8145	384.9696	384.8496	396.4907	411.0019	434.5386	448.8726 (73)

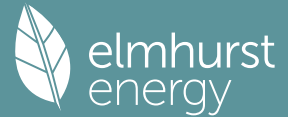
6. Solar gains

[Jan]				Area m2	Solar flux Table 6a		g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W			
North				4.6600		10.6334	0.6300		0.7000		0.7700		15.1436 (74)		
Northeast				2.0300		11.2829	0.6300		0.7000		0.7700		6.9999 (75)		
Southwest				2.0300		36.7938	0.6300		0.7000		0.7700		22.8267 (79)		
Solar gains				44.9702	82.0710	128.0481	187.0675	236.9110	247.6282	233.5385	194.1967	148.0117	94.8355	54.8304	37.8758 (83)
Total gains				503.6101	553.6787	578.9471	625.0875	653.0350	647.4427	618.5081	579.0463	544.5024	505.8374	489.3690	486.7485 (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	17.4992	17.6959	17.8930	18.8810	19.0780	20.0524	20.0524	20.2439	19.6655	19.0780	18.6835	18.2882
alpha	2.1666	2.1797	2.1929	2.2587	2.2719	2.3368	2.3368	2.3496	2.3110	2.2719	2.2456	2.2192
util living area	0.9610	0.9501	0.9344	0.8945	0.8274	0.7078	0.5874	0.6262	0.7911	0.9041	0.9468	0.9635 (86)
MIT	17.4543	17.7560	18.2690	19.1085	19.8386	20.4864	20.7689	20.7251	20.2574	19.3383	18.3602	17.5227 (87)
Th 2	19.6226	19.6356	19.6484	19.7092	19.7207	19.7747	19.7847	19.7538	19.7207	19.6975	19.6734	19.6734 (88)
util rest of house	0.9543	0.9414	0.9221	0.8730	0.7870	0.6311	0.4661	0.5108	0.7288	0.8805	0.9363	0.9573 (89)
MIT 2	15.5703	15.9559	16.6098	17.6880	18.5878	19.3652	19.6455	19.6195	19.1140	17.9918	16.7499	15.6745 (90)
Living area fraction									fLA = Living area / (4) =			0.4391 (91)

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MIT	16.3975	16.7463	17.3384	18.3117	19.1370	19.8575	20.1388	20.1050	19.6160	18.5830	17.4570	16.4860 (92)
Temperature adjustment												0.0000
adjusted MIT	16.3975	16.7463	17.3384	18.3117	19.1370	19.8575	20.1388	20.1050	19.6160	18.5830	17.4570	16.4860 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9301	0.9142	0.8922	0.8424	0.7643	0.6370	0.5057	0.5447	0.7205	0.8522	0.9099	0.9346	(94)
Useful gains	468.4269	506.1953	516.5276	526.5602	499.1359	412.3923	312.7822	315.3834	392.2972	431.0862	445.2719	454.9384	(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	1432.7568	1387.4038	1255.3761	1033.0940	807.9021	543.3887	365.7469	379.3045	581.3206	867.2153	1148.8629	1392.3070	(97)
Space heating kWh	717.4614	592.1721	549.7033	364.7043	229.7221	0.0000	0.0000	0.0000	0.0000	324.4801	506.5855	697.4022	(98a)
Space heating requirement - total per year (kWh/year)												3982.2310	
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	717.4614	592.1721	549.7033	364.7043	229.7221	0.0000	0.0000	0.0000	0.0000	324.4801	506.5855	697.4022	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3982.2310	
Space heating per m2										(98c) / (4) =		53.3740	(99)

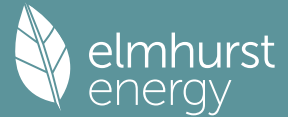
9a. Energy requirements - Individual heating systems, including micro-CHP

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 %)													89.2000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	717.4614	592.1721	549.7033	364.7043	229.7221	0.0000	0.0000	0.0000	0.0000	324.4801	506.5855	697.4022	(98)
Space heating efficiency (main heating system 1)	89.2000	89.2000	89.2000	89.2000	89.2000	0.0000	0.0000	0.0000	0.0000	89.2000	89.2000	89.2000	(210)
Space heating fuel (main heating system)	804.3289	663.8701	616.2593	408.8613	257.5360	0.0000	0.0000	0.0000	0.0000	363.7669	567.9210	781.8411	(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 requirement	130.2175	114.5929	121.2640	106.5665	103.0448	92.6734	91.7895	95.8292	97.2316	108.5565	115.4542	128.8786	(64)
Efficiency of water heater	88.8868	88.8695	88.8318	88.7398	88.5709	87.2000	87.2000	87.2000	87.2000	88.6901	88.8219	88.8820	(216)
Fuel for water heating, kWh/month	146.4981	128.9451	136.5097	120.0888	116.3415	106.2768	105.2632	109.8958	111.5041	122.3998	129.9840	144.9996	(217)
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	23.5365	18.8819	17.0010	12.4557	9.6211	7.8605	8.7767	11.4083	14.8183	19.4424	21.9601	24.1907	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												4464.3845	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.2000	
Water heating fuel used												1478.7066	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												189.9532	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												6799.0053	(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	4464.3845	0.2100	937.5208	(261)
Total CO2 associated with community systems			0.0000	(373)

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Water heating (other fuel)	1478.7066	0.2100	310.5284 (264)
Energy for instantaneous electric shower(s)	579.9609	0.1391	80.6854 (264a)
Space and water heating			1248.0491 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	189.9532	0.1443	27.4161 (268)
Total CO ₂ , kg/year			1368.0799 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			18.3400 (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	4464.3845	1.1300	5044.7545 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	1478.7066	1.1300	1670.9384 (278)
Energy for instantaneous electric shower(s)	579.9609	1.5143	878.2547 (278a)
Space and water heating			6715.6930 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	189.9532	1.5338	291.3566 (282)
Total Primary energy kWh/year			8015.4050 (286)
Dwelling Primary energy Rate (DPER)			107.4300 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	74.6100 (1b)	x 3.0000 (2b)	= 223.8300 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.6100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 223.8300 (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) = 0.1340 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3840 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3264 (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	0.4162	0.4080	0.3999	0.3591	0.3509	0.3101	0.3101	0.3019	0.3264	0.3509	0.3672	0.3836 (22b)
Effective ac	0.5866	0.5832	0.5799	0.5645	0.5616	0.5481	0.5481	0.5456	0.5533	0.5616	0.5674	0.5736 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type (Uw = 1.20)			8.7200	1.1450	9.9847		(27)
Exposed Floor above Stairway			9.1100	0.1300	1.1843		(28b)
External Wall	36.7500	8.7200	28.0300	0.1800	5.0454		(29a)
Corridor wall	33.8000	2.1000	31.7000	0.1800	5.7060		(29a)
Total net area of external elements Aum(A, m ²)			79.6600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.0204		(33)
Party Wall			48.0000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							3.9830 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	28.0034 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	43.3292	43.0808	42.8373	41.6936	41.4796	40.4835	40.4835
Heat transfer coeff	71.3326	71.0842	70.8407	69.6970	69.4830	68.4869	68.4869
						68.3025	68.8706
							69.4830
							69.9159
							70.3685 (39)

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Average = Sum(39)m / 12 =

69.6960

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9561	0.9527	0.9495	0.9342	0.9313	0.9179	0.9179	0.9155	0.9231	0.9313	0.9371	0.9432 (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												2.3527 (42)
Hot water usage for mixer showers												63.4220 (42a)
Hot water usage for baths												27.4087 (42b)
Hot water usage for other uses												38.7235 (42c)
Average daily hot water use (litres/day)												119.3995 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	129.8912	127.1179	123.7404	118.6042	114.4333	109.9493	108.2259	111.5888	115.1355	119.8430	125.0583	129.5543 (44)
Energy conte	205.7159	181.0141	190.1843	162.3632	154.0493	135.1955	130.8898	138.1702	141.9736	162.6258	178.1685	202.8507 (45)
Energy content (annual)												1983.2010
Distribution loss (46)m = 0.15 x (45)m												30.8574
Water storage loss:												27.1521
Total storage loss												28.5276
	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 (57)
Primary loss												0.0000 (59)
Combi loss												50.9589 (61)
Total heat required for water heating calculated for each month												256.6748
WWHRS												-29.1054
PV diverter												-0.0000
Solar input												0.0000
FGHRS												0.0000
Output from w/h												227.5694
12Total per year (kWh/year)												225.2432 (64)
Electric shower(s)												0.0000 (64a)
	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												81.1403

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	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												117.0224 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												207.8091 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												34.7633 (69)
Pumps, fans												3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												-94.1062 (71)
Water heating gains (Table 5)												109.0595 (72)
Total internal gains												495.1809 (73)

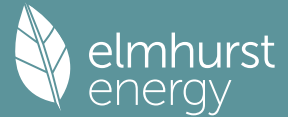
6. Solar gains

[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	4.6600	10.6334	0.6300	0.7000	0.7700	15.1436 (74)
Northeast	2.0300	11.2829	0.6300	0.7000	0.7700	6.9999 (75)
Southwest	2.0300	36.7938	0.6300	0.7000	0.7700	22.8267 (79)
Solar gains	44.9702	82.0710	128.0481	187.0675	236.9110	247.6282
Total gains	540.1511	589.5745	613.0101	654.3469	679.5523	671.0334

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)												29.4521
tau	29.0540	29.1556	29.2558	29.7358	29.8274	30.2612	30.2612	30.3430	30.0927	29.8274	29.6427	29.4521
alpha	2.9369	2.9437	2.9504	2.9824	2.9885	3.0174	3.0174	3.0229	3.0062	2.9885	2.9762	2.9635
util living area	0.9439	0.9258	0.8989	0.8347	0.7301	0.5767	0.4439	0.4844	0.6796	0.8495	0.9207	0.9483 (86)
MIT	19.0035	19.2438	19.6015	20.1221	20.5563	20.8475	20.9487	20.9324	20.7367	20.2027	19.5487	18.9785 (87)
Th 2	20.1201	20.1229	20.1256	20.1386	20.1410	20.1523	20.1523	20.1544	20.1479	20.1410	20.1361	20.1310 (88)
util rest of house	0.9366	0.9162	0.8853	0.8118	0.6917	0.5174	0.3672	0.4070	0.6246	0.8241	0.9089	0.9415 (89)
MIT 2	17.7794	18.0828	18.5331	19.1829	19.6992	20.0262	20.1206	20.1103	19.9145	19.2930	18.4793	17.7547 (90)
Living area fraction												FLA = Living area / (4) =
MIT	18.3169	18.5925	19.0022	19.5953	20.0755	20.3868	20.4842	20.4713	20.2755	19.6924	18.9489	18.2921 (92)

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Temperature adjustment												0.0000
adjusted MIT	18.3169	18.5925	19.0022	19.5953	20.0755	20.3868	20.4842	20.4713	20.2755	19.6924	18.9489	18.2921 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9173	0.8954	0.8643	0.7954	0.6886	0.5345	0.3980	0.4369	0.6334	0.8088	0.8890	0.9231	(94)
Useful gains	495.4912	527.8916	529.8421	520.4687	467.9293	358.6576	254.6862	262.8918	360.1982	431.3074	463.4764	482.3933	(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	999.8598	973.3224	885.6633	745.4283	581.9561	396.3192	266.0149	278.0780	425.3113	631.7703	828.4253	991.6384	(97)
Space heating kWh	375.2502	299.3295	264.7309	161.9709	84.8359	0.0000	0.0000	0.0000	0.0000	149.1444	262.7632	378.8784	(98a)
Space heating requirement - total per year (kWh/year)												1976.9035	
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	375.2502	299.3295	264.7309	161.9709	84.8359	0.0000	0.0000	0.0000	0.0000	149.1444	262.7632	378.8784	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1976.9035	
Space heating per m2											(98c) / (4) =	26.4965	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.4000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	375.2502	299.3295	264.7309	161.9709	84.8359	0.0000	0.0000	0.0000	0.0000	149.1444	262.7632	378.8784	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	406.1149	323.9497	286.5053	175.2932	91.8138	0.0000	0.0000	0.0000	0.0000	161.4117	284.3757	410.0416	(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	227.5694	201.3005	214.1886	189.3588	184.2072	166.7111	165.1645	171.3872	172.8726	191.8742	202.8883	225.2432	(64)
Efficiency of water heater													80.3000 (216)
(217)m	85.4454	85.2297	84.8365	84.0484	82.8265	80.3000	80.3000	80.3000	80.3000	83.8474	84.9365	85.4864	(217)
Fuel for water heating, kWh/month	266.3331	236.1858	252.4723	225.2972	222.4013	207.6103	205.6843	213.4336	215.2835	228.8373	238.8704	263.4841	(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	24.3149	19.5064	17.5633	12.8676	9.9393	8.1205	9.0670	11.7856	15.3083	20.0854	22.6864	24.9907	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.1188	-21.3597	-32.9136	-39.7533	-45.3176	-43.2028	-42.6829	-39.0731	-33.1522	-25.6028	-16.0317	-12.0432	(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	-4.0885	-8.8703	-18.1494	-28.0427	-37.8644	-38.3377	-37.8821	-31.7042	-22.7629	-12.9292	-5.5350	-3.2130	(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												2139.5059	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2775.8932	(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)												196.2356	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-614.6310	(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												4583.0037	(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	2139.5059	0.2100	449.2962	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2775.8932	0.2100	582.9376	(264)
Space and water heating			1032.2338	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)

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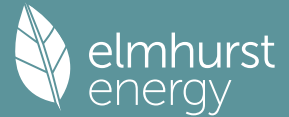


Energy for lighting	196.2356	0.1443	28.3229 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-365.2517	0.1331	-48.6300
PV Unit electricity exported	-249.3793	0.1251	-31.1919
Total			-79.8219 (269)
Total CO2, kg/year			992.6640 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.3000 (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	2139.5059	1.1300	2417.6417 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2775.8932	1.1300	3136.7593 (278)
Space and water heating			5554.4010 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	196.2356	1.5338	300.9927 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-365.2517	1.4920	-544.9499
PV Unit electricity exported	-249.3793	0.4591	-114.4856
Total			-659.4355 (283)
Total Primary energy kWh/year			5326.0590 (286)
Target Primary Energy Rate (TPER)			71.3900 (287)

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Property Reference	Flat 2.01			Issued on Date	22/04/2024
Assessment Reference	Renewables	Prop Type Ref			
Property	Christchurch Hall, , 38, Portland Street, Bristol, BS8 4JB				
SAP Rating	78 C	DER	5.50	TER	13.00
Environmental	95 A	% DER < TER			57.69
CO ₂ Emissions (t/year)	0.36	DFEE	58.34	TFEE	31.19
Compliance Check	See BREL	% DFEE < TFEE			-87.05
% DPER < TPER	16.82	DPER	58.01	TPER	69.74
Assessor Details	Mr. Jordan Howlett			Assessor ID	H055-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	74.6100 (1b)	3.0000 (2b)	223.8300 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.6100		223.8300 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	223.8300 (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) = 0.1340 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8840 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7514 (21)

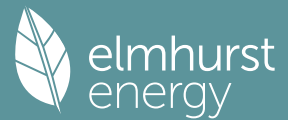
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.9581	0.9393	0.9205	0.8266	0.8078	0.7139	0.7139	0.6951	0.7514	0.8078	0.8454	0.8829 (22b)
Effective ac	0.9589	0.9411	0.9237	0.8416	0.8263	0.7548	0.7548	0.7416	0.7823	0.8263	0.8573	0.8898 (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
External Door			2.1000	1.4000	2.9400		(26)
Window (Uw = 1.40)			8.7200	1.3258	11.5606		(27)
Exposed Floor above Stairway			9.1100	0.1800	1.6398		(28b)
External Wall	36.7500	8.7200	28.0300	0.2600	7.2878		(29a)
Corridor wall	33.8000	2.1000	31.7000	0.2600	8.2420		(29a)
Total net area of external elements Aum(A, m ²)			79.6600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 31.6702		(33)
Party Wall			48.0000	0.0000	0.0000		(32)
Party Floor			65.5000				(32d)
Party Ceiling			74.6100				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							15.9320 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	47.6022 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	70.8316	69.5152	68.2249	62.1644	61.0305	55.7520	55.7520	54.7745	57.7852	61.0305	63.3244	65.7225 (38)
Heat transfer coeff												

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	118.4338	117.1174	115.8271	109.7666	108.6327	103.3542	103.3542	102.3767	105.3874	108.6327	110.9266	113.3247 (39)
Average = Sum(39)m / 12 =												109.7612
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.5874	1.5697	1.5524	1.4712	1.4560	1.3853	1.3853	1.3722	1.4125	1.4560	1.4868	1.5189 (40)
HLP (average)												1.4711
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3527 (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	27.5017	27.0932	26.5181	25.4576	24.6635	23.7830	23.3073	23.8785	24.5004	25.4425	26.5249	27.4087 (42b)
Hot water usage for other uses	38.7235	37.3154	35.9073	34.4992	33.0910	31.6829	31.6829	33.0910	34.4992	35.9073	37.3154	38.7235 (42c)
Average daily hot water use (litres/day)												60.7016 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	66.2252	64.4087	62.4254	59.9567	57.7545	55.4659	54.9902	56.9695	58.9995	61.3498	63.8403	66.1323 (44)
Energy conte	104.8846	91.7171	95.9455	82.0778	77.7487	68.2017	66.5059	70.5402	72.7523	83.2511	90.9522	103.5471 (45)
Energy content (annual)										Total = Sum(45)m =		1008.1241
Distribution loss (46)m = 0.15 x (45)m	15.7327	13.7576	14.3918	12.3117	11.6623	10.2303	9.9759	10.5810	10.9128	12.4877	13.6428	15.5321 (46)
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0044 (55)
Total storage loss	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364 (56)
If cylinder contains dedicated solar storage	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364 (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	159.2834	140.8515	150.3443	134.7218	132.1475	120.8457	120.9047	124.9390	125.3963	137.6499	143.5962	157.9459 (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	159.2834	140.8515	150.3443	134.7218	132.1475	120.8457	120.9047	124.9390	125.3963	137.6499	143.5962	157.9459 (64)
										Total per year (kWh/year) = Sum(64)m =		1648.6261 (64)
12Total per year (kWh/year)												1649 (64)
Electric shower(s)	50.9858	45.4288	49.6065	47.3389	48.2272	46.0041	47.5375	48.2272	47.3389	49.6065	48.6737	50.9858 (64a)
												Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =
												579.9609 (64a)
Heat gains from water heating, kWh/month	91.1396	81.1606	87.8225	81.2408	81.4273	76.2933	77.5166	79.0304	78.1401	83.6017	84.5252	90.6949 (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	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	117.0224	129.5605	117.0224	120.9232	117.0224	120.9232	117.0224	117.0224	120.9232	117.0224	120.9232	117.0224 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	207.8091	209.9655	204.5315	192.9629	178.3598	164.6349	155.4658	153.3094	158.7434	170.3119	184.9151	198.6400 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.7633	34.7633	34.7633	34.7633	34.7633	34.7633	34.7633	34.7633	34.7633	34.7633	34.7633	34.7633 (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)	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062 (71)
Water heating gains (Table 5)	122.4995	120.7748	118.0410	112.8344	109.4453	105.9629	104.1890	106.2237	108.5279	112.3678	117.3962	121.9018 (72)
Total internal gains	505.6209	518.5907	497.8848	485.0104	463.1173	449.8108	434.9671	434.8453	446.4843	457.9920	481.5243	495.8541 (73)

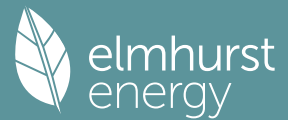
6. Solar gains

[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			4.6600	10.6334	0.6300	0.7000	0.7700	15.1436 (74)				
Northeast			2.0300	11.2829	0.6300	0.7000	0.7700	6.9999 (75)				
Southwest			2.0300	36.7938	0.6300	0.7000	0.7700	22.8267 (79)				
Solar gains	44.9702	82.0710	128.0481	187.0675	236.9110	247.6282	233.5385	194.1967	148.0117	94.8355	54.8304	37.8758 (83)
Total gains	550.5911	600.6617	625.9329	672.0778	700.0283	697.4389	668.5056	629.0420	594.4960	552.8276	536.3547	533.7299 (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	17.4992	17.6959	17.8930	18.8810	19.0780	20.0524	20.0524	20.2439	19.6655	19.0780	18.6835	18.2882
alpha	2.1666	2.1797	2.1929	2.2587	2.2719	2.3368	2.3368	2.3496	2.3110	2.2719	2.2456	2.2192
util living area	0.9540	0.9422	0.9248	0.8810	0.8091	0.6816	0.5581	0.5951	0.7647	0.8886	0.9371	0.9565 (86)
Living	17.5523	17.8511	18.3598	19.1897	19.9030	20.5296	20.7936	20.7549	20.3171	19.4220	18.4563	17.6233
Non living	15.6930	16.0743	16.7215	17.7847	18.6589	19.4046	19.6614	19.6403	19.1738	18.0908	16.8688	15.8009

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24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	19.2363	17.8511	18.3598	19.1897	19.9030	20.5296	20.7936	20.7549	20.3171	19.4220	18.4563	18.0956 (87)
Th 2	19.6226	19.6356	19.6484	19.7092	19.7207	19.7747	19.7747	19.7847	19.7538	19.7207	19.6975	19.6734 (88)
util rest of house												
	0.9462	0.9323	0.9110	0.8576	0.7662	0.6032	0.4386	0.4803	0.6988	0.8621	0.9249	0.9492 (89)
MIT 2	18.0518	16.0743	16.7215	17.7847	18.6589	19.4046	19.6614	19.6403	19.1738	18.0908	16.8688	16.4980 (90)
Living area fraction									FLA = Living area / (4) =			0.4391 (91)
MIT	18.5719	16.8544	17.4409	18.4016	19.2052	19.8986	20.1585	20.1297	19.6758	18.6753	17.5658	17.1995 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5719	16.8544	17.4409	18.4016	19.2052	19.8986	20.1585	20.1297	19.6758	18.6753	17.5658	17.1995 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9389	0.9032	0.8796	0.8269	0.7454	0.6121	0.4793	0.5161	0.6939	0.8338	0.8966	0.9303 (94)
Useful gains	516.9498	542.4973	550.5543	555.7109	521.7737	426.9088	320.3869	324.6574	412.5260	460.9280	480.8761	496.5527 (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	1690.2720	1400.0723	1267.2510	1042.9578	815.3094	547.6322	367.7894	381.8330	587.6189	877.2428	1160.9372	1473.1636 (97)
Space heating kWh	872.9517	576.2904	533.2224	350.8177	218.3906	0.0000	0.0000	0.0000	0.0000	309.7382	489.6440	726.5985 (98a)
Space heating requirement - total per year (kWh/year)												4077.6535
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	872.9517	576.2904	533.2224	350.8177	218.3906	0.0000	0.0000	0.0000	0.0000	309.7382	489.6440	726.5985 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4077.6535
Space heating per m2										(98c) / (4) =		54.6529 (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 %)												350.2647 (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	872.9517	576.2904	533.2224	350.8177	218.3906	0.0000	0.0000	0.0000	0.0000	309.7382	489.6440	726.5985 (98)
Space heating efficiency (main heating system 1)	350.2647	350.2647	350.2647	350.2647	350.2647	0.0000	0.0000	0.0000	0.0000	350.2647	350.2647	350.2647 (210)
Space heating fuel (main heating system)	249.2263	164.5300	152.2341	100.1579	62.3502	0.0000	0.0000	0.0000	0.0000	88.4298	139.7926	207.4427 (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	159.2834	140.8515	150.3443	134.7218	132.1475	120.8457	120.9047	124.9390	125.3963	137.6499	143.5962	157.9459 (64)
Efficiency of water heater (217)m	188.5179	188.5179	188.5179	188.5179	188.5179	188.5179	188.5179	188.5179	188.5179	188.5179	188.5179	188.5179 (216)
Fuel for water heating, kWh/month	84.4924	74.7152	79.7506	71.4636	70.0981	64.1030	64.1343	66.2743	66.5169	73.0169	76.1711	83.7830 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	23.5365	18.8819	17.0010	12.4557	9.6211	7.8605	8.7767	11.4083	14.8183	19.4424	21.9601	24.1907 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1164.1634 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												188.5179
Water heating fuel used												874.5196 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												189.9532 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												2808.5971 (238)

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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	1164.1634	0.1544	179.7416 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	874.5196	0.1405	122.8386 (264)
Energy for instantaneous electric shower(s)	579.9609	0.1391	80.6854 (264a)
Space and water heating			302.5802 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	189.9532	0.1443	27.4161 (268)
Total CO2, kg/year			410.6817 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.5000 (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	1164.1634	1.5716	1829.5493 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	874.5196	1.5194	1328.7128 (278)
Energy for instantaneous electric shower(s)	579.9609	1.5143	878.2547 (278a)
Space and water heating			3158.2621 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	189.9532	1.5338	291.3566 (282)
Total Primary energy kWh/year			4327.8733 (286)
Dwelling Primary energy Rate (DPER)			58.0100 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	74.6100 (1b)	x 3.0000 (2b)	= 223.8300 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.6100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 223.8300 (5)

2. Ventilation rate

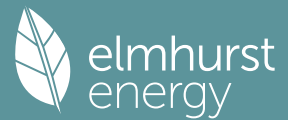
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1340 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3840 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3264 (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	0.4162	0.4080	0.3999	0.3591	0.3509	0.3101	0.3101	0.3019	0.3264	0.3509	0.3672	0.3836 (22b)
Effective ac	0.5866	0.5832	0.5799	0.5645	0.5616	0.5481	0.5481	0.5456	0.5533	0.5616	0.5674	0.5736 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type (Uw = 1.20)			8.7200	1.1450	9.9847		(27)
Exposed Floor above Stairway			9.1100	0.1300	1.1843		(28b)
External Wall	36.7500	8.7200	28.0300	0.1800	5.0454		(29a)
Corridor wall	33.8000	2.1000	31.7000	0.1800	5.7060		(29a)
Total net area of external elements Aum (A, m ²)			79.6600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.0204		(33)
Party Wall			48.0000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							3.9830 (36)
Point Thermal bridges						(36a) =	0.0000

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Total fabric heat loss (33) + (36) + (36a) = 28.0034 (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	43.3292	43.0808	42.8373	41.6936	41.4796	40.4835	40.4835	40.2990	40.8672	41.4796	41.9125	42.3650 (38)
Heat transfer coeff	71.3326	71.0842	70.8407	69.6970	69.4830	68.4869	68.4869	68.3025	68.8706	69.4830	69.9159	70.3685 (39)
Average = Sum(39)m / 12 =												69.6960

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9561	0.9527	0.9495	0.9342	0.9313	0.9179	0.9179	0.9155	0.9231	0.9313	0.9371	Dec 0.9432 (40)
HLP (average)												0.9341
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3527 (42)

Hot water usage for mixer showers 63.6660 62.7092 61.3150 58.6474 56.6788 54.4835 53.2356 54.6193 56.1360 58.4932 61.2180 63.4220 (42a)

Hot water usage for baths 27.5017 27.0932 26.5181 25.4576 24.6635 23.7830 23.3073 23.8785 24.5004 25.4425 26.5249 27.4087 (42b)

Hot water usage for other uses 38.7235 37.3154 35.9073 34.4992 33.0910 31.6829 31.6829 33.0910 34.4992 35.9073 37.3154 38.7235 (42c)

Average daily hot water use (litres/day) 30.8574 27.1521 28.5276 24.3545 23.1074 20.2793 19.6335 20.7255 21.2960 24.3939 26.7253 30.4276 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	129.8912	127.1179	123.7404	118.6042	114.4333	109.9493	108.2259	111.5888	115.1355	119.8430	125.0583	129.5543 (44)
Energy conte	205.7159	181.0141	190.1843	162.3632	154.0493	135.1955	130.8898	138.1702	141.9736	162.6258	178.1685	202.8507 (45)
Energy content (annual)										Total = Sum(45)m =		1983.2010
Distribution loss (46)m = 0.15 x (45)m	30.8574	27.1521	28.5276	24.3545	23.1074	20.2793	19.6335	20.7255	21.2960	24.3939	26.7253	30.4276 (46)
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8381 (55)
Total storage loss	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (56)
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (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	254.9586	225.4914	239.4270	210.0174	203.2919	182.8497	180.1325	187.4129	189.6278	211.8685	225.8227	252.0934 (62)
WWHRS	-29.1054	-25.7411	-26.9546	-22.3195	-20.8009	-17.7995	-16.6842	-17.7420	-18.4161	-21.7105	-24.5954	-28.5664 (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	225.8532	199.7503	212.4724	187.6979	182.4910	165.0502	163.4483	169.6709	171.2118	190.1580	201.2274	223.5270 (64)
12Total per year (kWh/year)												2292.5583 (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	107.7947	95.7690	102.6304	92.1091	90.6155	83.0759	82.9150	85.3357	85.3296	93.4672	97.3644	106.8420 (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	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328	117.6328 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	117.0224	129.5605	117.0224	120.9232	117.0224	120.9232	117.0224	117.0224	120.9232	117.0224	120.9232	117.0224 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	207.8091	209.9655	204.5315	192.9629	178.3598	164.6349	155.4658	153.3094	158.7434	170.3119	184.9151	198.6400 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.7633	34.7633	34.7633	34.7633	34.7633	34.7633	34.7633	34.7633	34.7633	34.7633	34.7633	34.7633 (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)	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062	-94.1062 (71)
Water heating gains (Table 5)	144.8853	142.5134	137.9441	127.9293	121.7950	115.3831	111.4449	114.6986	118.5133	125.6280	135.2283	143.6048 (72)
Total internal gains	531.0067	543.3293	520.7878	503.1053	478.4671	459.2310	442.2229	443.3202	456.4698	474.2522	502.3565	520.5571 (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	4.6600	10.6334	0.6300	0.7000	0.7700	15.1436 (74)
Northeast	2.0300	11.2829	0.6300	0.7000	0.7700	6.9999 (75)
Southwest	2.0300	36.7938	0.6300	0.7000	0.7700	22.8267 (79)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Solar gains	44.9702	82.0710	128.0481	187.0675	236.9110	247.6282	233.5385	194.1967	148.0117	94.8355	54.8304	37.8758 (83)
Total gains	575.9769	625.4003	648.8360	690.1727	715.3781	706.8592	675.7614	637.5169	604.4814	569.0877	557.1868	558.4329 (84)

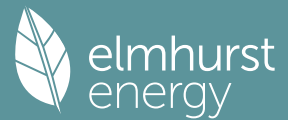
7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	29.0540	29.1556	29.2558	29.7358	29.8274	30.2612	30.2612	30.3430	30.0927	29.8274	29.6427	29.4521

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alpha	2.9369	2.9437	2.9504	2.9824	2.9885	3.0174	3.0174	3.0229	3.0062	2.9885	2.9762	2.9635
util living area	0.9352	0.9156	0.8865	0.8183	0.7100	0.5548	0.4235	0.4616	0.6543	0.8306	0.9085	0.9398 (86)
MIT	19.0878	19.3225	19.6725	20.1771	20.5911	20.8629	20.9548	20.9407	20.7636	20.2609	19.6260	19.0645 (87)
Th 2	20.1201	20.1229	20.1256	20.1386	20.1410	20.1523	20.1523	20.1544	20.1479	20.1410	20.1361	20.1310 (88)
util rest of house	0.9269	0.9050	0.8717	0.7941	0.6708	0.4962	0.3493	0.3865	0.5988	0.8033	0.8954	0.9321 (89)
MIT 2	17.8845	18.1801	18.6194	19.2470	19.7363	20.0398	20.1246	20.1161	19.9403	19.3600	18.5740	17.8622 (90)
Living area fraction	18.4128	18.6817	19.0818	19.6554	20.1116	20.4012	20.4892	20.4782	20.3018	19.7556	19.0359	18.3901 (92)
MIT	18.4128	18.6817	19.0818	19.6554	20.1116	20.4012	20.4892	20.4782	20.3018	19.7556	19.0359	18.3901 (93)
Temperature adjustment												0.0000
adjusted MIT	18.4128	18.6817	19.0818	19.6554	20.1116	20.4012	20.4892	20.4782	20.3018	19.7556	19.0359	18.3901 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9066	0.8837	0.8508	0.7789	0.6693	0.5141	0.3794	0.4160	0.6094	0.7894	0.8751	0.9125 (94)
Useful gains	522.1991	552.6689	552.0530	537.6015	478.8233	363.3634	256.3969	265.2362	368.3989	449.2125	487.5709	509.5766 (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	1006.7052	979.6609	891.3038	749.6183	584.4631	397.3046	266.3562	278.5497	427.1217	636.1560	834.5100	998.5359 (97)
Space heating kWh	360.4726	286.9387	252.4026	152.6521	78.5960	0.0000	0.0000	0.0000	0.0000	139.0859	249.7962	363.7857 (98a)
Space heating requirement - total per year (kWh/year)												1883.7298
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	360.4726	286.9387	252.4026	152.6521	78.5960	0.0000	0.0000	0.0000	0.0000	139.0859	249.7962	363.7857 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1883.7298
Space heating per m2										(98c) / (4) =		25.2477 (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	360.4726	286.9387	252.4026	152.6521	78.5960	0.0000	0.0000	0.0000	0.0000	139.0859	249.7962	363.7857 (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)	390.5445	310.8761	273.4590	165.3869	85.1528	0.0000	0.0000	0.0000	0.0000	150.6890	270.6351	394.1340 (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	225.8532	199.7503	212.4724	187.6979	182.4910	165.0502	163.4483	169.6709	171.2118	190.1580	201.2274	223.5270 (64)
Efficiency of water heater (217)m	85.1028	84.8714	84.4470	83.6003	82.3113	79.8000	79.8000	79.8000	79.8000	83.3695	84.5458	79.8000 (216)
Fuel for water heating, kWh/month	265.3886	235.3564	251.6045	224.5183	221.7082	206.8298	204.8224	212.6202	214.5511	228.0907	238.0100	85.1452 (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	24.3149	19.5064	17.5633	12.8676	9.9393	8.1205	9.0670	11.7856	15.3083	20.0854	22.6864	24.9907 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-14.1188	-21.3597	-32.9136	-39.7533	-45.3176	-43.2028	-42.6829	-39.0731	-33.1522	-25.6028	-16.0317	-12.0432 (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	-4.0885	-8.8703	-18.1494	-28.0427	-37.8644	-38.3377	-37.8821	-31.7042	-22.7629	-12.9292	-5.5350	-3.2130 (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												2040.8773 (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												2766.0246 (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)												196.2356 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-614.6310 (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												4474.5065 (238)

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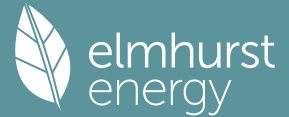
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2040.8773	0.2100	428.5842 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2766.0246	0.2100	580.8652 (264)
Space and water heating			1009.4494 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	196.2356	0.1443	28.3229 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-365.2517	0.1331	-48.6300
PV Unit electricity exported	-249.3793	0.1251	-31.1919
Total			-79.8219 (269)
Total CO2, kg/year			969.8796 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.0000 (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	2040.8773	1.1300	2306.1914 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2766.0246	1.1300	3125.6078 (278)
Space and water heating			5431.7992 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	196.2356	1.5338	300.9927 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-365.2517	1.4920	-544.9499
PV Unit electricity exported	-249.3793	0.4591	-114.4856
Total			-659.4355 (283)
Total Primary energy kWh/year			5203.4571 (286)
Target Primary Energy Rate (TPER)			69.7400 (287)

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Property Reference	Flat 2.02			Issued on Date	22/04/2024
Assessment Reference	Baseline	Prop Type Ref			
Property	Christchurch Hall, , 38, Portland Street, Bristol, BS8 4JB				
SAP Rating	79 C	DER	17.21	TER	11.63
Environmental	85 B	% DER < TER			-47.98
CO ₂ Emissions (t/year)	1.16	DFEE	52.04	TFEE	26.02
Compliance Check	See BREL	% DFEE < TFEE			-100.02
% DPER < TPER	-62.51	DPER	101.31	TPER	62.34
Assessor Details	Mr. Jordan Howlett			Assessor ID	H055-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	83.5200 (1b)	3.0000 (2b)	250.5600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	250.5600 (5)

2. Ventilation rate

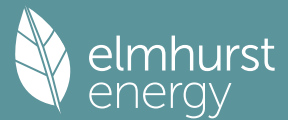
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1197 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8697 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7393 (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)
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	0.9426	0.9241	0.9056	0.8132	0.7947	0.7023	0.7023	0.6838	0.7393	0.7947	0.8317	0.8686 (22b)
Effective ac	0.9442	0.9270	0.9101	0.8306	0.8158	0.7466	0.7466	0.7338	0.7733	0.8158	0.8458	0.8773 (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
External Door			2.1000	1.4000	2.9400		(26)
Window (U _w = 1.40)			8.1000	1.3258	10.7386		(27)
External Wall	64.5000	8.1000	56.4000	0.3000	16.9200		(29a)
Corridor wall	3.7500	2.1000	1.6500	0.3000	0.4950		(29a)
Total net area of external elements A _{um} (A, m ²)			68.2500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.0936		(33)
Party Wall			46.9500	0.0000	0.0000		(32)
Party Floor			83.5200				(32d)
Party Ceiling			83.5200				(32b)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							13.6500 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss					(33) + (36) + (36a) =		44.7436 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	78.0727	76.6464	75.2484	68.6818	67.4533	61.7340	61.7340
Heat transfer coeff	122.8163	121.3901	119.9920	113.4255	112.1969	106.4776	106.4776
						105.4185	108.6806
							112.1969
							114.6823
							117.2807 (39)

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Average = Sum(39)m / 12 =

113.4196

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4705	1.4534	1.4367	1.3581	1.3434	1.2749	1.2749	1.2622	1.3013	1.3434	1.3731	1.4042	(40)
HLP (average)												1.3580	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5263 (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													
28.7535	28.3264	27.7251	26.6163	25.7861	24.8655	24.3682	24.9654	25.6155	26.6006	27.7322	28.6563		(42b)
Hot water usage for other uses													
40.5015	39.0287	37.5559	36.0831	34.6104	33.1376	33.1376	34.6104	36.0831	37.5559	39.0287	40.5015		(42c)
Average daily hot water use (litres/day)												63.4785	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	69.2550	67.3551	65.2810	62.6995	60.3964	58.0031	57.5058	59.5757	61.6987	64.1565	66.7609	69.1577	(44)
Energy conte	109.6829	95.9128	100.3345	85.8324	81.3052	71.3215	69.5483	73.7672	76.0806	87.0598	95.1132	108.2843	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													1054.2427
16.4524	14.3869	15.0502	12.8749	12.1958	10.6982	10.4322	11.0651	11.4121	13.0590	14.2670	16.2426		(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	25.3427	22.8841	25.3270	24.4956	25.3024	24.4770	25.2887	25.2947	24.4853	25.3125	24.5101	25.3411	(61)
Total heat required for water heating calculated for each month													
135.0256	118.7970	125.6615	110.3280	106.6076	95.7985	94.8370	99.0618	100.5659	112.3723	119.6233	133.6254		(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													
135.0256	118.7970	125.6615	110.3280	106.6076	95.7985	94.8370	99.0618	100.5659	112.3723	119.6233	133.6254		(64)
12Total per year (kWh/year)													1352 (64)
Electric shower(s)													
53.3170	47.5059	51.8746	49.5033	50.4322	48.1074	49.7110	50.4322	49.5033	51.8746	50.8992	53.3170		(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												606.4777	(64a)
Heat gains from water heating, kWh/month													
56.1345	49.4885	52.6616	47.0390	45.9676	41.8605	41.8747	43.4593	43.7940	48.2442	50.4775	55.6690		(65)

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

Metabolic gains (Table 5), Watts													
(66)m	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
132.8483	147.0821	132.8483	137.2766	132.8483	137.2766	132.8483	132.8483	137.2766	132.8483	137.2766	132.8483	137.2766	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
226.6398	228.9916	223.0651	210.4483	194.5219	179.5532	169.5533	167.2015	173.1280	185.7448	201.6712	216.6398		(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	(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)													
-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	(71)
Water heating gains (Table 5)													
75.4496	73.6436	70.7817	65.3320	61.7845	58.1396	56.2832	58.4130	60.8249	64.8443	70.1076	74.8240		(72)
Total internal gains													
498.8317	513.6113	490.5891	476.9508	453.0486	435.8634	419.5789	419.3568	432.1235	447.3314	472.9494	488.2061		(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			
Southwest				8.1000	36.7938	0.6300	0.7000	0.7700	91.0819 (79)			
Solar gains	91.0819	155.1461	212.2777	263.0223	294.6069	292.4765	281.9785	258.4150	229.8518	171.4695	109.0951	77.9471 (83)
Total gains	589.9135	668.7574	702.8668	739.9731	747.6555	728.3399	701.5574	677.7718	661.9753	618.8009	582.0444	566.1532 (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	18.8900	19.1119	19.3346	20.4540	20.6779	21.7886	21.7886	22.0075	21.3470	20.6779	20.2298	19.7816	
alpha	2.2593	2.2741	2.2890	2.3636	2.3785	2.4526	2.4526	2.4672	2.4231	2.3785	2.3487	2.3188	
util living area													
0.9566	0.9408	0.9211	0.8777	0.8102	0.6864	0.5582	0.5857	0.7506	0.8823	0.9383	0.9598		(86)
MIT	17.7328	18.0722	18.5737	19.3534	19.9984	20.5751	20.8201	20.7933	20.4130	19.5792	18.6250	17.7981	(87)
Th 2	19.7097	19.7226	19.7353	19.7956	19.8070	19.8606	19.8606	19.8706	19.8399	19.8070	19.7840	19.7601	(88)
util rest of house													
0.9494	0.9311	0.9074	0.8547	0.7694	0.6126	0.4460	0.4783	0.6866	0.8560	0.9268	0.9533		(89)
MIT 2	16.7815	17.1231	17.6246	18.4215	19.0420	19.5939	19.7804	19.7726	19.4470	18.6553	17.7098	16.8763	(90)
Living area fraction													
17.2213	17.5619	18.0634	18.8523	19.4841	20.0475	20.2610	20.2444	19.8936	19.0824	18.1329	17.3024	0.4623	(91)
MIT													
Temperature adjustment													
adjusted MIT	17.2213	17.5619	18.0634	18.8523	19.4841	20.0475	20.2610	20.2444	19.8936	19.0824	18.1329	17.3024	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9301	0.9089	0.8835	0.8326	0.7565	0.6260	0.4884	0.5167	0.6899	0.8361	0.9058	0.9353	(94)
Useful gains	548.6521	607.8324	621.0067	616.1088	565.6135	455.9070	342.6194	350.1971	456.7284	517.3591	527.2402	529.5157	(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	1586.9460	1537.0234	1387.5100	1128.8497	873.3549	580.0345	389.8160	405.2744	629.6480	951.7014	1265.2760	1536.6595	(97)
Space heating kWh	772.4907	624.4164	570.2785	369.1735	228.9596	0.0000	0.0000	0.0000	0.0000	323.1507	531.3858	749.3150	(98a)
Space heating requirement - total per year (kWh/year)												4169.1701	
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	772.4907	624.4164	570.2785	369.1735	228.9596	0.0000	0.0000	0.0000	0.0000	323.1507	531.3858	749.3150	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4169.1701	
Space heating per m2											(98c) / (4) =	49.9182	(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 %)													89.2000	(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	772.4907	624.4164	570.2785	369.1735	228.9596	0.0000	0.0000	0.0000	0.0000	323.1507	531.3858	749.3150	(98)	
Space heating efficiency (main heating system 1)	89.2000	89.2000	89.2000	89.2000	89.2000	0.0000	0.0000	0.0000	0.0000	89.2000	89.2000	89.2000	(210)	
Space heating fuel (main heating system)	866.0209	700.0184	639.3257	413.8716	256.6812	0.0000	0.0000	0.0000	0.0000	362.2766	595.7239	840.0393	(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	135.0256	118.7970	125.6615	110.3280	106.6076	95.7985	94.8370	99.0618	100.5659	112.3723	119.6233	133.6254	(64)	
Efficiency of water heater	88.8966	88.8742	88.8321	88.7317	88.5547	87.2000	87.2000	87.2000	87.2000	88.6752	88.8256	88.8914	(216)	
Fuel for water heating, kWh/month	151.8905	133.6687	141.4595	124.3389	120.3861	109.8606	108.7580	113.6030	115.3279	126.7234	134.6720	150.3242	(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	32.4084	25.9993	23.4095	17.1508	13.2477	10.8235	12.0850	15.7086	20.4039	26.7710	30.2378	33.3092	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)														
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)														
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)														
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)	
Electricity generated by PVs (Appendix M) (negative quantity)														
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)														
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)														
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)	
Annual totals kWh/year														
Space heating fuel - main system 1												4673.9576	(211)	
Space heating fuel - main system 2												0.0000	(213)	
Space heating fuel - secondary												0.0000	(215)	
Efficiency of water heater												87.2000		
Water heating fuel used												1531.0130	(219)	
Space cooling fuel												0.0000	(221)	
Electricity for pumps and fans:														
central heating pump													41.0000	(230c)
main heating flue fan													45.0000	(230e)
Total electricity for the above, kWh/year													86.0000	(231)
Electricity for lighting (calculated in Appendix L)													261.5547	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													0.0000	(233)
Wind generation													0.0000	(234)
Hydro-electric generation (Appendix N)													0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)													0.0000	(235)
Appendix Q - special features														
Energy saved or generated													-0.0000	(236)
Energy used													0.0000	(237)
Total delivered energy for all uses													7159.0030	(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	4673.9576	0.2100	981.5311	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1531.0130	0.2100	321.5127	(264)
Energy for instantaneous electric shower(s)	606.4777	0.1391	84.3745	(264a)
Space and water heating			1303.0438	(265)

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Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	261.5547	0.1443	37.7504 (268)
Total CO ₂ , kg/year			1437.0980 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			17.2100 (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	4673.9576	1.1300	5281.5720 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	1531.0130	1.1300	1730.0447 (278)
Energy for instantaneous electric shower(s)	606.4777	1.5143	918.4099 (278a)
Space and water heating			7011.6168 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	261.5547	1.5338	401.1814 (282)
Total Primary energy kWh/year			8461.3088 (286)
Dwelling Primary energy Rate (DPER)			101.3100 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	83.5200 (1b)	x 3.0000 (2b)	= 250.5600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 250.5600 (5)

2. Ventilation rate

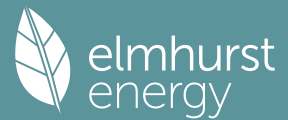
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1197 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3697 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3143 (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	0.4007	0.3928	0.3850	0.3457	0.3378	0.2986	0.2986	0.2907	0.3143	0.3378	0.3536	0.3693 (22b)
Effective ac	0.5803	0.5772	0.5741	0.5598	0.5571	0.5446	0.5446	0.5423	0.5494	0.5571	0.5625	0.5682 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type (Uw = 1.20)			8.1000	1.1450	9.2748		(27)
External Wall	64.5000	8.1000	56.4000	0.1800	10.1520		(29a)
Corridor wall	3.7500	2.1000	1.6500	0.1800	0.2970		(29a)
Total net area of external elements Aum(A, m ²)			68.2500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.8238		(33)
Party Wall			46.9500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							3.4125 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	25.2363 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	47.9803	47.7225	47.4698	46.2831	46.0611	45.0275	45.0275
Heat transfer coeff	73.2166	72.9588	72.7062	71.5195	71.2974	70.2639	70.2639
Average = Sum(39)m / 12 =							70.0724
	70.6620	71.2974	71.7466	72.2162	71.5184		
HLP	0.8766	0.8735	0.8705	0.8563	0.8537	0.8413	0.8413
	0.8390	0.8460	0.8537	0.8590	0.8647		(40)

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HLP (average)	31	28	31	30	31	30	31	31	30	31	30	0.8563
Days in mont												31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.5263 (42)
Hot water usage for mixer showers	66.5769	65.5764	64.1184	61.3289	59.2703	56.9745	55.6696	57.1166	58.7027	61.1676	64.0170	66.3218 (42a)
Hot water usage for baths	28.7535	28.3264	27.7251	26.6163	25.7861	24.8655	24.3682	24.9654	25.6155	26.6006	27.7322	28.6563 (42b)
Hot water usage for other uses	40.5015	39.0287	37.5559	36.0831	34.6104	33.1376	33.1376	34.6104	36.0831	37.5559	39.0287	40.5015 (42c)
Average daily hot water use (litres/day)												124.8602 (43)

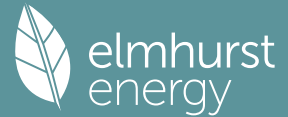
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	135.8318	132.9315	129.3994	124.0283	119.6667	114.9776	113.1754	116.6923	120.4013	125.3241	130.7779	135.4796 (44)
Energy conte	215.1244	189.2927	198.8821	169.7886	161.0944	141.3784	136.8759	144.4894	148.4669	170.0636	186.3172	212.1282 (45)
Energy content (annual)										Total = Sum(45)m =		2073.9018
Distribution loss (46)m = 0.15 x (45)m	32.2687	28.3939	29.8323	25.4683	24.1642	21.2068	20.5314	21.6734	22.2700	25.5095	27.9476	31.8192 (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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	266.0833	235.3201	249.8410	219.1037	212.0533	190.6934	187.8348	195.4483	197.7819	221.0225	235.6322	263.0871 (62)
WWHRS	-30.4362	-26.9180	-28.1870	-23.3399	-21.7520	-18.6133	-17.4470	-18.5532	-19.2581	-22.7031	-25.7199	-29.8725 (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	235.6472	208.4021	221.6540	195.7637	190.3013	172.0801	170.3878	176.8951	178.5239	198.3194	209.9123	233.2146 (64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				2391.1016 (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	84.2686	74.4467	78.8680	68.7835	66.3036	59.3371	58.2510	60.7825	61.6940	69.2859	74.2792	83.2724 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.8483	147.0821	132.8483	137.2766	132.8483	137.2766	132.8483	132.8483	137.2766	132.8483	137.2766	132.8483 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	226.6398	228.9916	223.0651	210.4483	194.5219	179.5532	169.5533	167.2015	173.1280	185.7448	201.6712	216.6398 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313 (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)	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506 (71)
Water heating gains (Table 5)	113.2643	110.7837	106.0054	95.5326	89.1178	82.4126	78.2943	81.6968	85.6861	93.1262	103.1656	111.9252 (72)
Total internal gains	536.6463	550.7514	525.8128	507.1515	480.3819	460.1364	441.5899	442.6406	456.9847	475.6133	506.0074	525.3074 (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											
Southwest	8.1000							0.7000		0.7700		91.0819 (79)
Solar gains	91.0819	155.1461	212.2777	263.0223	294.6069	292.4765	281.9785	258.4150	229.8518	171.4695	109.0951	77.9471 (83)
Total gains	627.7282	705.8975	738.0905	770.1738	774.9888	752.6129	723.5684	701.0556	686.8365	647.0828	615.1025	603.2544 (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	31.6868	31.7988	31.9093	32.4387	32.5397	33.0184	33.0184	33.1086	32.8324	32.5397	32.3360	32.1258
alpha	3.1125	3.1199	3.1273	3.1626	3.1693	3.2012	3.2012	3.2072	3.1888	3.1693	3.1557	3.1417
util living area	0.9347	0.9071	0.8723	0.8020	0.6979	0.5452	0.4107	0.4384	0.6192	0.8091	0.9037	0.9407 (86)
MIT	19.2847	19.5573	19.8906	20.3268	20.6676	20.8925	20.9673	20.9590	20.8301	20.4071	19.8014	19.2504 (87)
Th 2	20.1874	20.1900	20.1926	20.2048	20.2071	20.2177	20.2177	20.2197	20.2136	20.2071	20.2025	20.1976 (88)
util rest of house	0.9267	0.8962	0.8569	0.7779	0.6604	0.4906	0.3432	0.3708	0.5669	0.7813	0.8906	0.9334 (89)
MIT 2	18.1749	18.5167	18.9333	19.4744	19.8763	20.1283	20.1971	20.1927	20.0642	19.5807	18.8357	18.1388 (90)
Living area fraction									fLA = Living area / (4) =			0.4623 (91)
MIT	18.6880	18.9977	19.3758	19.8684	20.2421	20.4816	20.5531	20.5470	20.4183	19.9627	19.2821	18.6527 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6880	18.9977	19.3758	19.8684	20.2421	20.4816	20.5531	20.5470	20.4183	19.9627	19.2821	18.6527 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9084	0.8770	0.8391	0.7667	0.6622	0.5096	0.3726	0.3997	0.5811	0.7718	0.8727	0.9159	(94)
Useful gains	570.2530	619.0616	619.3057	590.4906	513.1647	383.5211	269.6329	280.2381	399.1051	499.4480	536.7820	552.5351	(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	1053.4379	1028.5539	936.1528	784.4562	609.0307	413.2626	277.7632	290.5879	446.4630	667.5387	874.0255	1043.7157	(97)
Space heating kWh	359.4895	275.1788	235.7342	139.6553	71.3243	0.0000	0.0000	0.0000	0.0000	125.0595	242.8154	365.4384	(98a)
Space heating requirement - total per year (kWh/year)												1814.6954	
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	359.4895	275.1788	235.7342	139.6553	71.3243	0.0000	0.0000	0.0000	0.0000	125.0595	242.8154	365.4384	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1814.6954	
Space heating per m2										(98c) / (4) =		21.7277	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	359.4895	275.1788	235.7342	139.6553	71.3243	0.0000	0.0000	0.0000	0.0000	125.0595	242.8154	365.4384	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	389.0579	297.8126	255.1236	151.1421	77.1908	0.0000	0.0000	0.0000	0.0000	135.3458	262.7872	395.4961	(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	235.6472	208.4021	221.6540	195.7637	190.3013	172.0801	170.3878	176.8951	178.5239	198.3194	209.9123	233.2146	(64)
Efficiency of water heater (217)m	85.2835	84.9779	84.5137	83.6701	82.4751	80.3000	80.3000	80.3000	80.3000	83.4209	84.6943	85.3395	(216)
Fuel for water heating, kWh/month	276.3105	245.2428	262.2700	233.9711	230.7379	214.2965	212.1890	220.2928	222.3211	237.7335	247.8471	273.2787	(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	27.6033	22.1444	19.9385	14.6078	11.2835	9.2187	10.2932	13.3795	17.3786	22.8017	25.7545	28.3704	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-15.7460	-23.7874	-36.5984	-44.1287	-50.2319	-47.8548	-47.2765	-43.3154	-36.8049	-28.4818	-17.8673	-13.4348	(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)	-4.6356	-10.0528	-20.5626	-31.7635	-42.8837	-43.4233	-42.9096	-35.9142	-25.7876	-14.6518	-6.2749	-3.6434	(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												1963.9561	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2876.4911	(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)												222.7741	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-688.0309	(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												4461.1904	(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	1963.9561	0.2100	412.4308 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2876.4911	0.2100	604.0631 (264)
Space and water heating			1016.4939 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	222.7741	0.1443	32.1532 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-405.5280	0.1332	-54.0063
PV Unit electricity exported	-282.5029	0.1251	-35.3362
Total			-89.3425 (269)

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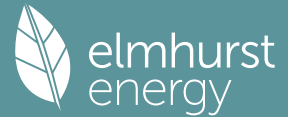
Total CO₂, kg/year
EPC Target Carbon Dioxide Emission Rate (TER)

971.2338 (272)
11.6300 (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	1963.9561	1.1300	2219.2704 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	2876.4911	1.1300	3250.4349 (278)
Space and water heating			5469.7053 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	222.7741	1.5338	341.6984 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-405.5280	1.4921	-605.0935
PV Unit electricity exported	-282.5029	0.4591	-129.6969
Total			-734.7904 (283)
Total Primary energy kWh/year			5206.7140 (286)
Target Primary Energy Rate (TPER)			62.3400 (287)

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Property Reference	Flat 2.02			Issued on Date	22/04/2024
Assessment Reference	Additional Measures		Prop Type Ref		
Property	Christchurch Hall, , 38, Portland Street, Bristol, BS8 4JB				
SAP Rating	79 C	DER	16.33	TER	11.63
Environmental	86 B	% DER < TER			-40.41
CO ₂ Emissions (t/year)	1.11	DFEE	50.78	TFEE	26.02
Compliance Check	See BREL	% DFEE < TFEE			-95.18
% DPER < TPER	-54.29	DPER	96.19	TPER	62.34
Assessor Details	Mr. Jordan Howlett			Assessor ID	H055-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	83.5200	3.0000	250.5600
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.5200		
Dwelling volume			

2. Ventilation rate

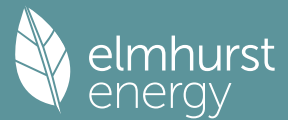
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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 = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1197 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8697 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7393 (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)
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	0.9426	0.9241	0.9056	0.8132	0.7947	0.7023	0.7023	0.6838	0.7393	0.7947	0.8317	0.8686 (22b)
Effective ac	0.9442	0.9270	0.9101	0.8306	0.8158	0.7466	0.7466	0.7338	0.7733	0.8158	0.8458	0.8773 (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
External Door			2.1000	1.4000	2.9400		(26)
Window (U _w = 1.40)			8.1000	1.3258	10.7386		(27)
External Wall	64.5000	8.1000	56.4000	0.2600	14.6640		(29a)
Corridor wall	3.7500	2.1000	1.6500	0.2600	0.4290		(29a)
Total net area of external elements A _{um} (A, m ²)			68.2500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.7716		(33)
Party Wall			46.9500	0.0000	0.0000		(32)
Party Floor			83.5200				(32d)
Party Ceiling			83.5200				(32b)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							13.6500 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss					(33) + (36) + (36a) =		42.4216 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	78.0727	76.6464	75.2484	68.6818	67.4533	61.7340	61.7340
Heat transfer coeff	120.4943	119.0681	117.6700	111.1035	109.8749	104.1556	104.1556

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Average = Sum(39)m / 12 =

111.0976

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4427	1.4256	1.4089	1.3303	1.3156	1.2471	1.2471	1.2344	1.2735	1.3156	1.3453	1.3764	(40)
HLP (average)												1.3302	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5263 (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													
28.7535	28.3264	27.7251	26.6163	25.7861	24.8655	24.3682	24.9654	25.6155	26.6006	27.7322	28.6563		(42b)
Hot water usage for other uses													
40.5015	39.0287	37.5559	36.0831	34.6104	33.1376	33.1376	34.6104	36.0831	37.5559	39.0287	40.5015		(42c)
Average daily hot water use (litres/day)												63.4785	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	69.2550	67.3551	65.2810	62.6995	60.3964	58.0031	57.5058	59.5757	61.6987	64.1565	66.7609	69.1577	(44)
Energy conte	109.6829	95.9128	100.3345	85.8324	81.3052	71.3215	69.5483	73.7672	76.0806	87.0598	95.1132	108.2843	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m												1054.2427	
16.4524	14.3869	15.0502	12.8749	12.1958	10.6982	10.4322	11.0651	11.4121	13.0590	14.2670	16.2426		(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	25.3427	22.8841	25.3270	24.4956	25.3024	24.4770	25.2887	25.2947	24.4853	25.3125	24.5101	25.3411	(61)
Total heat required for water heating calculated for each month													
135.0256	118.7970	125.6615	110.3280	106.6076	95.7985	94.8370	99.0618	100.5659	112.3723	119.6233	133.6254		(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													
135.0256	118.7970	125.6615	110.3280	106.6076	95.7985	94.8370	99.0618	100.5659	112.3723	119.6233	133.6254		(64)
12Total per year (kWh/year)												1352.3039	(64)
Electric shower(s)												1352	(64)
53.3170	47.5059	51.8746	49.5033	50.4322	48.1074	49.7110	50.4322	49.5033	51.8746	50.8992	53.3170		(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												606.4777	(64a)
Heat gains from water heating, kWh/month													
56.1345	49.4885	52.6616	47.0390	45.9676	41.8605	41.8747	43.4593	43.7940	48.2442	50.4775	55.6690		(65)

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

Metabolic gains (Table 5), Watts													
(66)m	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
132.8483	147.0821	132.8483	137.2766	132.8483	137.2766	132.8483	132.8483	137.2766	132.8483	137.2766	132.8483	137.2766	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
226.6398	228.9916	223.0651	210.4483	194.5219	179.5532	169.5533	167.2015	173.1280	185.7448	201.6712	216.6398		(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	(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)													
-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	(71)
Water heating gains (Table 5)													
75.4496	73.6436	70.7817	65.3320	61.7845	58.1396	56.2832	58.4130	60.8249	64.8443	70.1076	74.8240		(72)
Total internal gains													
498.8317	513.6113	490.5891	476.9508	453.0486	435.8634	419.5789	419.3568	432.1235	447.3314	472.9494	488.2061		(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	
Southwest			8.1000		36.7938		0.6300		0.7000		0.7700	91.0819 (79)
Solar gains	91.0819	155.1461	212.2777	263.0223	294.6069	292.4765	281.9785	258.4150	229.8518	171.4695	109.0951	77.9471 (83)
Total gains	589.9135	668.7574	702.8668	739.9731	747.6555	728.3399	701.5574	677.7718	661.9753	618.8009	582.0444	566.1532 (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	19.2540	19.4847	19.7162	20.8814	21.1149	22.2744	22.2744	22.5032	21.8130	21.1149	20.6479	20.1812
alpha	2.2836	2.2990	2.3144	2.3921	2.4077	2.4850	2.4850	2.5002	2.4542	2.4077	2.3765	2.3454
util living area												
	0.9563	0.9403	0.9203	0.8758	0.8070	0.6808	0.5516	0.5791	0.7461	0.8805	0.9377	0.9596 (86)
MIT	17.7899	18.1290	18.6263	19.4000	20.0336	20.5967	20.8315	20.8061	20.4382	19.6195	18.6765	17.8575 (87)
Th 2	19.7307	19.7437	19.7565	19.8172	19.8287	19.8825	19.8825	19.8926	19.8617	19.8287	19.8055	19.7815 (88)
util rest of house												
	0.9492	0.9306	0.9065	0.8529	0.7664	0.6079	0.4417	0.4738	0.6826	0.8542	0.9262	0.9531 (89)
MIT 2	16.0355	16.4694	17.1037	18.1016	18.8800	19.5568	19.7856	19.7739	19.3781	18.3904	17.1982	16.1454 (90)
Living area fraction												
	16.8465	17.2366	17.8076	18.7018	19.4133	20.0375	20.2691	20.2511	19.8682	18.9586	17.8816	16.9369 (91)
fLA = Living area / (4) =												
MIT	16.8465	17.2366	17.8076	18.7018	19.4133	20.0375	20.2691	20.2511	19.8682	18.9586	17.8816	16.9369 (92)
Temperature adjustment												
	16.8465	17.2366	17.8076	18.7018	19.4133	20.0375	20.2691	20.2511	19.8682	18.9586	17.8816	16.9369 (93)
adjusted MIT	16.8465	17.2366	17.8076	18.7018	19.4133	20.0375	20.2691	20.2511	19.8682	18.9586	17.8816	16.9369 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9255	0.9036	0.8775	0.8259	0.7494	0.6191	0.4824	0.5105	0.6830	0.8295	0.9006	0.9311	(94)
Useful gains	545.9716	604.2670	616.7800	611.1267	560.2857	450.8796	338.4402	345.9951	452.1380	513.3144	524.2069	527.1390	(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	1511.7865	1468.8967	1330.5621	1089.0141	847.4983	566.3513	382.1557	397.0340	613.4951	918.4016	1211.4265	1464.2128	(97)
Space heating kWh	718.5663	581.0312	531.0539	344.0789	213.6862	0.0000	0.0000	0.0000	0.0000	301.3849	494.7981	697.1828	(98a)
Space heating requirement - total per year (kWh/year)												3881.7824	
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	718.5663	581.0312	531.0539	344.0789	213.6862	0.0000	0.0000	0.0000	0.0000	301.3849	494.7981	697.1828	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3881.7824	
Space heating per m2												46.4773	(99)

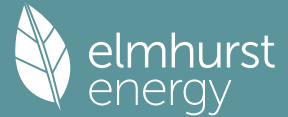
9a. Energy requirements - Individual heating systems, including micro-CHP

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 %)													89.2000	(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	718.5663	581.0312	531.0539	344.0789	213.6862	0.0000	0.0000	0.0000	0.0000	301.3849	494.7981	697.1828	(98)	
Space heating efficiency (main heating system 1)	89.2000	89.2000	89.2000	89.2000	89.2000	0.0000	0.0000	0.0000	0.0000	89.2000	89.2000	89.2000	(210)	
Space heating fuel (main heating system)	805.5676	651.3802	595.3519	385.7387	239.5585	0.0000	0.0000	0.0000	0.0000	337.8755	554.7064	781.5951	(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	135.0256	118.7970	125.6615	110.3280	106.6076	95.7985	94.8370	99.0618	100.5659	112.3723	119.6233	133.6254	(64)	
Efficiency of water heater (217)m	88.8775	88.8541	88.8102	88.7060	88.5242	87.2000	87.2000	87.2000	87.2000	88.6478	88.8035	88.8722	(216)	
Fuel for water heating, kWh/month	151.9232	133.6990	141.4943	124.3749	120.4276	109.8606	108.7580	113.6030	115.3279	126.7627	134.7057	150.3569	(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	27.2367	21.8503	19.6738	14.4138	11.1337	9.0963	10.1565	13.2018	17.1478	22.4989	25.4125	27.9937	(232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)	
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)	
Annual totals kWh/year														
Space heating fuel - main system 1												4351.7739	(211)	
Space heating fuel - main system 2												0.0000	(213)	
Space heating fuel - secondary												0.0000	(215)	
Efficiency of water heater												87.2000		
Water heating fuel used												1531.2938	(219)	
Space cooling fuel												0.0000	(221)	
Electricity for pumps and fans:														
central heating pump												41.0000	(230c)	
main heating flue fan												45.0000	(230e)	
Total electricity for the above, kWh/year												86.0000	(231)	
Electricity for lighting (calculated in Appendix L)												219.8157	(232)	
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation												0.0000	(233)	
Wind generation												0.0000	(234)	
Hydro-electric generation (Appendix N)												0.0000	(235a)	
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)	
Appendix Q - special features														
Energy saved or generated												-0.0000	(236)	
Energy used												0.0000	(237)	
Total delivered energy for all uses												6795.3612	(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	4351.7739	0.2100	913.8725	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1531.2938	0.2100	321.5717	(264)
Energy for instantaneous electric shower(s)	606.4777	0.1391	84.3745	(264a)
Space and water heating			1235.4442	(265)

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Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	219.8157	0.1443	31.7262 (268)
Total CO ₂ , kg/year			1363.4742 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			16.3300 (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	4351.7739	1.1300	4917.5046 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	1531.2938	1.1300	1730.3620 (278)
Energy for instantaneous electric shower(s)	606.4777	1.5143	918.4099 (278a)
Space and water heating			6647.8666 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	219.8157	1.5338	337.1607 (282)
Total Primary energy kWh/year			8033.5380 (286)
Dwelling Primary energy Rate (DPER)			96.1900 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	83.5200	3.0000	250.5600
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.5200		
Dwelling volume			

2. Ventilation rate

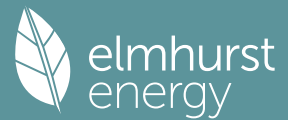
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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 = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1197 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3697 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3143 (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	0.4007	0.3928	0.3850	0.3457	0.3378	0.2986	0.2986	0.2907	0.3143	0.3378	0.3536	0.3693 (22b)
Effective ac	0.5803	0.5772	0.5741	0.5598	0.5571	0.5446	0.5446	0.5423	0.5494	0.5571	0.5625	0.5682 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type (Uw = 1.20)			8.1000	1.1450	9.2748		(27)
External Wall	64.5000	8.1000	56.4000	0.1800	10.1520		(29a)
Corridor wall	3.7500	2.1000	1.6500	0.1800	0.2970		(29a)
Total net area of external elements Aum(A, m ²)			68.2500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.8238		(33)
Party Wall			46.9500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							3.4125 (36)
Point Thermal bridges							0.0000
Total fabric heat loss						(33) + (36) + (36a) =	25.2363 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	47.9803	47.7225	47.4698	46.2831	46.0611	45.0275	45.0275
Heat transfer coeff	73.2166	72.9588	72.7062	71.5195	71.2974	70.2639	70.2639
Average = Sum(39)m / 12 =							70.0724
HLP	0.8766	0.8735	0.8705	0.8563	0.8537	0.8413	0.8413

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HLP (average)	31	28	31	30	31	30	31	31	30	31	30	0.8563
Days in mont												31

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.5263 (42)
Hot water usage for mixer showers												
66.5769	65.5764	64.1184	61.3289	59.2703	56.9745	55.6696	57.1166	58.7027	61.1676	64.0170	66.3218	(42a)
Hot water usage for baths												
28.7535	28.3264	27.7251	26.6163	25.7861	24.8655	24.3682	24.9654	25.6155	26.6006	27.7322	28.6563	(42b)
Hot water usage for other uses												
40.5015	39.0287	37.5559	36.0831	34.6104	33.1376	33.1376	34.6104	36.0831	37.5559	39.0287	40.5015	(42c)
Average daily hot water use (litres/day)												124.8602 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	135.8318	132.9315	129.3994	124.0283	119.6667	114.9776	113.1754	116.6923	120.4013	125.3241	130.7779	135.4796 (44)
Energy conte	215.1244	189.2927	198.8821	169.7886	161.0944	141.3784	136.8759	144.4894	148.4669	170.0636	186.3172	212.1282 (45)
Energy content (annual)										Total = Sum(45)m =		2073.9018
Distribution loss	(46)m = 0.15 x (45)m											
32.2687	28.3939	29.8323	25.4683	24.1642	21.2068	20.5314	21.6734	22.2700	25.5095	27.9476	31.8192	(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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
266.0833	235.3201	249.8410	219.1037	212.0533	190.6934	187.8348	195.4483	197.7819	221.0225	235.6322	263.0871	(62)
WWHRS	-30.4362	-26.9180	-28.1870	-23.3399	-21.7520	-18.6133	-17.4470	-18.5532	-19.2581	-22.7031	-25.7199	-29.8725 (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	235.6472	208.4021	221.6540	195.7637	190.3013	172.0801	170.3878	176.8951	178.5239	198.3194	209.9123	233.2146 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2391.1016 (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	84.2686	74.4467	78.8680	68.7835	66.3036	59.3371	58.2510	60.7825	61.6940	69.2859	74.2792	83.2724 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.8483	147.0821	132.8483	137.2766	132.8483	137.2766	132.8483	132.8483	137.2766	132.8483	137.2766	132.8483 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	226.6398	228.9916	223.0651	210.4483	194.5219	179.5532	169.5533	167.2015	173.1280	185.7448	201.6712	216.6398 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313 (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)	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506 (71)
Water heating gains (Table 5)	113.2643	110.7837	106.0054	95.5326	89.1178	82.4126	78.2943	81.6968	85.6861	93.1262	103.1656	111.9252 (72)
Total internal gains	536.6463	550.7514	525.8128	507.1515	480.3819	460.1364	441.5899	442.6406	456.9847	475.6133	506.0074	525.3074 (73)

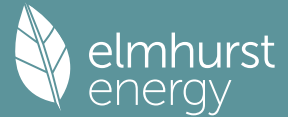
6. Solar gains												

[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											
Southwest	8.1000							0.7000		0.7700		91.0819 (79)
Solar gains	91.0819	155.1461	212.2777	263.0223	294.6069	292.4765	281.9785	258.4150	229.8518	171.4695	109.0951	77.9471 (83)
Total gains	627.7282	705.8975	738.0905	770.1738	774.9888	752.6129	723.5684	701.0556	686.8365	647.0828	615.1025	603.2544 (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	31.6868	31.7988	31.9093	32.4387	32.5397	33.0184	33.0184	33.1086	32.8324	32.5397	32.3360	32.1258
alpha	3.1125	3.1199	3.1273	3.1626	3.1693	3.2012	3.2012	3.2072	3.1888	3.1693	3.1557	3.1417
util living area	0.9347	0.9071	0.8723	0.8020	0.6979	0.5452	0.4107	0.4384	0.6192	0.8091	0.9037	0.9407 (86)
MIT	19.2847	19.5573	19.8906	20.3268	20.6676	20.8925	20.9673	20.9590	20.8301	20.4071	19.8014	19.2504 (87)
Th 2	20.1874	20.1900	20.1926	20.2048	20.2071	20.2177	20.2177	20.2197	20.2136	20.2071	20.2025	20.1976 (88)
util rest of house	0.9267	0.8962	0.8569	0.7779	0.6604	0.4906	0.3432	0.3708	0.5669	0.7813	0.8906	0.9334 (89)
MIT 2	18.1749	18.5167	18.9333	19.4744	19.8763	20.1283	20.1971	20.1927	20.0642	19.5807	18.8357	18.1388 (90)
Living area fraction									fLA = Living area / (4) =			0.4623 (91)
MIT	18.6880	18.9977	19.3758	19.8684	20.2421	20.4816	20.5531	20.5470	20.4183	19.9627	19.2821	18.6527 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6880	18.9977	19.3758	19.8684	20.2421	20.4816	20.5531	20.5470	20.4183	19.9627	19.2821	18.6527 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9084	0.8770	0.8391	0.7667	0.6622	0.5096	0.3726	0.3997	0.5811	0.7718	0.8727	0.9159	(94)
Useful gains	570.2530	619.0616	619.3057	590.4906	513.1647	383.5211	269.6329	280.2381	399.1051	499.4480	536.7820	552.5351	(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	1053.4379	1028.5539	936.1528	784.4562	609.0307	413.2626	277.7632	290.5879	446.4630	667.5387	874.0255	1043.7157	(97)
Space heating kWh	359.4895	275.1788	235.7342	139.6553	71.3243	0.0000	0.0000	0.0000	0.0000	125.0595	242.8154	365.4384	(98a)
Space heating requirement - total per year (kWh/year)												1814.6954	
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	359.4895	275.1788	235.7342	139.6553	71.3243	0.0000	0.0000	0.0000	0.0000	125.0595	242.8154	365.4384	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1814.6954	
Space heating per m2										(98c) / (4) =		21.7277	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	359.4895	275.1788	235.7342	139.6553	71.3243	0.0000	0.0000	0.0000	0.0000	125.0595	242.8154	365.4384	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	389.0579	297.8126	255.1236	151.1421	77.1908	0.0000	0.0000	0.0000	0.0000	135.3458	262.7872	395.4961	(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	235.6472	208.4021	221.6540	195.7637	190.3013	172.0801	170.3878	176.8951	178.5239	198.3194	209.9123	233.2146	(64)
Efficiency of water heater (217)m	85.2835	84.9779	84.5137	83.6701	82.4751	80.3000	80.3000	80.3000	80.3000	83.4209	84.6943	85.3395	(216)
Fuel for water heating, kWh/month	276.3105	245.2428	262.2700	233.9711	230.7379	214.2965	212.1890	220.2928	222.3211	237.7335	247.8471	273.2787	(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	27.6033	22.1444	19.9385	14.6078	11.2835	9.2187	10.2932	13.3795	17.3786	22.8017	25.7545	28.3704	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-15.7460	-23.7874	-36.5984	-44.1287	-50.2319	-47.8548	-47.2765	-43.3154	-36.8049	-28.4818	-17.8673	-13.4348	(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)	-4.6356	-10.0528	-20.5626	-31.7635	-42.8837	-43.4233	-42.9096	-35.9142	-25.7876	-14.6518	-6.2749	-3.6434	(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												1963.9561	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2876.4911	(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)												222.7741	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-688.0309	(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												4461.1904	(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	1963.9561	0.2100	412.4308 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2876.4911	0.2100	604.0631 (264)
Space and water heating			1016.4939 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	222.7741	0.1443	32.1532 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-405.5280	0.1332	-54.0063
PV Unit electricity exported	-282.5029	0.1251	-35.3362
Total			-89.3425 (269)

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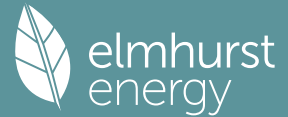
Total CO₂, kg/year
EPC Target Carbon Dioxide Emission Rate (TER)

971.2338 (272)
11.6300 (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	1963.9561	1.1300	2219.2704 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	2876.4911	1.1300	3250.4349 (278)
Space and water heating			5469.7053 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	222.7741	1.5338	341.6984 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-405.5280	1.4921	-605.0935
PV Unit electricity exported	-282.5029	0.4591	-129.6969
Total			-734.7904 (283)
Total Primary energy kWh/year			5206.7140 (286)
Target Primary Energy Rate (TPER)			62.3400 (287)

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Property Reference	Flat 2.02				Issued on Date	22/04/2024
Assessment Reference	Renewables			Prop Type Ref		
Property	Christchurch Hall, , 38, Portland Street, Bristol, BS8 4JB					
SAP Rating	79 C	DER	5.00	TER	11.37	
Environmental	96 A	% DER < TER				56.02
CO ₂ Emissions (t/year)	0.37	DFEE	50.78	TFEE	26.02	
Compliance Check	See BREL	% DFEE < TFEE				-95.18
% DPER < TPER	13.58	DPER	52.69	TPER	60.97	
Assessor Details	Mr. Jordan Howlett				Assessor ID	H055-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	83.5200	3.0000	250.5600
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.5200		
Dwelling volume			250.5600

2. Ventilation rate

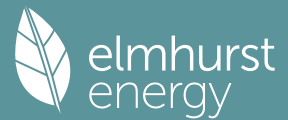
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1197 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8697 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7393 (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)
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	0.9426	0.9241	0.9056	0.8132	0.7947	0.7023	0.7023	0.6838	0.7393	0.7947	0.8317	0.8686 (22b)
Effective ac	0.9442	0.9270	0.9101	0.8306	0.8158	0.7466	0.7466	0.7338	0.7733	0.8158	0.8458	0.8773 (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
External Door			2.1000	1.4000	2.9400		(26)
Window (U _w = 1.40)			8.1000	1.3258	10.7386		(27)
External Wall	64.5000	8.1000	56.4000	0.2600	14.6640		(29a)
Corridor wall	3.7500	2.1000	1.6500	0.2600	0.4290		(29a)
Total net area of external elements A _{um} (A, m ²)			68.2500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.7716		(33)
Party Wall			46.9500	0.0000	0.0000		(32)
Party Floor			83.5200				(32d)
Party Ceiling			83.5200				(32b)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							13.6500 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	42.4216 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	78.0727	76.6464	75.2484	68.6818	67.4533	61.7340	61.7340
Heat transfer coeff	120.4943	119.0681	117.6700	111.1035	109.8749	104.1556	104.1556

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Average = Sum(39)m / 12 =

111.0976

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.4427	1.4256	1.4089	1.3303	1.3156	1.2471	1.2471	1.2344	1.2735	1.3156	1.3453	1.3764	(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													2.5263 (42)
Hot water usage for mixer showers													(42a)
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	
Hot water usage for baths													(42b)
28.7535	28.3264	27.7251	26.6163	25.7861	24.8655	24.3682	24.9654	25.6155	26.6006	27.7322	28.6563		
Hot water usage for other uses													(42c)
40.5015	39.0287	37.5559	36.0831	34.6104	33.1376	33.1376	34.6104	36.0831	37.5559	39.0287	40.5015		
Average daily hot water use (litres/day)												63.4785	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	69.2550	67.3551	65.2810	62.6995	60.3964	58.0031	57.5058	59.5757	61.6987	64.1565	66.7609	69.1577	(44)
Energy content (annual)	109.6829	95.9128	100.3345	85.8324	81.3052	71.3215	69.5483	73.7672	76.0806	87.0598	95.1132	108.2843	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1054.2427	
16.4524	14.3869	15.0502	12.8749	12.1958	10.6982	10.4322	11.0651	11.4121	13.0590	14.2670	16.2426		(46)
Water storage loss:												180.0000	(47)
Store volume												1.8600	(48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400	(49)
Temperature factor from Table 2b												1.0044	(55)
Enter (49) or (54) in (55)													
Total storage loss													
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)
If cylinder contains dedicated solar storage													
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(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													
164.0817	145.0472	154.7333	138.4764	135.7040	123.9655	123.9471	128.1660	128.7246	141.4586	147.7572	162.6831		(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	164.0817	145.0472	154.7333	138.4764	135.7040	123.9655	123.9471	128.1660	128.7246	141.4586	147.7572	162.6831	(64)
12Total per year (kWh/year)												1694.7447	(64)
Electric shower(s)	53.3170	47.5059	51.8746	49.5033	50.4322	48.1074	49.7110	50.4322	49.5033	51.8746	50.8992	53.3170	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												606.4777	(64a)
Heat gains from water heating, kWh/month	93.3179	83.0750	89.8489	83.0303	83.1611	77.8565	79.0716	80.6547	79.7878	85.4351	86.4651	92.8528	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.8483	147.0821	132.8483	137.2766	132.8483	137.2766	132.8483	132.8483	137.2766	132.8483	137.2766	132.8483	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	226.6398	228.9916	223.0651	210.4483	194.5219	179.5532	169.5533	167.2015	173.1280	185.7448	201.6712	216.6398	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	(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)	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	(71)
Water heating gains (Table 5)	125.4272	123.6235	120.7647	115.3199	111.7756	108.1340	106.2790	108.4068	110.8164	114.8321	120.0904	124.8022	(72)
Total internal gains	545.8093	560.5912	537.5721	523.9387	500.0398	485.8578	469.5746	469.3506	482.1150	494.3192	519.9322	535.1843	(73)

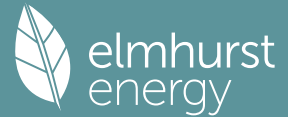
6. Solar gains

[Jan]													
	Area												
	m2												
Southwest	8.1000												
Solar gains	91.0819	155.1461	212.2777	263.0223	294.6069	292.4765	281.9785	258.4150	229.8518	171.4695	109.0951	77.9471	(83)
Total gains	636.8912	715.7373	749.8497	786.9611	794.6467	778.3343	751.5532	727.7656	711.9668	665.7887	629.0273	613.1314	(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	19.2540	19.4847	19.7162	20.8814	21.1149	22.2744	22.2744	22.5032	21.8130	21.1149	20.6479	20.1812	
alpha	2.2836	2.2990	2.3144	2.3921	2.4077	2.4850	2.4850	2.5002	2.4542	2.4077	2.3765	2.3454	
util living area	0.9494	0.9323	0.9105	0.8625	0.7891	0.6560	0.5251	0.5515	0.7212	0.8649	0.9279	0.9527	(86)
Living	17.8797	18.2147	18.7068	19.4704	20.0885	20.6314	20.8496	20.8270	20.4839	19.6910	18.7631	17.9500	
Non living	16.1481	16.5758	17.2023	18.1848	18.9401	19.5882	19.7973	19.7884	19.4228	18.4738	17.3051	16.2615	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	

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MIT	19.4038	18.2147	18.7068	19.4704	20.0885	20.6314	20.8496	20.8270	20.4839	19.6910	18.7631	18.3767 (87)
Th 2	19.7307	19.7437	19.7565	19.8172	19.8287	19.8825	19.8825	19.8926	19.8617	19.8287	19.8055	19.7815 (88)
util rest of house												
	0.9413	0.9216	0.8955	0.8379	0.7466	0.5822	0.4175	0.4477	0.6555	0.8362	0.9149	0.9453 (89)
MIT 2	18.3021	16.5758	17.2023	18.1848	18.9401	19.5882	19.7973	19.7884	19.4228	18.4738	17.3051	16.8958 (90)
Living area fraction									fLA = Living area /	(4) =		0.4623 (91)
MIT	18.8114	17.3335	17.8978	18.7791	19.4710	20.0705	20.2837	20.2685	19.9133	19.0365	17.9791	17.5804 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8114	17.3335	17.8978	18.7791	19.4710	20.0705	20.2837	20.2685	19.9133	19.0365	17.9791	17.5804 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9343	0.8931	0.8656	0.8112	0.7315	0.5957	0.4585	0.4853	0.6589	0.8122	0.8880	0.9271	(94)
Useful gains	595.0312	639.2441	649.1051	638.4152	581.2603	463.6624	344.6002	353.2003	469.1045	540.7441	558.5941	568.4303	(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													
	1748.5424	1480.4281	1341.1805	1097.6006	853.8366	569.7813	383.6824	398.8321	618.2967	926.9609	1222.3782	1538.1893	(97)
Space heating kWh	858.2123	565.2757	514.9041	330.6135	202.7968	0.0000	0.0000	0.0000	0.0000	287.3453	477.9246	721.5007	(98a)
Space heating requirement - total per year (kWh/year)												3958.5729	
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	858.2123	565.2757	514.9041	330.6135	202.7968	0.0000	0.0000	0.0000	0.0000	287.3453	477.9246	721.5007	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3958.5729	
Space heating per m2											(98c) / (4) =	47.3967	(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 %)													350.0267 (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	858.2123	565.2757	514.9041	330.6135	202.7968	0.0000	0.0000	0.0000	0.0000	287.3453	477.9246	721.5007	(98)
Space heating efficiency (main heating system 1)	350.0267	350.0267	350.0267	350.0267	350.0267	0.0000	0.0000	0.0000	0.0000	350.0267	350.0267	350.0267	(210)
Space heating fuel (main heating system)	245.1848	161.4950	147.1042	94.4538	57.9375	0.0000	0.0000	0.0000	0.0000	82.0924	136.5395	206.1274	(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	164.0817	145.0472	154.7333	138.4764	135.7040	123.9655	123.9471	128.1660	128.7246	141.4586	147.7572	162.6831	(64)
Efficiency of water heater (217)m	188.4193	188.4193	188.4193	188.4193	188.4193	188.4193	188.4193	188.4193	188.4193	188.4193	188.4193	188.4193	(216)
Fuel for water heating, kWh/month	87.0833	76.9811	82.1218	73.4937	72.0223	65.7924	65.7826	68.0217	68.3182	75.0765	78.4193	86.3410	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	27.2367	21.8503	19.6738	14.4138	11.1337	9.0963	10.1565	13.2018	17.1478	22.4989	25.4125	27.9937	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1130.9347	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												188.4193	
Water heating fuel used												899.4537	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												219.8157	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												2856.6819	(238)

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

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	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1130.9347	0.1546	174.8467 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	899.4537	0.1405	126.3682 (264)
Energy for instantaneous electric shower(s)	606.4777	0.1391	84.3745 (264a)
Space and water heating			301.2149 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	219.8157	0.1443	31.7262 (268)
Total CO2, kg/year			417.3156 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.0000 (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	1130.9347	1.5723	1778.1983 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	899.4537	1.5195	1366.6989 (278)
Energy for instantaneous electric shower(s)	606.4777	1.5143	918.4099 (278a)
Space and water heating			3144.8973 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	219.8157	1.5338	337.1607 (282)
Total Primary energy kWh/year			4400.4679 (286)
Dwelling Primary energy Rate (DPER)			52.6900 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	83.5200	3.0000	250.5600
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.5200		
Dwelling volume			250.5600

2. Ventilation rate

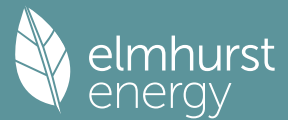
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.1197 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3697 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3143 (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	0.4007	0.3928	0.3850	0.3457	0.3378	0.2986	0.2986	0.2907	0.3143	0.3378	0.3536	0.3693
Effective ac	0.5803	0.5772	0.5741	0.5598	0.5571	0.5446	0.5446	0.5423	0.5494	0.5571	0.5625	0.5682

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					
TER Opaque door			2.1000	1.0000	2.1000			(26)				
TER Opening Type (Uw = 1.20)			8.1000	1.1450	9.2748			(27)				
External Wall	64.5000	8.1000	56.4000	0.1800	10.1520			(29a)				
Corridor wall	3.7500	2.1000	1.6500	0.1800	0.2970			(29a)				
Total net area of external elements Aum(A, m2)			68.2500					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26)... (30) + (32) =	21.8238			(33)				
Party Wall			46.9500	0.0000	0.0000			(32)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								100.0000 (35)				
Thermal bridges (User defined value 0.050 * total exposed area)								3.4125 (36)				
Point Thermal bridges						(36a) =		0.0000				
Total fabric heat loss						(33) + (36) + (36a) =		25.2363 (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	47.9803	47.7225	47.4698	46.2831	46.0611	45.0275	45.0275	44.8361	45.4257	46.0611	46.5103	46.9799 (38)
Heat transfer coeff	73.2166	72.9588	72.7062	71.5195	71.2974	70.2639	70.2639	70.0724	70.6620	71.2974	71.7466	72.2162 (39)
Average = Sum(39)m / 12 =												71.5184
HLP	Jan 0.8766	Feb 0.8735	Mar 0.8705	Apr 0.8563	May 0.8537	Jun 0.8413	Jul 0.8413	Aug 0.8390	Sep 0.8460	Oct 0.8537	Nov 0.8590	Dec 0.8647 (40)
HLP (average)												0.8563
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5263 (42)
Hot water usage for mixer showers												
66.5769	65.5764	64.1184	61.3289	59.2703	56.9745	55.6696	57.1166	58.7027	61.1676	64.0170	66.3218	(42a)
Hot water usage for baths												
28.7535	28.3264	27.7251	26.6163	25.7861	24.8655	24.3682	24.9654	25.6155	26.6006	27.7322	28.6563	(42b)
Hot water usage for other uses												
40.5015	39.0287	37.5559	36.0831	34.6104	33.1376	33.1376	34.6104	36.0831	37.5559	39.0287	40.5015	(42c)
Average daily hot water use (litres/day)												124.8602 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
135.8318	132.9315	129.3994	124.0283	119.6667	114.9776	113.1754	116.6923	120.4013	125.3241	130.7779	135.4796	(44)
Energy content (annual)	215.1244	189.2927	198.8821	169.7886	161.0944	141.3784	136.8759	144.4894	148.4669	170.0636	186.3172	212.1282 (45)
Energy content (annual)										Total = Sum(45)m =		2073.9018
Distribution loss (46)m = 0.15 x (45)m												
32.2687	28.3939	29.8323	25.4683	24.1642	21.2068	20.5314	21.6734	22.2700	25.5095	27.9476	31.8192	(46)
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8381 (55)
Total storage loss												
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(56)
If cylinder contains dedicated solar storage												
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(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												
264.3671	233.7700	248.1248	217.4428	210.3371	189.0326	186.1185	193.7321	196.1211	219.3063	233.9714	261.3709	(62)
WWHRS	-30.4362	-26.9180	-28.1870	-23.3399	-21.7520	-18.6133	-17.4470	-18.5532	-19.2581	-22.7031	-25.7199	-29.8725 (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												
233.9309	206.8520	219.9378	194.1029	188.5851	170.4192	168.6715	175.1789	176.8630	196.6032	208.2515	231.4984	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2370.8943 (64)
Electric shower(s)												2371 (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												
110.9230	98.5216	105.5224	94.5781	92.9580	85.1317	84.9054	87.4369	87.4886	95.9403	100.0738	109.9268	(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	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133	126.3133 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	132.8483	147.0821	132.8483	137.2766	132.8483	137.2766	132.8483	132.8483	137.2766	132.8483	137.2766	132.8483 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	226.6398	228.9916	223.0651	210.4483	194.5219	179.5532	169.5533	167.2015	173.1280	185.7448	201.6712	216.6398 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313	35.6313 (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)	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506	-101.0506 (71)
Water heating gains (Table 5)	149.0901	146.6096	141.8312	131.3584	124.9436	118.2384	114.1201	117.5227	121.5119	128.9520	138.9914	147.7510 (72)
Total internal gains	572.4721	586.5772	561.6386	542.9773	516.2077	495.9623	477.4157	478.4665	492.8105	511.4391	541.8332	561.1332 (73)

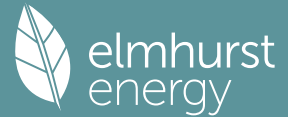
6. Solar gains

[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	
Southwest				8.1000	36.7938	0.6300	0.7000		0.7700		91.0819 (79)	
Solar gains	91.0819	155.1461	212.2777	263.0223	294.6069	292.4765	281.9785	258.4150	229.8518	171.4695	109.0951	77.9471 (83)
Total gains	663.5540	741.7233	773.9163	805.9996	810.8146	788.4387	759.3942	736.8815	722.6623	682.9086	650.9283	639.0803 (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 31.6868	Feb 31.7988	Mar 31.9093	Apr 32.4387	May 32.5397	Jun 33.0184	Jul 33.0184	Aug 33.1086	Sep 32.8324	Oct 32.5397	Nov 32.3360	Dec 32.1258
alpha	3.1125	3.1199	3.1273	3.1626	3.1693	3.2012	3.2012	3.2072	3.1888	3.1693	3.1557	3.1417
util living area	0.9258	0.8966	0.8597	0.7860	0.6790	0.5255	0.3932	0.4195	0.5972	0.7905	0.8912	0.9321 (86)
MIT	19.3590	19.6240	19.9486	20.3698	20.6939	20.9033	20.9711	20.9639	20.8472	20.4512	19.8672	19.3267 (87)
Th 2	20.1874	20.1900	20.1926	20.2048	20.2071	20.2177	20.2177	20.2197	20.2136	20.2071	20.2025	20.1976 (88)

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util rest of house	0.9169	0.8848	0.8433	0.7609	0.6410	0.4718	0.3280	0.3541	0.5451	0.7613	0.8768	0.9239 (89)
MIT 2	18.2673	18.5986	19.0031	19.5240	19.9041	20.1378	20.1997	20.1961	20.0802	19.6307	18.9157	18.2338 (90)
Living area fraction									FLA = Living area / (4) =			
MIT	18.7720	19.0726	19.4402	19.9150	20.2692	20.4917	20.5563	20.5510	20.4348	20.0100	19.3555	18.7390 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7720	19.0726	19.4402	19.9150	20.2692	20.4917	20.5563	20.5510	20.4348	20.0100	19.3555	18.7390 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8980	0.8655	0.8259	0.7510	0.6442	0.4911	0.3566	0.3824	0.5603	0.7534	0.8591	0.9057	(94)
Useful gains	595.8942	641.9809	639.2065	605.3152	522.3039	387.1866	270.8177	281.7594	404.8950	514.4850	559.1906	578.8045	(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	1059.5878	1034.0182	940.8330	787.7869	610.9640	413.9744	277.9845	290.8729	447.6270	670.9108	879.2931	1049.9541	(97)
Space heating kWh	344.9881	263.4491	224.4101	131.3797	65.9631	0.0000	0.0000	0.0000	0.0000	116.3808	230.4738	350.5353	(98a)
Space heating requirement - total per year (kWh/year)												1727.5800	
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	344.9881	263.4491	224.4101	131.3797	65.9631	0.0000	0.0000	0.0000	0.0000	116.3808	230.4738	350.5353	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1727.5800	
Space heating per m2												20.6846	(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	344.9881	263.4491	224.4101	131.3797	65.9631	0.0000	0.0000	0.0000	0.0000	116.3808	230.4738	350.5353	(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)	373.7682	285.4270	243.1312	142.3398	71.4660	0.0000	0.0000	0.0000	0.0000	126.0897	249.7008	379.7782	(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	233.9309	206.8520	219.9378	194.1029	188.5851	170.4192	168.6715	175.1789	176.8630	196.6032	208.2515	231.4984	(64)
Efficiency of water heater	84.9295	84.6033	84.1050	83.2039	81.9524	79.8000	79.8000	79.8000	79.8000	82.9252	84.2877	79.8000	(216)
Fuel for water heating, kWh/month	275.4413	244.4964	261.5039	233.2858	230.1154	213.5579	211.3678	219.5224	221.6328	237.0850	247.0722	272.3907	(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	27.6033	22.1444	19.9385	14.6078	11.2835	9.2187	10.2932	13.3795	17.3786	22.8017	25.7545	28.3704	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-15.7460	-23.7874	-36.5984	-44.1287	-50.2319	-47.8548	-47.2765	-43.3154	-36.8049	-28.4818	-17.8673	-13.4348	(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	-4.6356	-10.0528	-20.5626	-31.7635	-42.8837	-43.4233	-42.9096	-35.9142	-25.7876	-14.6518	-6.2749	-3.6434	(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												1871.7010	(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												2867.4718	(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)												222.7741	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-688.0309	(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												4359.9161	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
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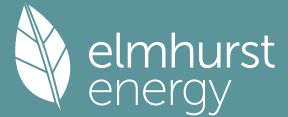


Space heating - main system 1	1871.7010	0.2100	393.0572 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2867.4718	0.2100	602.1691 (264)
Space and water heating			995.2263 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	222.7741	0.1443	32.1532 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-405.5280	0.1332	-54.0063
PV Unit electricity exported	-282.5029	0.1251	-35.3362
Total			-89.3425 (269)
Total CO2, kg/year			949.9662 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.3700 (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	1871.7010	1.1300	2115.0221 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2867.4718	1.1300	3240.2431 (278)
Space and water heating			5355.2653 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	222.7741	1.5338	341.6984 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-405.5280	1.4921	-605.0935
PV Unit electricity exported	-282.5029	0.4591	-129.6969
Total			-734.7904 (283)
Total Primary energy kWh/year			5092.2740 (286)
Target Primary Energy Rate (TPER)			60.9700 (287)

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Property Reference	Flat 2.03			Issued on Date	22/04/2024
Assessment Reference	Baseline	Prop Type Ref			
Property	Christchurch Hall, , 38, Portland Street, Bristol, BS8 4JB				
SAP Rating	76 C	DER	22.16	TER	15.15
Environmental	83 B	% DER < TER			-46.27
CO ₂ Emissions (t/year)	1.09	DFEE	66.29	TFEE	34.14
Compliance Check	See BREL	% DFEE < TFEE			-94.17
% DPER < TPER	-58.49	DPER	129.19	TPER	81.51
Assessor Details	Mr. Jordan Howlett			Assessor ID	H055-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	59.4200 (1b)	3.0000 (2b)	178.2600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	178.2600 (5)

2. Ventilation rate

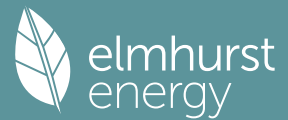
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1683 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.9183 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7805 (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)
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	0.9952	0.9757	0.9562	0.8586	0.8391	0.7415	0.7415	0.7220	0.7805	0.8391	0.8781	0.9171 (22b)
Effective ac	0.9952	0.9760	0.9571	0.8686	0.8520	0.7749	0.7749	0.7606	0.8046	0.8520	0.8855	0.9206 (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
External Door			2.1000	1.4000	2.9400		(26)
Window (U _w = 1.40)			7.7500	1.3258	10.2746		(27)
External Wall	47.2600	7.7500	39.5100	0.3000	11.8530		(29a)
Corridor wall	35.1000	2.1000	33.0000	0.3000	9.9000		(29a)
Total net area of external elements A _{um} (A, m ²)			82.3600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.9676		(33)
Party Wall			19.6600	0.0000	0.0000		(32)
Party Floor			59.4200				(32d)
Party Ceiling			59.4200				(32b)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							16.4720 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	51.4396 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	58.5441	57.4129	56.3041	51.0961	50.1217	45.5857	45.5857
Heat transfer coeff	109.9838	108.8526	107.7438	102.5358	101.5614	97.0253	97.0253
						96.1853	98.7726
							101.5614
							103.5326
							105.5934 (39)

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Average = Sum(39)m / 12 =

102.5311

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8510	1.8319	1.8133	1.7256	1.7092	1.6329	1.6329	1.6187	1.6623	1.7092	1.7424	1.7771	(40)
HLP (average)												1.7255	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.9652 (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													
24.7079	24.3410	23.8242	22.8714	22.1580	21.3669	20.9396	21.4528	22.0115	22.8579	23.8303	24.6244		(42b)
Hot water usage for other uses													
34.7555	33.4917	32.2278	30.9640	29.7002	28.4363	28.4363	29.7002	30.9640	32.2278	33.4917	34.7555		(42c)
Average daily hot water use (litres/day)												54.5040	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	59.4634	57.8326	56.0520	53.8354	51.8582	49.8033	49.3760	51.1529	52.9755	55.0858	57.3220	59.3799	(44)
Energy conte	94.1755	82.3529	86.1499	73.6980	69.8111	61.2389	59.7159	63.3380	65.3240	74.7509	81.6657	92.9745	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													905.1954
14.1263	12.3529	12.9225	11.0547	10.4717	9.1858	8.9574	9.5007	9.7986	11.2126	12.2499	13.9462		(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	25.3127	22.8587	25.3012	24.4744	25.2830	24.4606	25.2730	25.2773	24.4668	25.2905	24.4851	25.3115	(61)
Total heat required for water heating calculated for each month													
119.4882	105.2116	111.4511	98.1724	95.0941	85.6996	84.9889	88.6153	89.7908	100.0414	106.1508	118.2861		(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													
119.4882	105.2116	111.4511	98.1724	95.0941	85.6996	84.9889	88.6153	89.7908	100.0414	106.1508	118.2861		(64)
12Total per year (kWh/year)													
Electric shower(s)	45.7831	40.7931	44.5445	42.5083	43.3059	41.3097	42.6867	43.3059	42.5083	44.5445	43.7069	45.7831	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												520.7800	(64a)
Heat gains from water heating, kWh/month													
49.0873	43.2953	46.1063	41.2503	40.3594	36.8045	36.8455	38.2057	38.4640	42.3134	44.2019	48.6877		(65)

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

Metabolic gains (Table 5), Watts													
(66)m	98.2594	98.2594	98.2594	98.2594	98.2594	98.2594	98.2594	98.2594	98.2594	98.2594	98.2594	98.2594	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
94.2467	104.3445	94.2467	97.3882	94.2467	97.3882	94.2467	94.2467	97.3882	94.2467	97.3882	94.2467	94.2467	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
171.4818	173.2613	168.7771	159.2309	147.1805	135.8549	128.2886	126.5092	130.9933	140.5396	152.5899	163.9156	163.9156	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	(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)													
-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	(71)
Water heating gains (Table 5)													
65.9776	64.4275	61.9708	57.2920	54.2465	51.1174	49.5235	51.3518	53.4222	56.8729	61.3915	65.4404		(72)
Total internal gains													
387.1839	397.5111	380.4724	369.3890	351.1515	336.8383	324.5366	324.5854	334.2816	347.1369	366.8474	379.0805		(73)

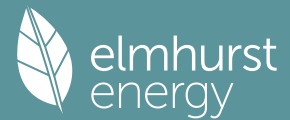
6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Northeast				4.0300	11.2829		0.6300		0.7000		0.7700		13.8963 (75)
Southeast				3.7200	36.7938		0.6300		0.7000		0.7700		41.8302 (77)
Solar gains	55.7265	99.5386	148.4534	204.4912	247.8045	254.2633	241.7033	208.1283	167.6607	113.3171	67.5881		47.1463 (83)
Total gains	442.9103	497.0497	528.9258	573.8802	598.9561	591.1016	566.2399	532.7137	501.9424	460.4540	434.4355		426.2268 (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	15.0073	15.1632	15.3193	16.0974	16.2518	17.0116	17.0116	17.1602	16.7107	16.2518	15.9424	15.6312
alpha	2.0005	2.0109	2.0213	2.0732	2.0835	2.1341	2.1341	2.1440	2.1140	2.0835	2.0628	2.0421
util living area	0.9553	0.9419	0.9230	0.8801	0.8123	0.6975	0.5811	0.6168	0.7753	0.8916	0.9394	0.9581 (86)
MIT	17.0988	17.4360	18.0034	18.8953	19.6833	20.3866	20.7122	20.6638	20.1478	19.1437	18.0644	17.1503 (87)
Th 2	19.4345	19.4477	19.4607	19.5225	19.5342	19.5893	19.5893	19.5996	19.5680	19.5342	19.5106	19.4861 (88)
util rest of house	0.9471	0.9311	0.9078	0.8543	0.7655	0.6109	0.4439	0.4862	0.7034	0.8633	0.9267	0.9506 (89)
MIT 2	15.9984	16.3378	16.9044	17.8090	18.5650	19.2277	19.4756	19.4556	19.0229	18.0684	16.9983	16.0780 (90)
Living area fraction												flA = Living area / (4) = 0.5628 (91)
MIT	16.6177	16.9558	17.5229	18.4203	19.1943	19.8799	20.1715	20.1356	19.6560	18.6736	17.5982	16.6814 (92)
Temperature adjustment												0.0000

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adjusted MIT 16.6177 16.9558 17.5229 18.4203 19.1943 19.8799 20.1715 20.1356 19.6560 18.6736 17.5982 16.6814 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9255	0.9068	0.8816	0.8297	0.7524	0.6311	0.5060	0.5416	0.7086	0.8415	0.9037	0.9303	(94)
Useful gains	409.9117	450.7263	466.2947	476.1590	450.6522	373.0274	286.4984	288.5043	355.6818	387.4672	392.5813	396.5062	(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	1354.7434	1312.3078	1187.6512	976.1704	761.1353	512.2832	346.5295	359.3061	548.7760	819.9621	1086.9100	1317.9583	(97)
Space heating kWh	702.9547	578.9828	536.6893	360.0082	230.9994	0.0000	0.0000	0.0000	0.0000	321.7762	499.9166	685.5603	(98a)
Space heating requirement - total per year (kWh/year)												3916.8877	
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	702.9547	578.9828	536.6893	360.0082	230.9994	0.0000	0.0000	0.0000	0.0000	321.7762	499.9166	685.5603	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3916.8877	
Space heating per m2										(98c) / (4) =		65.9187	(99)

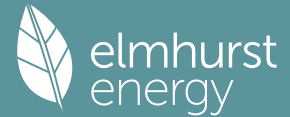
9a. Energy requirements - Individual heating systems, including micro-CHP

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 %)													89.2000	(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	702.9547	578.9828	536.6893	360.0082	230.9994	0.0000	0.0000	0.0000	0.0000	321.7762	499.9166	685.5603	(98)	
Space heating efficiency (main heating system 1)	89.2000	89.2000	89.2000	89.2000	89.2000	0.0000	0.0000	0.0000	0.0000	89.2000	89.2000	89.2000	(210)	
Space heating fuel (main heating system)	788.0658	649.0839	601.6696	403.5967	258.9680	0.0000	0.0000	0.0000	0.0000	360.7357	560.4447	768.5654	(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	119.4882	105.2116	111.4511	98.1724	95.0941	85.6996	84.9889	88.6153	89.7908	100.0414	106.1508	118.2861	(64)	
Efficiency of water heater (217)m	88.9038	88.8865	88.8496	88.7638	88.6074	87.2000	87.2000	87.2000	87.2000	88.7174	88.8431	88.9000	(216)	
Fuel for water heating, kWh/month	134.4018	118.3662	125.4379	110.5996	107.3208	98.2793	97.4643	101.6231	102.9712	112.7641	119.4812	133.0553	(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	20.7351	16.6344	14.9775	10.9731	8.4760	6.9249	7.7321	10.0504	13.0545	17.1282	19.3463	21.3114	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)														
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)														
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)														
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)	
Electricity generated by PVs (Appendix M) (negative quantity)														
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)														
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)														
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)	
Annual totals kWh/year														
Space heating fuel - main system 1													4391.1297	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													87.2000	
Water heating fuel used													1361.7647	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
central heating pump													41.0000	(230c)
main heating flue fan													45.0000	(230e)
Total electricity for the above, kWh/year													86.0000	(231)
Electricity for lighting (calculated in Appendix L)													167.3438	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													0.0000	(233)
Wind generation													0.0000	(234)
Hydro-electric generation (Appendix N)													0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)													0.0000	(235)
Appendix Q - special features														
Energy saved or generated													-0.0000	(236)
Energy used													0.0000	(237)
Total delivered energy for all uses													6527.0183	(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	4391.1297	0.2100	922.1372	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1361.7647	0.2100	285.9706	(264)
Energy for instantaneous electric shower(s)	520.7800	0.1391	72.4520	(264a)

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Space and water heating			1208.1078 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	167.3438	0.1443	24.1529 (268)
Total CO ₂ , kg/year			1316.6420 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			22.1600 (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	4391.1297	1.1300	4961.9766 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	1361.7647	1.1300	1538.7941 (278)
Energy for instantaneous electric shower(s)	520.7800	1.5143	788.6350 (278a)
Space and water heating			6500.7707 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	167.3438	1.5338	256.6776 (282)
Total Primary energy kWh/year			7676.1840 (286)
Dwelling Primary energy Rate (DPER)			129.1900 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	59.4200 (1b)	x 3.0000 (2b)	= 178.2600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 178.2600 (5)

2. Ventilation rate

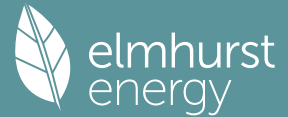
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1122 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3622 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3079 (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	0.3925	0.3848	0.3771	0.3387	0.3310	0.2925	0.2925	0.2848	0.3079	0.3310	0.3463	0.3617 (22b)
Effective ac	0.5770	0.5740	0.5711	0.5573	0.5548	0.5428	0.5428	0.5405	0.5474	0.5548	0.5600	0.5654 (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					
TER Opaque door			2.1000	1.0000	2.1000		(26)					
TER Opening Type (Uw = 1.20)			7.7500	1.1450	8.8740		(27)					
External Wall	47.2600	7.7500	39.5100	0.1800	7.1118		(29a)					
Corridor wall	35.1000	2.1000	33.0000	0.1800	5.9400		(31)					
Total net area of external elements Aum(A, m2)			82.3600				(32)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.0258		(33)					
Party Wall			19.6600	0.0000	0.0000		(35)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (36)					
Thermal bridges (User defined value 0.050 * total exposed area)							4.1180 (36)					
Point Thermal bridges						(36a) =	0.0000					
Total fabric heat loss						(33) + (36) + (36a) =	28.1438 (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	33.9448	33.7688	33.5963	32.7861	32.6346	31.9289	31.9289	31.7982	32.2007	32.6346	32.9412	33.2618 (38)
Average = Sum(39)m / 12 =	62.0887	61.9127	61.7402	60.9300	60.7784	60.0727	60.0727	59.9421	60.3445	60.7784	61.0851	61.4057 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
												60.9293

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HLP	1.0449	1.0420	1.0390	1.0254	1.0229	1.0110	1.0110	1.0088	1.0156	1.0229	1.0280	1.0334 (40)
HLP (average)												1.0254
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9652 (42)
Hot water usage for mixer showers												
57.1693	56.3102	55.0582	52.6629	50.8952	48.9238	47.8033	49.0458	50.4077	52.5244	54.9712	56.9503 (42a)	
Hot water usage for baths												
24.7079	24.3410	23.8242	22.8714	22.1580	21.3669	20.9396	21.4528	22.0115	22.8579	23.8303	24.6244 (42b)	
Hot water usage for other uses												
34.7555	33.4917	32.2278	30.9640	29.7002	28.4363	28.4363	29.7002	30.9640	32.2278	33.4917	34.7555 (42c)	
Average daily hot water use (litres/day)												107.2122 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use												
116.6327	114.1428	111.1103	106.4983	102.7533	98.7271	97.1793	100.1987	103.3832	107.6101	112.2932	116.3301 (44)	
Energy conte	184.7177	162.5378	170.7724	145.7909	138.3257	121.3965	117.5299	124.0669	146.0259	159.9822	182.1449 (45)	
Energy content (annual)									Total = Sum(45)m =			1780.7726
Distribution loss (46)m = 0.15 x (45)m												
27.7077	24.3807	25.6159	21.8686	20.7489	18.2095	17.6295	18.6100	19.1223	21.9039	23.9973	27.3217 (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 (59)	
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	48.6873	49.5215	50.9589	49.3151	50.9589	49.3151 (61)	
Total heat required for water heating calculated for each month												
235.6766	208.5652	221.7313	195.1059	189.2846	170.0838	167.0514	175.0258	176.7969	196.9848	209.2973	233.1038 (62)	
WWHRS	-26.1354	-23.1144	-24.2040	-20.0419	-18.6783	-15.9832	-14.9817	-15.9315	-16.5368	-19.4951	-22.0856 (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												
209.5412	185.4508	197.5272	175.0640	170.6063	154.1006	152.0697	159.0943	160.2601	177.4897	187.2117	207.4524 (64)	
12Total per year (kWh/year)									Total per year (kWh/year) = Sum(64)m =			2135.8680 (64)
Electric shower(s)												2136 (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												
74.1584	65.5507	69.5215	60.8042	58.7330	52.5362	51.4591	53.9920	54.7165	61.2933	65.5229	73.3029 (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	98.2594	98.2594	98.2594	98.2594	98.2594	98.2594	98.2594	98.2594	98.2594	98.2594	98.2594	98.2594 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	94.2467	104.3445	94.2467	97.3882	94.2467	97.3882	94.2467	94.2467	97.3882	94.2467	97.3882	94.2467 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	171.4818	173.2613	168.7771	159.2309	147.1805	135.8549	128.2886	126.5092	130.9933	140.5396	152.5899	163.9156 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259 (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)	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075 (71)
Water heating gains (Table 5)	99.6752	97.5456	93.4429	84.4503	78.9422	72.9669	69.1654	72.5699	75.9951	82.3835	91.0040	98.5254 (72)
Total internal gains	420.8815	430.6292	411.9445	396.5473	375.8473	358.6878	344.1785	345.8035	356.8545	372.6476	396.4599	412.1655 (73)

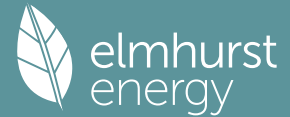
6. Solar gains

[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		
Northeast				4.0300	11.2829	0.6300		0.7000		0.7700		13.8963 (75)
Southeast				3.7200	36.7938	0.6300		0.7000		0.7700		41.8302 (77)
Solar gains	55.7265	99.5386	148.4534	204.4912	247.8045	254.2633	241.7033	208.1283	167.6607	113.3171	67.5881	47.1463 (83)
Total gains	476.6080	530.1678	560.3979	601.0385	623.6518	612.9510	585.8819	553.9318	524.5152	485.9646	464.0480	459.3118 (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	26.5838	26.6594	26.7339	27.0894	27.1569	27.4759	27.4759	27.5358	27.3522	27.1569	27.0206	26.8795
alpha	2.7723	2.7773	2.7823	2.8060	2.8105	2.8317	2.8317	2.8357	2.8235	2.8105	2.8014	2.7920
util living area												
	0.9338	0.9107	0.8776	0.8073	0.7003	0.5523	0.4239	0.4606	0.6484	0.8255	0.9072	0.9392 (86)
MIT	18.8922	19.1675	19.5601	20.0960	20.5387	20.8343	20.9424	20.9258	20.7254	20.1709	19.4660	18.8534 (87)
Th 2	20.0461	20.0485	20.0509	20.0622	20.0643	20.0742	20.0742	20.0760	20.0704	20.0643	20.0600	20.0556 (88)
util rest of house												
	0.9251	0.8991	0.8612	0.7810	0.6583	0.4895	0.3436	0.3797	0.5892	0.7962	0.8933	0.9312 (89)
MIT 2	17.5930	17.9386	18.4297	19.0924	19.6138	19.9410	20.0401	20.0297	19.8336	19.1969	18.3260	17.5503 (90)
Living area fraction									fLA =	Living area / (4) =		0.5628 (91)
MIT	18.3242	18.6302	19.0659	19.6572	20.1343	20.4438	20.5479	20.5340	20.3355	19.7451	18.9676	18.2837 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3242	18.6302	19.0659	19.6572	20.1343	20.4438	20.5479	20.5340	20.3355	19.7451	18.9676	18.2837 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9051	0.8781	0.8413	0.7683	0.6617	0.5155	0.3856	0.4209	0.6070	0.7849	0.8737	0.9119	(94)
Useful gains	431.3675	465.5389	471.4593	461.7811	412.6663	315.9543	225.9059	233.1370	318.3889	381.4314	405.4321	418.8334	(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	870.7440	850.0736	775.8191	655.4346	512.6250	351.0502	237.1593	247.7989	376.2789	555.8225	724.9307	864.8162	(97)
Space heating kWh	326.8961	258.4074	226.4437	139.4305	74.3693	0.0000	0.0000	0.0000	0.0000	129.7470	230.0390	331.8112	(98a)
Space heating requirement - total per year (kWh/year)												1717.1441	
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	326.8961	258.4074	226.4437	139.4305	74.3693	0.0000	0.0000	0.0000	0.0000	129.7470	230.0390	331.8112	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1717.1441	
Space heating per m2										(98c) / (4) =		28.8984	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	326.8961	258.4074	226.4437	139.4305	74.3693	0.0000	0.0000	0.0000	0.0000	129.7470	230.0390	331.8112	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	353.7836	279.6617	245.0689	150.8988	80.4863	0.0000	0.0000	0.0000	0.0000	140.4188	248.9599	359.1030	(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	209.5412	185.4508	197.5272	175.0640	170.6063	154.1006	152.0697	159.0943	160.2601	177.4897	187.2117	207.4524	(64)
Efficiency of water heater (217)m	85.3303	85.0923	84.6750	83.8983	82.7296	80.3000	80.3000	80.3000	80.3000	83.7202	84.8240	85.3822	(216)
Fuel for water heating, kWh/month	245.5649	217.9407	233.2769	208.6622	206.2217	191.9061	189.3769	198.1249	199.5767	212.0035	220.7061	242.9690	(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	19.5826	15.7099	14.1450	10.3632	8.0049	6.5400	7.3023	9.4918	12.3289	16.1762	18.2710	20.1269	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-11.3138	-17.1555	-26.4992	-32.0923	-36.6702	-35.0004	-34.5873	-31.6235	-26.7706	-20.6052	-12.8625	-9.6469	(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	-3.1867	-6.9199	-14.1677	-21.9010	-29.5766	-29.9391	-29.5752	-24.7441	-17.7606	-10.0820	-4.3134	-2.5033	(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												1858.3811	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2566.3297	(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)												158.0427	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-489.4971	(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												4179.2564	(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	1858.3811	0.2100	390.2600 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2566.3297	0.2100	538.9292 (264)
Space and water heating			929.1893 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	158.0427	0.1443	22.8105 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-294.8274	0.1331	-39.2371

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PV Unit electricity exported	-194.6697	0.1251	-24.3477
Total			-63.5849 (269)
Total CO2, kg/year			900.3441 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.1500 (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	1858.3811	1.1300	2099.9706 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2566.3297	1.1300	2899.9525 (278)
Space and water heating			4999.9231 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	158.0427	1.5338	242.4112 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-294.8274	1.4918	-439.8159
PV Unit electricity exported	-194.6697	0.4591	-89.3652
Total			-529.1811 (283)
Total Primary energy kWh/year			4843.2541 (286)
Target Primary Energy Rate (TPER)			81.5100 (287)

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Property Reference	Flat 2.03			Issued on Date	22/04/2024
Assessment Reference	Additional Measures	Prop Type Ref			
Property	Christchurch Hall, , 38, Portland Street, Bristol, BS8 4JB				
SAP Rating	77 C	DER	21.00	TER	15.15
Environmental	84 B	% DER < TER			-38.61
CO ₂ Emissions (t/year)	1.04	DFEE	64.18	TFEE	34.14
Compliance Check	See BREL	% DFEE < TFEE			-88.00
% DPER < TPER	-50.50	DPER	122.67	TPER	81.51
Assessor Details	Mr. Jordan Howlett			Assessor ID	H055-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	59.4200 (1b)	3.0000 (2b)	178.2600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4200		178.2600 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	178.2600 (5)

2. Ventilation rate

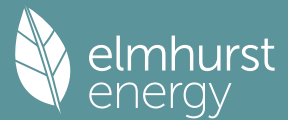
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1683 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.9183 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7805 (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)
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	0.9952	0.9757	0.9562	0.8586	0.8391	0.7415	0.7415	0.7220	0.7805	0.8391	0.8781	0.9171 (22b)
Effective ac	0.9952	0.9760	0.9571	0.8686	0.8520	0.7749	0.7749	0.7606	0.8046	0.8520	0.8855	0.9206 (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
External Door			2.1000	1.4000	2.9400		(26)
Window (U _w = 1.40)			7.7500	1.3258	10.2746		(27)
External Wall	47.2600	7.7500	39.5100	0.2600	10.2726		(29a)
Corridor wall	35.1000	2.1000	33.0000	0.2600	8.5800		(29a)
Total net area of external elements A _{um} (A, m ²)			82.3600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.0672		(33)
Party Wall			19.6600	0.0000	0.0000		(32)
Party Floor			59.4200				(32d)
Party Ceiling			59.4200				(32b)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							16.4720 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	48.5392 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	58.5441	57.4129	56.3041	51.0961	50.1217	45.5857	45.5857
Heat transfer coeff	107.0834	105.9522	104.8434	99.6354	98.6610	94.1249	94.1249
						93.2849	95.8722
						98.6610	100.6322
						102.6930	102.6930 (39)

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Average = Sum(39)m / 12 =

99.6307

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.8021	1.7831	1.7644	1.6768	1.6604	1.5841	1.5841	1.5699	1.6135	1.6604	1.6936	1.7283	(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												1.9652 (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	24.7079	24.3410	23.8242	22.8714	22.1580	21.3669	20.9396	21.4528	22.0115	22.8579	23.8303	24.6244 (42b)
Hot water usage for other uses	34.7555	33.4917	32.2278	30.9640	29.7002	28.4363	28.4363	29.7002	30.9640	32.2278	33.4917	34.7555 (42c)
Average daily hot water use (litres/day)												54.5040 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	59.4634	57.8326	56.0520	53.8354	51.8582	49.8033	49.3760	51.1529	52.9755	55.0858	57.3220	59.3799 (44)
Energy content (annual)	94.1755	82.3529	86.1499	73.6980	69.8111	61.2389	59.7159	63.3380	65.3240	74.7509	81.6657	92.9745 (45)
Distribution loss (46)m = 0.15 x (45)m	14.1263	12.3529	12.9225	11.0547	10.4717	9.1858	8.9574	9.5007	9.7986	11.2126	12.2499	13.9462 (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	25.3127	22.8587	25.3012	24.4744	25.2830	24.4606	25.2730	25.2773	24.4668	25.2905	24.4851	25.3115 (61)
Total heat required for water heating calculated for each month	119.4882	105.2116	111.4511	98.1724	95.0941	85.6996	84.9889	88.6153	89.7908	100.0414	106.1508	118.2861 (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	119.4882	105.2116	111.4511	98.1724	95.0941	85.6996	84.9889	88.6153	89.7908	100.0414	106.1508	118.2861 (64)
12Total per year (kWh/year)												1202.9903 (64)
Electric shower(s)	45.7831	40.7931	44.5445	42.5083	43.3059	41.3097	42.6867	43.3059	42.5083	44.5445	43.7069	45.7831 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												520.7800 (64a)
Heat gains from water heating, kWh/month	49.0873	43.2953	46.1063	41.2503	40.3594	36.8045	36.8455	38.2057	38.4640	42.3134	44.2019	48.6877 (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	98.2594	98.2594	98.2594	98.2594	98.2594	98.2594	98.2594	98.2594	98.2594	98.2594	98.2594	98.2594	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	94.2467	104.3445	94.2467	97.3882	94.2467	97.3882	94.2467	94.2467	97.3882	94.2467	97.3882	94.2467	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	171.4818	173.2613	168.7771	159.2309	147.1805	135.8549	128.2886	126.5092	130.9933	140.5396	152.5899	163.9156	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	(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)	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	(71)
Water heating gains (Table 5)	65.9776	64.4275	61.9708	57.2920	54.2465	51.1174	49.5235	51.3518	53.4222	56.8729	61.3915	65.4404	(72)
Total internal gains	387.1839	397.5111	380.4724	369.3890	351.1515	336.8383	324.5366	324.5854	334.2816	347.1369	366.8474	379.0805	(73)

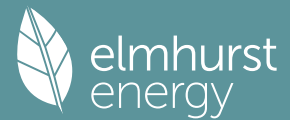
6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Northeast				4.0300	11.2829	0.6300	0.7000	0.7700	13.8963 (75)			
Southeast				3.7200	36.7938	0.6300	0.7000	0.7700	41.8302 (77)			
Solar gains	55.7265	99.5386	148.4534	204.4912	247.8045	254.2633	241.7033	208.1283	167.6607	113.3171	67.5881	47.1463 (83)
Total gains	442.9103	497.0497	528.9258	573.8802	598.9561	591.1016	566.2399	532.7137	501.9424	460.4540	434.4355	426.2268 (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	15.4137	15.5783	15.7431	16.5660	16.7296	17.5358	17.5358	17.6937	17.2162	16.7296	16.4019	16.0727
alpha	2.0276	2.0386	2.0495	2.1044	2.1153	2.1691	2.1691	2.1796	2.1477	2.1153	2.0935	2.0715
util living area	0.9549	0.9412	0.9220	0.8779	0.8084	0.6909	0.5729	0.6089	0.7704	0.8897	0.9387	0.9578 (86)
MIT	17.1787	17.5161	18.0784	18.9634	19.7363	20.4212	20.7323	20.6862	20.1873	19.2025	18.1381	17.2347 (87)
Th 2	19.4685	19.4818	19.4950	19.5575	19.5693	19.6250	19.6250	19.6355	19.6035	19.5693	19.5454	19.5206 (88)
util rest of house	0.9468	0.9306	0.9068	0.8523	0.7619	0.6056	0.4394	0.4814	0.6992	0.8615	0.9260	0.9504 (89)
MIT 2	15.1801	15.6059	16.3149	17.4353	18.3772	19.1859	19.4878	19.4614	18.9353	17.7507	16.4127	15.2632 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	16.3048	16.6809	17.3074	18.2953	19.1421	19.8811	20.1882	20.1507	19.6399	18.5677	17.3837	16.3727 (92)
Temperature adjustment	0.0000											

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adjusted MIT 16.3048 16.6809 17.3074 18.2953 19.1421 19.8811 20.1882 20.1507 19.6399 18.5677 17.3837 16.3727 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9213	0.9019	0.8760	0.8231	0.7451	0.6235	0.4990	0.5345	0.7014	0.8352	0.8988	0.9264	(94)
Useful gains	408.0627	448.3014	463.3219	472.3502	446.2549	368.5513	282.5807	284.7317	352.0471	384.5898	390.4776	394.8365	(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	1285.5192	1248.2098	1133.0813	936.1033	734.2416	497.0829	337.7362	349.8823	531.1200	786.1014	1034.8729	1250.0504	(97)
Space heating kWh	652.8276	537.5385	498.3010	333.9022	214.2621	0.0000	0.0000	0.0000	0.0000	298.7246	463.9647	636.2791	(98a)
Space heating requirement - total per year (kWh/year)												3635.7998	
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	652.8276	537.5385	498.3010	333.9022	214.2621	0.0000	0.0000	0.0000	0.0000	298.7246	463.9647	636.2791	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3635.7998	
Space heating per m2										(98c) / (4) =		61.1881	(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 %)												89.2000	(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	652.8276	537.5385	498.3010	333.9022	214.2621	0.0000	0.0000	0.0000	0.0000	298.7246	463.9647	636.2791	(98)
Space heating efficiency (main heating system 1)	89.2000	89.2000	89.2000	89.2000	89.2000	0.0000	0.0000	0.0000	0.0000	89.2000	89.2000	89.2000	(210)
Space heating fuel (main heating system)	731.8695	602.6216	558.6334	374.3299	240.2042	0.0000	0.0000	0.0000	0.0000	334.8931	520.1397	713.3174	(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	119.4882	105.2116	111.4511	98.1724	95.0941	85.6996	84.9889	88.6153	89.7908	100.0414	106.1508	118.2861	(64)
Efficiency of water heater (217)m	88.8846	88.8664	88.8276	88.7376	88.5755	87.2000	87.2000	87.2000	87.2000	88.6897	88.8207	88.8804	(216)
Fuel for water heating, kWh/month	134.4307	118.3930	125.4689	110.6323	107.3594	98.2793	97.4643	101.6231	102.9712	112.7993	119.5114	133.0845	(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	18.2217	14.6181	13.1620	9.6431	7.4486	6.0855	6.7948	8.8322	11.4721	15.0521	17.0013	18.7282	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												4076.0088	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.2000	
Water heating fuel used												1362.0174	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												147.0597	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												6191.8659	(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	4076.0088	0.2100	855.9618	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1362.0174	0.2100	286.0237	(264)
Energy for instantaneous electric shower(s)	520.7800	0.1391	72.4520	(264a)

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Space and water heating			1141.9855 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	147.0597	0.1443	21.2253 (268)
Total CO ₂ , kg/year			1247.5920 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			21.0000 (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	4076.0088	1.1300	4605.8899 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	1362.0174	1.1300	1539.0797 (278)
Energy for instantaneous electric shower(s)	520.7800	1.5143	788.6350 (278a)
Space and water heating			6144.9696 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	147.0597	1.5338	225.5650 (282)
Total Primary energy kWh/year			7289.2704 (286)
Dwelling Primary energy Rate (DPER)			122.6700 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	59.4200 (1b)	x 3.0000 (2b)	= 178.2600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 178.2600 (5)

2. Ventilation rate

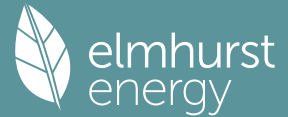
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1122 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3622 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3079 (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	0.3925	0.3848	0.3771	0.3387	0.3310	0.2925	0.2925	0.2848	0.3079	0.3310	0.3463	0.3617 (22b)
Effective ac	0.5770	0.5740	0.5711	0.5573	0.5548	0.5428	0.5428	0.5405	0.5474	0.5548	0.5600	0.5654 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type (Uw = 1.20)			7.7500	1.1450	8.8740		(27)
External Wall	47.2600	7.7500	39.5100	0.1800	7.1118		(29a)
Corridor wall	35.1000	2.1000	33.0000	0.1800	5.9400		(29a)
Total net area of external elements Aum(A, m ²)			82.3600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.0258		(33)
Party Wall			19.6600	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							4.1180 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	28.1438 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	33.9448	33.7688	33.5963	32.7861	32.6346	31.9289	31.9289
Heat transfer coeff	62.0887	61.9127	61.7402	60.9300	60.7784	60.0727	60.0727
Average = Sum(39)m / 12 =						59.9421	60.3445
	Jan	Feb	Mar	Apr	May	Jun	Jul
							Aug
							Sep
							Oct
							Nov
							Dec

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HLP	1.0449	1.0420	1.0390	1.0254	1.0229	1.0110	1.0110	1.0088	1.0156	1.0229	1.0280	1.0334 (40)
HLP (average)												1.0254
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9652 (42)
Hot water usage for mixer showers												
57.1693	56.3102	55.0582	52.6629	50.8952	48.9238	47.8033	49.0458	50.4077	52.5244	54.9712	56.9503 (42a)	
Hot water usage for baths												
24.7079	24.3410	23.8242	22.8714	22.1580	21.3669	20.9396	21.4528	22.0115	22.8579	23.8303	24.6244 (42b)	
Hot water usage for other uses												
34.7555	33.4917	32.2278	30.9640	29.7002	28.4363	28.4363	29.7002	30.9640	32.2278	33.4917	34.7555 (42c)	
Average daily hot water use (litres/day)												107.2122 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use												
116.6327	114.1428	111.1103	106.4983	102.7533	98.7271	97.1793	100.1987	103.3832	107.6101	112.2932	116.3301 (44)	
Energy conte	184.7177	162.5378	170.7724	145.7909	138.3257	121.3965	117.5299	124.0669	146.0259	159.9822	182.1449 (45)	
Energy content (annual)									Total = Sum(45)m =			1780.7726
Distribution loss (46)m = 0.15 x (45)m												
27.7077	24.3807	25.6159	21.8686	20.7489	18.2095	17.6295	18.6100	19.1223	21.9039	23.9973	27.3217 (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 (59)	
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	48.6873	49.5215	50.9589	49.3151	50.9589	49.3151 (61)	
Total heat required for water heating calculated for each month												
235.6766	208.5652	221.7313	195.1059	189.2846	170.0838	167.0514	175.0258	176.7969	196.9848	209.2973	233.1038 (62)	
WWHRS	-26.1354	-23.1144	-24.2040	-20.0419	-18.6783	-15.9832	-14.9817	-15.9315	-16.5368	-19.4951	-22.0856 (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												
209.5412	185.4508	197.5272	175.0640	170.6063	154.1006	152.0697	159.0943	160.2601	177.4897	187.2117	207.4524 (64)	
12Total per year (kWh/year)									Total per year (kWh/year) = Sum(64)m =			2135.8680 (64)
Electric shower(s)												2136 (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)	
												0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												
Heat gains from water heating, kWh/month												
74.1584	65.5507	69.5215	60.8042	58.7330	52.5362	51.4591	53.9920	54.7165	61.2933	65.5229	73.3029 (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	98.2594	98.2594	98.2594	98.2594	98.2594	98.2594	98.2594	98.2594	98.2594	98.2594	98.2594	98.2594 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	94.2467	104.3445	94.2467	97.3882	94.2467	97.3882	94.2467	94.2467	97.3882	94.2467	97.3882	94.2467 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	171.4818	173.2613	168.7771	159.2309	147.1805	135.8549	128.2886	126.5092	130.9933	140.5396	152.5899	163.9156 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259 (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)	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075 (71)
Water heating gains (Table 5)	99.6752	97.5456	93.4429	84.4503	78.9422	72.9669	69.1654	72.5699	75.9951	82.3835	91.0040	98.5254 (72)
Total internal gains	420.8815	430.6292	411.9445	396.5473	375.8473	358.6878	344.1785	345.8035	356.8545	372.6476	396.4599	412.1655 (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	
Northeast					4.0300	11.2829	0.6300		0.7000	0.7700	13.8963 (75)	
Southeast					3.7200	36.7938	0.6300		0.7000	0.7700	41.8302 (77)	
Solar gains	55.7265	99.5386	148.4534	204.4912	247.8045	254.2633	241.7033	208.1283	167.6607	113.3171	67.5881	47.1463 (83)
Total gains	476.6080	530.1678	560.3979	601.0385	623.6518	612.9510	585.8819	553.9318	524.5152	485.9646	464.0480	459.3118 (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	26.5838	26.6594	26.7339	27.0894	27.1569	27.4759	27.4759	27.5358	27.3522	27.1569	27.0206	26.8795
alpha	2.7723	2.7773	2.7823	2.8060	2.8105	2.8317	2.8317	2.8357	2.8235	2.8105	2.8014	2.7920
util living area												
	0.9338	0.9107	0.8776	0.8073	0.7003	0.5523	0.4239	0.4606	0.6484	0.8255	0.9072	0.9392 (86)
MIT	18.8922	19.1675	19.5601	20.0960	20.5387	20.8343	20.9424	20.9258	20.7254	20.1709	19.4660	18.8534 (87)
Th 2	20.0461	20.0485	20.0509	20.0622	20.0643	20.0742	20.0742	20.0760	20.0704	20.0643	20.0600	20.0556 (88)
util rest of house												
	0.9251	0.8991	0.8612	0.7810	0.6583	0.4895	0.3436	0.3797	0.5892	0.7962	0.8933	0.9312 (89)
MIT 2	17.5930	17.9386	18.4297	19.0924	19.6138	19.9410	20.0401	20.0297	19.8336	19.1969	18.3260	17.5503 (90)
Living area fraction									fLA =	Living area / (4) =		0.5628 (91)
MIT	18.3242	18.6302	19.0659	19.6572	20.1343	20.4438	20.5479	20.5340	20.3355	19.7451	18.9676	18.2837 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3242	18.6302	19.0659	19.6572	20.1343	20.4438	20.5479	20.5340	20.3355	19.7451	18.9676	18.2837 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9051	0.8781	0.8413	0.7683	0.6617	0.5155	0.3856	0.4209	0.6070	0.7849	0.8737	0.9119	(94)
Useful gains	431.3675	465.5389	471.4593	461.7811	412.6663	315.9543	225.9059	233.1370	318.3889	381.4314	405.4321	418.8334	(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	870.7440	850.0736	775.8191	655.4346	512.6250	351.0502	237.1593	247.7989	376.2789	555.8225	724.9307	864.8162	(97)
Space heating kWh	326.8961	258.4074	226.4437	139.4305	74.3693	0.0000	0.0000	0.0000	0.0000	129.7470	230.0390	331.8112	(98a)
Space heating requirement - total per year (kWh/year)												1717.1441	
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	326.8961	258.4074	226.4437	139.4305	74.3693	0.0000	0.0000	0.0000	0.0000	129.7470	230.0390	331.8112	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1717.1441	
Space heating per m2										(98c) / (4) =		28.8984	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													92.4000	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	326.8961	258.4074	226.4437	139.4305	74.3693	0.0000	0.0000	0.0000	0.0000	129.7470	230.0390	331.8112	(98)	
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)	
Space heating fuel (main heating system)	353.7836	279.6617	245.0689	150.8988	80.4863	0.0000	0.0000	0.0000	0.0000	140.4188	248.9599	359.1030	(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	209.5412	185.4508	197.5272	175.0640	170.6063	154.1006	152.0697	159.0943	160.2601	177.4897	187.2117	207.4524	(64)	
Efficiency of water heater (217)m	85.3303	85.0923	84.6750	83.8983	82.7296	80.3000	80.3000	80.3000	80.3000	83.7202	84.8240	85.3822	(216)	
Fuel for water heating, kWh/month	245.5649	217.9407	233.2769	208.6622	206.2217	191.9061	189.3769	198.1249	199.5767	212.0035	220.7061	242.9690	(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	19.5826	15.7099	14.1450	10.3632	8.0049	6.5400	7.3023	9.4918	12.3289	16.1762	18.2710	20.1269	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-11.3138	-17.1555	-26.4992	-32.0923	-36.6702	-35.0004	-34.5873	-31.6235	-26.7706	-20.6052	-12.8625	-9.6469	(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)	-3.1867	-6.9199	-14.1677	-21.9010	-29.5766	-29.9391	-29.5752	-24.7441	-17.7606	-10.0820	-4.3134	-2.5033	(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												1858.3811	(211)	
Space heating fuel - main system 2												0.0000	(213)	
Space heating fuel - secondary												0.0000	(215)	
Efficiency of water heater												80.3000		
Water heating fuel used												2566.3297	(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)												158.0427	(232)	
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation												-489.4971	(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												4179.2564	(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	1858.3811	0.2100	390.2600 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2566.3297	0.2100	538.9292 (264)
Space and water heating			929.1893 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	158.0427	0.1443	22.8105 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-294.8274	0.1331	-39.2371

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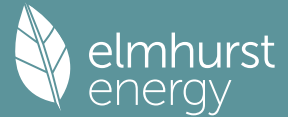


PV Unit electricity exported	-194.6697	0.1251	-24.3477
Total			-63.5849 (269)
Total CO2, kg/year			900.3441 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.1500 (273)

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	1858.3811	1.1300	2099.9706 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2566.3297	1.1300	2899.9525 (278)
Space and water heating			4999.9231 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	158.0427	1.5338	242.4112 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-294.8274	1.4918	-439.8159
PV Unit electricity exported	-194.6697	0.4591	-89.3652
Total			-529.1811 (283)
Total Primary energy kWh/year			4843.2541 (286)
Target Primary Energy Rate (TPER)			81.5100 (287)

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Property Reference	Flat 2.03			Issued on Date	22/04/2024
Assessment Reference	Renewables	Prop Type Ref			
Property	Christchurch Hall, , 38, Portland Street, Bristol, BS8 4JB				
SAP Rating	77 C	DER	6.25	TER	14.80
Environmental	95 A	% DER < TER			57.77
CO ₂ Emissions (t/year)	0.33	DFEE	64.18	TFEE	34.14
Compliance Check	See BREL	% DFEE < TFEE			-88.00
% DPER < TPER	17.25	DPER	65.86	TPER	79.59
Assessor Details	Mr. Jordan Howlett			Assessor ID	H055-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	59.4200 (1b)	3.0000 (2b)	178.2600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4200		178.2600 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	178.2600 (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) = 0.1683 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.9183 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7805 (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)
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	0.9952	0.9757	0.9562	0.8586	0.8391	0.7415	0.7415	0.7220	0.7805	0.8391	0.8781	0.9171 (22b)
Effective ac	0.9952	0.9760	0.9571	0.8686	0.8520	0.7749	0.7749	0.7606	0.8046	0.8520	0.8855	0.9206 (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
External Door			2.1000	1.4000	2.9400		(26)
Window (U _w = 1.40)			7.7500	1.3258	10.2746		(27)
External Wall	47.2600	7.7500	39.5100	0.2600	10.2726		(29a)
Corridor wall	35.1000	2.1000	33.0000	0.2600	8.5800		(29a)
Total net area of external elements A _{um} (A, m ²)			82.3600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.0672		(33)
Party Wall			19.6600	0.0000	0.0000		(32)
Party Floor			59.4200				(32d)
Party Ceiling			59.4200				(32b)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							16.4720 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss					(33) + (36) + (36a) =		48.5392 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	58.5441	57.4129	56.3041	51.0961	50.1217	45.5857	45.5857
Heat transfer coeff	107.0834	105.9522	104.8434	99.6354	98.6610	94.1249	94.1249
						93.2849	95.8722
							98.6610
							100.6322
							102.6930 (39)

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Average = Sum(39)m / 12 =

99.6307

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.8021	1.7831	1.7644	1.6768	1.6604	1.5841	1.5841	1.5699	1.6135	1.6604	1.6936	1.7283 (40)
HLP (average)												1.6767
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9652 (42)
Hot water usage for mixer showers												0.0000 (42a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Hot water usage for baths												24.6244 (42b)
24.7079	24.3410	23.8242	22.8714	22.1580	21.3669	20.9396	21.4528	22.0115	22.8579	23.8303	24.6244	
Hot water usage for other uses												34.7555 (42c)
34.7555	33.4917	32.2278	30.9640	29.7002	28.4363	28.4363	29.7002	30.9640	32.2278	33.4917	34.7555	
Average daily hot water use (litres/day)												54.5040 (43)
Daily hot water use												
59.4634	57.8326	56.0520	53.8354	51.8582	49.8033	49.3760	51.1529	52.9755	55.0858	57.3220	59.3799	(44)
Energy content (annual)												92.9745 (45)
94.1755	82.3529	86.1499	73.6980	69.8111	61.2389	59.7159	63.3380	65.3240	74.7509	81.6657	92.9745	
Distribution loss (46)m = 0.15 x (45)m												905.1954
14.1263	12.3529	12.9225	11.0547	10.4717	9.1858	8.9574	9.5007	9.7986	11.2126	12.2499	13.9462	(46)
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0044 (55)
Total storage loss												
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)
If cylinder contains dedicated solar storage												
31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(57)
Primary loss												23.2624 (59)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	
Combi loss												0.0000 (61)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Total heat required for water heating calculated for each month												
148.5743	131.4873	140.5487	126.3420	124.2099	113.8829	114.1147	117.7368	117.9680	129.1497	134.3097	147.3733	(62)
WWHRS												0.0000 (63a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
PV diverter												0.0000 (63b)
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 (63c)
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 (63d)
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												
148.5743	131.4873	140.5487	126.3420	124.2099	113.8829	114.1147	117.7368	117.9680	129.1497	134.3097	147.3733	(64)
Total per year (kWh/year)												1545.6974 (64)
Electric shower(s)												1546 (64)
45.7831	40.7931	44.5445	42.5083	43.3059	41.3097	42.6867	43.3059	42.5083	44.5445	43.7069	45.7831	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												520.7800 (64a)
Heat gains from water heating, kWh/month												
86.2782	76.8881	83.3000	77.2469	77.5577	72.8046	74.0463	75.4054	74.4625	79.5098	80.1958	85.8788	(65)

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

Metabolic gains (Table 5), Watts												
(66)m												
98.2594	98.2594	98.2594	98.2594	98.2594	98.2594	98.2594	98.2594	98.2594	98.2594	98.2594	98.2594	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
94.2467	104.3445	94.2467	97.3882	94.2467	97.3882	94.2467	94.2467	97.3882	94.2467	97.3882	94.2467	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
171.4818	173.2613	168.7771	159.2309	147.1805	135.8549	128.2886	126.5092	130.9933	140.5396	152.5899	163.9156	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	(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)												
-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	(71)
Water heating gains (Table 5)												
115.9653	114.4169	111.9624	107.2873	104.2442	101.1174	99.5245	101.3514	103.4202	106.8681	111.3830	115.4286	(72)
Total internal gains												
434.1716	444.5005	427.4640	416.3842	398.1492	386.8384	374.5377	374.5850	384.2795	394.1321	413.8390	426.0686	(73)

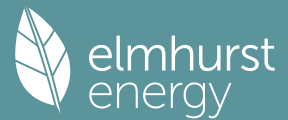
6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Northeast				4.0300	11.2829		0.6300		0.7000		0.7700		13.8963 (75)
Southeast				3.7200	36.7938		0.6300		0.7000		0.7700		41.8302 (77)
Solar gains	55.7265	99.5386	148.4534	204.4912	247.8045	254.2633	241.7033	208.1283	167.6607	113.3171	67.5881		47.1463 (83)
Total gains	489.8981	544.0391	575.9174	620.8755	645.9538	641.1016	616.2410	582.7133	551.9403	507.4492	481.4270		473.2150 (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	
15.4137	15.5783	15.7431	16.5660	16.7296	17.5358	17.5358	17.6937	17.2162	16.7296	16.4019	16.0727	
2.0276	2.0386	2.0495	2.1044	2.1153	2.1691	2.1691	2.1796	2.1477	2.1153	2.0935	2.0715	
util living area												
0.9464	0.9316	0.9104	0.8624	0.7881	0.6629	0.5421	0.5762	0.7416	0.8717	0.9270	0.9493 (86)	
Living	17.2925	17.6257	18.1822	19.0552	19.8089	20.4707	20.7611	20.7203	20.2543	19.2978	18.2492	17.3518
Non living	15.3211	15.7408	16.4406	17.5428	18.4554	19.2292	19.5051	19.4837	19.0000	17.8613	16.5486	15.4089
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0

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16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	19.1037	17.6257	18.1822	19.0552	19.8089	20.4707	20.7611	20.7203	20.2543	19.2978	18.2492	17.8621 (87)
Th 2	19.4685	19.4818	19.4950	19.5575	19.5693	19.6250	19.6250	19.6355	19.6035	19.5693	19.5454	19.5206 (88)
util rest of house	0.9369	0.9195	0.8934	0.8345	0.7390	0.5761	0.4111	0.4501	0.6668	0.8402	0.9123	0.9405 (89)
MIT 2	17.8003	15.7408	16.4406	17.5428	18.4554	19.2292	19.5051	19.4837	19.0000	17.8613	16.5486	16.1459 (90)
Living area fraction									fLA = Living area / (4) =			0.5628 (91)
MIT	18.5338	16.8016	17.4207	18.3940	19.2171	19.9279	20.2119	20.1797	19.7059	18.6697	17.5057	17.1117 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5338	16.8016	17.4207	18.3940	19.2171	19.9279	20.2119	20.1797	19.7059	18.6697	17.5057	17.1117 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9298	0.8889	0.8614	0.8058	0.7245	0.5973	0.4714	0.5048	0.6732	0.8146	0.8833	0.9206 (94)
Useful gains	455.5069	483.6005	496.1049	500.2770	468.0250	382.9577	290.5105	294.1815	371.5596	413.3449	425.2230	435.6183 (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	1524.2015	1260.9990	1144.9661	945.9343	741.6453	501.4894	339.9723	352.5846	537.4449	796.1635	1047.1437	1325.9426 (97)
Space heating kWh	795.1088	522.4118	482.7528	320.8732	203.5735	0.0000	0.0000	0.0000	0.0000	284.8170	447.7830	662.4013 (98a)
Space heating requirement - total per year (kWh/year)												3719.7214
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	795.1088	522.4118	482.7528	320.8732	203.5735	0.0000	0.0000	0.0000	0.0000	284.8170	447.7830	662.4013 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3719.7214
Space heating per m2										(98c) / (4) =		62.6005 (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 %)	352.2898 (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	795.1088	522.4118	482.7528	320.8732	203.5735	0.0000	0.0000	0.0000	0.0000	284.8170	447.7830	662.4013 (98)
Space heating efficiency (main heating system 1)	352.2898	352.2898	352.2898	352.2898	352.2898	0.0000	0.0000	0.0000	0.0000	352.2898	352.2898	352.2898 (210)
Space heating fuel (main heating system)	225.6974	148.2904	137.0329	91.0822	57.7858	0.0000	0.0000	0.0000	0.0000	80.8474	127.1064	188.0274 (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	148.5743	131.4873	140.5487	126.3420	124.2099	113.8829	114.1147	117.7368	117.9680	129.1497	134.3097	147.3733 (64)
Efficiency of water heater (217)m	189.3555	189.3555	189.3555	189.3555	189.3555	189.3555	189.3555	189.3555	189.3555	189.3555	189.3555	189.3555 (216)
Fuel for water heating, kWh/month	78.4632	69.4394	74.2248	66.7221	65.5961	60.1424	60.2648	62.1777	62.2998	68.2049	70.9299	77.8289 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	18.2217	14.6181	13.1620	9.6431	7.4486	6.0855	6.7948	8.8322	11.4721	15.0521	17.0013	18.7282 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1055.8698 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												189.3555
Water heating fuel used												816.2939 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	147.0597 (232)

Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	2540.0034 (238)

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

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	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1055.8698	0.1543	162.9704 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	816.2939	0.1404	114.5995 (264)
Energy for instantaneous electric shower(s)	520.7800	0.1391	72.4520 (264a)
Space and water heating			277.5699 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	147.0597	0.1443	21.2253 (268)
Total CO2, kg/year			371.2472 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.2500 (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	1055.8698	1.5714	1659.1667 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	816.2939	1.5191	1240.0202 (278)
Energy for instantaneous electric shower(s)	520.7800	1.5143	788.6350 (278a)
Space and water heating			2899.1869 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	147.0597	1.5338	225.5650 (282)
Total Primary energy kWh/year			3913.3869 (286)
Dwelling Primary energy Rate (DPER)			65.8600 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	59.4200 (1b)	x 3.0000 (2b)	= 178.2600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 178.2600 (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) =	0.1122 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3622	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3079	(21)

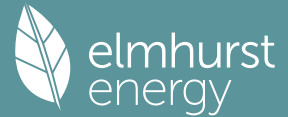
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3925	0.3848	0.3771	0.3387	0.3310	0.2925	0.2925	0.2848	0.3079	0.3310	0.3463	0.3617 (22b)
Effective ac	0.5770	0.5740	0.5711	0.5573	0.5548	0.5428	0.5428	0.5405	0.5474	0.5548	0.5600	0.5654 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type (Uw = 1.20)			7.7500	1.1450	8.8740		(27)
External Wall	47.2600	7.7500	39.5100	0.1800	7.1118		(29a)
Corridor wall	35.1000	2.1000	33.0000	0.1800	5.9400		(29a)
Total net area of external elements Aum(A, m ²)			82.3600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	24.0258			(33)
Party Wall			19.6600	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							4.1180 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	28.1438 (37)

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

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(38)m	Jan 33.9448	Feb 33.7688	Mar 33.5963	Apr 32.7861	May 32.6346	Jun 31.9289	Jul 31.9289	Aug 31.7982	Sep 32.2007	Oct 32.6346	Nov 32.9412	Dec 33.2618	(38)
Heat transfer coeff	62.0887	61.9127	61.7402	60.9300	60.7784	60.0727	60.0727	59.9421	60.3445	60.7784	61.0851	61.4057	(39)
Average = Sum(39)m / 12 =												60.9293	
HLP	Jan 1.0449	Feb 1.0420	Mar 1.0390	Apr 1.0254	May 1.0229	Jun 1.0110	Jul 1.0110	Aug 1.0088	Sep 1.0156	Oct 1.0229	Nov 1.0280	Dec 1.0334	(40)
HLP (average)												1.0254	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.9652	(42)
Hot water usage for mixer showers														
57.1693	56.3102	55.0582	52.6629	50.8952	48.9238	47.8033	49.0458	50.4077	52.5244	54.9712	56.9503	56.9503	(42a)	
Hot water usage for baths														
24.7079	24.3410	23.8242	22.8714	22.1580	21.3669	20.9396	21.4528	22.0115	22.8579	23.8303	24.6244	24.6244	(42b)	
Hot water usage for other uses														
34.7555	33.4917	32.2278	30.9640	29.7002	28.4363	28.4363	29.7002	30.9640	32.2278	33.4917	34.7555	34.7555	(42c)	
Average daily hot water use (litres/day)												107.2122	(43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
116.6327	114.1428	111.1103	106.4983	102.7533	98.7271	97.1793	100.1987	103.3832	107.6101	112.2932	116.3301	116.3301	(44)	
Energy content (annual)	184.7177	162.5378	170.7724	145.7909	138.3257	121.3965	117.5299	124.0669	127.4818	146.0259	159.9822	182.1449	(45)	
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1780.7726		
27.7077	24.3807	25.6159	21.8686	20.7489	18.2095	17.6295	18.6100	19.1223	21.9039	23.9973	27.3217	27.3217	(46)	
Water storage loss:														
Store volume												180.0000	(47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.5520	(48)	
Temperature factor from Table 2b												0.5400	(49)	
Enter (49) or (54) in (55)												0.8381	(55)	
Total storage loss														
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	(56)	
If cylinder contains dedicated solar storage														
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	(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														
233.9604	207.0151	220.0150	193.4450	187.5684	169.0506	166.7726	173.3096	175.1360	195.2686	207.6364	231.3876	231.3876	(62)	
WWHRS	-26.1354	-23.1144	-24.2040	-20.0419	-18.6783	-15.9832	-14.9817	-15.9315	-16.5368	-19.4951	-22.0856	-25.6514	(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	207.8250	183.9007	195.8110	173.4031	168.8901	153.0675	151.7909	157.3780	158.5992	175.7735	185.5508	205.7361	(64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2117.7258	(64)	
Electric shower(s)												2118	(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														
100.8128	89.6256	96.1759	86.5988	85.3874	78.4877	78.4728	80.6464	80.5111	87.9478	91.3174	99.9573	99.9573	(65)	

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

Metabolic gains (Table 5), Watts													
(66)m	Jan 98.2594	Feb 98.2594	Mar 98.2594	Apr 98.2594	May 98.2594	Jun 98.2594	Jul 98.2594	Aug 98.2594	Sep 98.2594	Oct 98.2594	Nov 98.2594	Dec 98.2594	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
94.2467	104.3445	94.2467	97.3882	94.2467	97.3882	94.2467	94.2467	94.2467	97.3882	94.2467	97.3882	94.2467	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
171.4818	173.2613	168.7771	159.2309	147.1805	135.8549	128.2886	126.5092	130.9933	140.5396	152.5899	163.9156	163.9156	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	32.8259	(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)													
-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	-78.6075	(71)
Water heating gains (Table 5)													
135.5010	133.3715	129.2687	120.2761	114.7681	109.0107	105.4742	108.3957	111.8209	118.2094	126.8298	134.3512	134.3512	(72)
Total internal gains													
456.7073	466.4551	447.7703	432.3731	411.6731	394.7316	380.4874	381.6294	392.6803	408.4734	432.2857	447.9913	447.9913	(73)

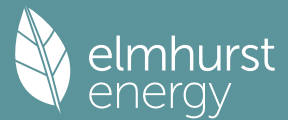
6. Solar gains

[Jan]														
				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	Gains W		
Northeast				4.0300	11.2829		0.6300		0.7000		0.7700	13.8963 (75)		
Southeast				3.7200	36.7938		0.6300		0.7000		0.7700	41.8302 (77)		
Solar gains	55.7265	99.5386	148.4534	204.4912	247.8045	254.2633	241.7033	208.1283	167.6607	113.3171	67.5881	47.1463	(83)	
Total gains	512.4338	565.9937	596.2238	636.8643	659.4776	648.9948	622.1907	589.7576	560.3410	521.7905	499.8738	495.1376	(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	26.5838	26.6594	26.7339	27.0894	27.1569	27.4759	27.4759	27.5358	27.3522	27.1569	27.0206	26.8795
alpha	2.7723	2.7773	2.7823	2.8060	2.8105	2.8317	2.8317	2.8357	2.8235	2.8105	2.8014	2.7920
util living area												
	0.9229	0.8983	0.8627	0.7886	0.6784	0.5291	0.4023	0.4371	0.6215	0.8037	0.8924	0.9286 (86)

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MIT	18.9915	19.2587	19.6406	20.1570	20.5769	20.8518	20.9496	20.9351	20.7547	20.2362	19.5560	18.9549 (87)
Th 2	20.0461	20.0485	20.0509	20.0622	20.0643	20.0742	20.0742	20.0760	20.0704	20.0643	20.0600	20.0556 (88)
util rest of house												
	0.9130	0.8855	0.8450	0.7610	0.6357	0.4673	0.3252	0.3589	0.5620	0.7724	0.8769	0.9194 (89)
MIT 2	17.7162	18.0506	18.5266	19.1625	19.6538	19.9560	20.0446	20.0359	19.8610	19.2710	18.4354	17.6766 (90)
Living area fraction									fLA =	Living area / (4) =		0.5628 (91)
MIT	18.4339	18.7305	19.1536	19.7222	20.1733	20.4601	20.5539	20.5420	20.3639	19.8142	19.0660	18.3960 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4339	18.7305	19.1536	19.7222	20.1733	20.4601	20.5539	20.5420	20.3639	19.8142	19.0660	18.3960 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8922	0.8642	0.8256	0.7499	0.6410	0.4939	0.3659	0.3992	0.5817	0.7631	0.8573	0.8991	(94)
Useful gains	457.1892	489.1418	492.2426	477.6056	422.7234	320.5133	227.6690	235.4504	325.9684	398.1559	428.5457	445.1982	(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													
	877.5556	856.2827	781.2329	659.3967	514.9932	352.0330	237.5219	248.2786	377.9938	560.0246	730.9459	871.7159	(97)
Space heating kWh	312.7526	246.7187	215.0088	130.8896	68.6487	0.0000	0.0000	0.0000	0.0000	120.4303	217.7282	317.3292	(98a)
Space heating requirement - total per year (kWh/year)												1629.5059	
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	312.7526	246.7187	215.0088	130.8896	68.6487	0.0000	0.0000	0.0000	0.0000	120.4303	217.7282	317.3292	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1629.5059	
Space heating per m2											(98c) / (4) =	27.4235	(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	312.7526	246.7187	215.0088	130.8896	68.6487	0.0000	0.0000	0.0000	0.0000	120.4303	217.7282	317.3292 (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)	338.8435	267.3008	232.9456	141.8089	74.3756	0.0000	0.0000	0.0000	0.0000	130.4770	235.8919	343.8019 (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	207.8250	183.9007	195.8110	173.4031	168.8901	153.0675	151.7909	157.3780	158.5992	175.7735	185.5508	205.7361 (64)
Efficiency of water heater (217)m	84.9741	84.7195	84.2700	83.4375	82.2079	79.8000	79.8000	79.8000	79.8000	83.2297	84.4193	79.8000 (216)
Fuel for water heating, kWh/month	244.5746	217.0701	232.3614	207.8240	205.4426	191.8139	190.2141	197.2156	198.7459	211.1909	219.7966	241.9624 (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	19.5826	15.7099	14.1450	10.3632	8.0049	6.5400	7.3023	9.4918	12.3289	16.1762	18.2710	20.1269 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-11.3138	-17.1555	-26.4992	-32.0923	-36.6702	-35.0004	-34.5873	-31.6235	-26.7706	-20.6052	-12.8625	-9.6469 (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	-3.1867	-6.9199	-14.1677	-21.9010	-29.5766	-29.9391	-29.5752	-24.7441	-17.7606	-10.0820	-4.3134	-2.5033 (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												1765.4452 (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												2558.2120 (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)												158.0427 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-489.4971 (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												4078.2029 (238)

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

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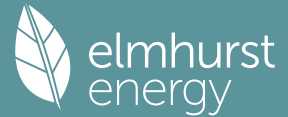


	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1765.4452	0.2100	370.7435 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2558.2120	0.2100	537.2245 (264)
Space and water heating			907.9680 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	158.0427	0.1443	22.8105 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-294.8274	0.1331	-39.2371
PV Unit electricity exported	-194.6697	0.1251	-24.3477
Total			-63.5849 (269)
Total CO2, kg/year			879.1229 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.8000 (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	1765.4452	1.1300	1994.9531 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2558.2120	1.1300	2890.7795 (278)
Space and water heating			4885.7326 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	158.0427	1.5338	242.4112 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-294.8274	1.4918	-439.8159
PV Unit electricity exported	-194.6697	0.4591	-89.3652
Total			-529.1811 (283)
Total Primary energy kWh/year			4729.0636 (286)
Target Primary Energy Rate (TPER)			79.5900 (287)

Full SAP Calculation Printout



Property Reference	Flat 3.01			Issued on Date	22/04/2024
Assessment Reference	Baseline	Prop Type Ref			
Property	Christchurch Hall, , 38, Portland Street, Bristol, BS8 4JB				
SAP Rating	78 C	DER	18.41	TER	11.14
Environmental	82 B	% DER < TER			-65.26
CO ₂ Emissions (t/year)	2.16	DFEE	64.77	TFEE	36.91
Compliance Check	See BREL	% DFEE < TFEE			-75.49
% DPER < TPER	-77.40	DPER	104.97	TPER	59.17
Assessor Details	Mr. Jordan Howlett			Assessor ID	H055-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	74.7400 (1b)	x 3.0000 (2b)	= 224.2200 (1b) - (3b)
First floor	67.8000 (1c)	x 2.4000 (2c)	= 162.7200 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	142.5400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 386.9400 (5)

2. Ventilation rate

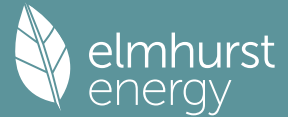
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	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) = 0.1034 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8534 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7254 (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	0.9248	0.9067	0.8886	0.7979	0.7798	0.6891	0.6891	0.6710	0.7254	0.7798	0.8160	0.8523 (22b)
Effective ac	0.9277	0.9111	0.8948	0.8183	0.8040	0.7374	0.7374	0.7251	0.7631	0.8040	0.8330	0.8632 (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
External Door			2.1000	1.4000	2.9400		(26)
Window (Uw = 1.40)			20.7700	1.3258	27.5360		(27)
Exposed Floor			7.7300	0.1800	1.3914		(28b)
External Wall	36.3100	12.7700	23.5400	0.3000	7.0620		(29a)
Corridor wall	33.9600	2.1000	31.8600	0.3000	9.5580		(29a)
Loft Wall	61.5100		61.5100	0.1800	11.0718		(29a)
Dormer Wall	18.9600	8.0000	10.9600	0.1800	1.9728		(29a)
Exposed Roof	18.2100		18.2100	0.1600	2.9136		(30)
Loft Roof	67.6800		67.6800	0.1500	10.1520		(30)
Total net area of external elements Aum(A, m ²)			244.3600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	74.5976		(33)
Party Wall			61.9200	0.0000	0.0000		(32)
Party Floor			59.9500				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							48.8720 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	123.4696 (37)

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Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 118.4543	Feb 116.3338	Mar 114.2552	Apr 104.4923	May 102.6657	Jun 94.1625	Jul 94.1625	Aug 92.5879	Sep 97.4378	Oct 102.6657	Nov 106.3609	Dec 110.2241 (38)
Heat transfer coeff	241.9239	239.8033	237.7248	227.9619	226.1353	217.6321	217.6321	216.0575	220.9074	226.1353	229.8305	233.6937 (39)
Average = Sum(39)m / 12 =												227.9532

HLP	Jan 1.6972	Feb 1.6824	Mar 1.6678	Apr 1.5993	May 1.5865	Jun 1.5268	Jul 1.5268	Aug 1.5158	Sep 1.5498	Oct 1.5865	Nov 1.6124	Dec 1.6395 (40)
HLP (average)												1.5992
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9218 (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	(42a)
Hot water usage for baths	31.6052	31.1358	30.4748	29.2561	28.3435	27.3316	26.7850	27.4414	28.1560	29.2388	30.4827	31.4983 (42b)
Hot water usage for other uses	44.5519	42.9318	41.3117	39.6916	38.0716	36.4515	36.4515	38.0716	39.6916	41.3117	42.9318	44.5519 (42c)
Average daily hot water use (litres/day)												69.8047 (43)
Daily hot water use	Jan 76.1570	Feb 74.0676	Mar 71.7865	Apr 68.9477	May 66.4151	Jun 63.7831	Jul 63.2365	Aug 65.5130	Sep 67.8477	Oct 70.5505	Nov 73.4144	Dec 76.0502 (44)
Energy conte	120.6141	105.4713	110.3332	94.3860	89.4075	78.4288	76.4791	81.1187	83.6630	95.7364	104.5923	119.0762 (45)
Energy content (annual)										Total = Sum(45)m =		1159.3067
Distribution loss (46)m = 0.15 x (45)m	18.0921	15.8207	16.5500	14.1579	13.4111	11.7643	11.4719	12.1678	12.5494	14.3605	15.6888	17.8614 (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	25.3665	22.9044	25.3475	24.5125	25.3178	24.4899	25.3013	25.3084	24.5000	25.3300	24.5301	25.3646 (61)
Total heat required for water heating calculated for each month	145.9807	128.3757	135.6808	118.8985	114.7253	102.9187	101.7804	106.4272	108.1630	121.0665	129.1224	144.4408 (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	145.9807	128.3757	135.6808	118.8985	114.7253	102.9187	101.7804	106.4272	108.1630	121.0665	129.1224	144.4408 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1457.5799 (64)
Electric shower(s)	58.6277	52.2377	57.0416	54.4341	55.4555	52.8992	54.6625	55.4555	54.4341	57.0416	55.9690	58.6277 (64a)
												666.8863 (64a)
Heat gains from water heating, kWh/month	61.1027	53.8547	57.2831	51.1200	49.9213	45.4249	45.4202	47.1630	47.5515	52.4253	54.9017	60.5909 (65)

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

Metabolic gains (Table 5), Watts	Jan 146.0885	Feb 146.0885	Mar 146.0885	Apr 146.0885	May 146.0885	Jun 146.0885	Jul 146.0885	Aug 146.0885	Sep 146.0885	Oct 146.0885	Nov 146.0885	Dec 146.0885 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	167.5283	185.4777	167.5283	173.1125	167.5283	173.1125	167.5283	167.5283	173.1125	167.5283	173.1125	167.5283 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	312.2819	315.5224	307.3564	289.9720	268.0274	247.4024	233.6237	230.3832	238.5492	255.9336	277.8783	298.5032 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6089	37.6089	37.6089	37.6089	37.6089	37.6089	37.6089	37.6089	37.6089	37.6089	37.6089	37.6089 (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)	-116.8708	-116.8708	-116.8708	-116.8708	-116.8708	-116.8708	-116.8708	-116.8708	-116.8708	-116.8708	-116.8708	-116.8708 (71)
Water heating gains (Table 5)	82.1274	80.1410	76.9934	71.0000	67.0985	63.0901	61.0487	63.3911	66.0437	70.4641	76.2524	81.4394 (72)
Total internal gains	631.7641	650.9677	621.7047	603.9111	572.4807	550.4316	529.0273	528.1292	544.5320	563.7525	597.0698	617.2974 (73)

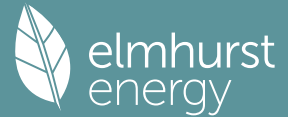
6. Solar gains

[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			7.7200		10.6334		0.6300		0.7000		0.7700		25.0877 (74)
Northeast			8.0300		11.2829		0.6300		0.7000		0.7700		27.6892 (75)
Southwest			5.0200		36.7938		0.6300		0.7000		0.7700		56.4483 (79)
Solar gains	109.2251	200.4582	314.5747	460.6366	583.0324	608.9639	574.5129	478.1671	364.1388	232.2186	133.4010		91.8347 (83)
Total gains	740.9892	851.4259	936.2793	1064.5477	1155.5132	1159.3956	1103.5402	1006.2962	908.6708	795.9711	730.4708		709.1321 (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 16.3665	Feb 16.5112	Mar 16.6556	Apr 17.3689	May 17.5092	Jun 18.1933	Jul 18.1933	Aug 18.3259	Sep 17.9235	Oct 17.5092	Nov 17.2277	Dec 16.9429
alpha	2.0911	2.1007	2.1104	2.1579	2.1673	2.2129	2.2129	2.2217	2.1949	2.1673	2.1485	2.1295
util living area	0.9763	0.9671	0.9526	0.9172	0.8552	0.7492	0.6387	0.6853	0.8395	0.9347	0.9673	0.9785 (86)
MIT	17.0114	17.3313	17.9007	18.7941	19.6146	20.3367	20.6801	20.6137	20.0432	19.0019	17.9320	17.0465 (87)
Th 2	19.5428	19.5535	19.5640	19.6139	19.6233	19.6674	19.6674	19.6757	19.6504	19.6233	19.6043	19.5845 (88)

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util rest of house	0.9719	0.9610	0.9430	0.8986	0.8172	0.6714	0.5068	0.5626	0.7823	0.9165	0.9602	0.9745 (89)
MIT 2	15.9742	16.2974	16.8678	17.7747	18.5702	19.2569	19.5305	19.4958	19.0029	17.9941	16.9254	16.0322 (90)
Living area fraction									FLA =	Living area /	(4) =	0.2030 (91)
MIT	16.1848	16.5074	17.0775	17.9816	18.7822	19.4761	19.7639	19.7228	19.2141	18.1987	17.1298	16.2381 (92)
Temperature adjustment												0.0000
adjusted MIT	16.1848	16.5074	17.0775	17.9816	18.7822	19.4761	19.7639	19.7228	19.2141	18.1987	17.1298	16.2381 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9558	0.9409	0.9182	0.8682	0.7870	0.6578	0.5181	0.5678	0.7580	0.8890	0.9406	0.9597	(94)
Useful gains	708.2067	801.0712	859.6761	924.2730	909.3497	762.6217	571.7130	571.3865	688.7359	707.6475	687.0606	680.5580	(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	2875.2089	2783.4820	2514.5409	2070.2690	1601.5369	1061.1962	688.5630	717.9169	1129.7413	1718.3410	2305.1493	2813.2290	(97)
Space heating kWh	1612.2497	1332.1800	1231.2194	825.1171	514.9873	0.0000	0.0000	0.0000	0.0000	751.9559	1165.0239	1586.7072	(98a)
Space heating requirement - total per year (kWh/year)												9019.4406	
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	1612.2497	1332.1800	1231.2194	825.1171	514.9873	0.0000	0.0000	0.0000	0.0000	751.9559	1165.0239	1586.7072	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												9019.4406	
Space heating per m2										(98c) / (4) =		63.2766	(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 %)													89.2000 (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	1612.2497	1332.1800	1231.2194	825.1171	514.9873	0.0000	0.0000	0.0000	0.0000	751.9559	1165.0239	1586.7072	(98)
Space heating efficiency (main heating system 1)	89.2000	89.2000	89.2000	89.2000	89.2000	0.0000	0.0000	0.0000	0.0000	89.2000	89.2000	89.2000	(210)
Space heating fuel (main heating system)	1807.4548	1493.4754	1380.2909	925.0192	577.3400	0.0000	0.0000	0.0000	0.0000	842.9999	1306.0806	1778.8197	(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	145.9807	128.3757	135.6808	118.8985	114.7253	102.9187	101.7804	106.4272	108.1630	121.0665	129.1224	144.4408	(64)
Efficiency of water heater (217)m	89.0305	89.0205	88.9974	88.9431	88.8288	87.2000	87.2000	87.2000	87.2000	88.9172	88.9963	87.2000	(216)
Fuel for water heating, kWh/month	163.9671	144.2091	152.4548	133.6794	129.1532	118.0260	116.7206	122.0495	124.0402	136.1564	145.0873	162.2390	(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	43.1526	34.6186	31.1702	22.8367	17.6397	14.4118	16.0915	20.9164	27.1683	35.6463	40.2624	44.3520	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												10111.4805	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.2000	
Water heating fuel used												1647.7827	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												348.2664	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												12860.4158	(238)

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

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	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	10111.4805	0.2100	2123.4109 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1647.7827	0.2100	346.0344 (264)
Energy for instantaneous electric shower(s)	666.8863	0.1391	92.7786 (264a)
Space and water heating			2469.4453 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	348.2664	0.1443	50.2656 (268)
Total CO2, kg/year			2624.4188 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			18.4100 (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	10111.4805	1.1300	11425.9730 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1647.7827	1.1300	1861.9944 (278)
Energy for instantaneous electric shower(s)	666.8863	1.5143	1009.8887 (278a)
Space and water heating			13287.9674 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	348.2664	1.5338	534.1826 (282)
Total Primary energy kWh/year			14962.1394 (286)
Dwelling Primary energy Rate (DPER)			104.9700 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	74.7400 (1b)	x 3.0000 (2b)	= 224.2200 (1b) - (3b)
First floor	67.8000 (1c)	x 2.4000 (2c)	= 162.7200 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	142.5400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 386.9400 (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) = 0.1034 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3534	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3004 (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	0.3830	0.3755	0.3680	0.3304	0.3229	0.2854	0.2854	0.2778	0.3004	0.3229	0.3379	0.3529 (22b)
Effective ac	0.5733	0.5705	0.5677	0.5546	0.5521	0.5407	0.5407	0.5386	0.5451	0.5521	0.5571	0.5623 (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
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type (Uw = 1.20)			20.7700	1.1450	23.7824		(27)
Exposed Floor			7.7300	0.1300	1.0049		(28b)
External Wall	36.3100	12.7700	23.5400	0.1800	4.2372		(29a)
Corridor wall	33.9600	2.1000	31.8600	0.1800	5.7348		(29a)
Loft Wall	61.5100		61.5100	0.1800	11.0718		(29a)
Dormer Wall	18.9600	8.0000	10.9600	0.1800	1.9728		(29a)
Exposed Roof	18.2100		18.2100	0.1100	2.0031		(30)
Loft Roof	67.6800		67.6800	0.1100	7.4448		(30)
Total net area of external elements Aum(A, m2)			244.3600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	59.3518		(33)
Party Wall			61.9200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)

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Thermal bridges (User defined value 0.050 * total exposed area)
 Point Thermal bridges (36a) = 12.2180 (36)
 Total fabric heat loss (33) + (36) + (36a) = 71.5698 (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
 73.2090 72.8454 72.4890 70.8149 70.5017 69.0437 69.0437 68.7737 69.6053 70.5017 71.1354 71.7978 (38)
 Heat transfer coeff 144.7789 144.4153 144.0588 142.3848 142.0716 140.6135 140.6135 140.3435 141.1751 142.0716 142.7052 143.3676 (39)
 Average = Sum(39)m / 12 = 142.3833

HLP Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 1.0157 1.0132 1.0107 0.9989 0.9967 0.9865 0.9865 0.9846 0.9904 0.9967 1.0012 1.0058 (40)
 HLP (average) 0.9989
 Days in mont 31 28 31 30 31 30 31 31 30 31 30 31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9218 (42)
 Hot water usage for mixer showers 73.2083 72.1081 70.5050 67.4376 65.1739 62.6495 61.2146 62.8057 64.5498 67.2602 70.3935 72.9278 (42a)
 Hot water usage for baths 31.6052 31.1358 30.4748 29.2561 28.3435 27.3316 26.7850 27.4414 28.1560 29.2388 30.4827 31.4983 (42b)
 Hot water usage for other uses 44.5519 42.9318 41.3117 39.6916 38.0716 36.4515 36.4515 38.0716 39.6916 41.3117 42.9318 44.5519 (42c)
 Average daily hot water use (litres/day) 137.3003 (43)
 Daily hot water use Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 149.3654 146.1757 142.2915 136.3853 131.5890 126.4326 124.4512 128.3186 132.3975 137.8107 143.8079 148.9780 (44)
 Energy conte 236.5582 208.1523 218.6968 186.7047 177.1441 155.4637 150.5129 158.8853 163.2593 187.0079 204.8808 233.2636 (45)
 Energy content (annual) Total = Sum(45)m = 2280.5295
 Distribution loss (46)m = 0.15 x (45)m 35.4837 31.2228 32.8045 28.0057 26.5716 23.3196 22.5769 23.8328 24.4889 28.0512 30.7321 34.9895 (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
 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 (57)
 Combi loss 50.9589 46.0274 50.9589 49.3151 50.9589 49.3151 50.9589 50.9589 49.3151 50.9589 49.3151 50.9589 (61)
 Total heat required for water heating calculated for each month
 WWHRS 287.5171 254.1797 269.6557 236.0197 228.1030 204.7787 201.4718 209.8442 212.5744 237.9668 254.1958 284.2225 (62)
 PV diverter -33.4678 -29.5992 -30.9946 -25.6647 -23.9186 -20.4673 -19.1848 -20.4012 -21.1763 -24.9645 -28.2817 -32.8480 (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)
 FGHR 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 254.0494 224.5805 238.6611 210.3550 204.1844 184.3114 182.2870 189.4430 191.3981 213.0023 225.9141 251.3745 (64)
 Total per year (kWh/year) = Sum(64)m = 2569.5608 (64)
 12Total per year (kWh/year) = 2570 (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 91.3953 80.7175 85.4564 74.4081 71.6401 64.0204 62.7853 65.5691 66.6125 74.9198 80.4516 90.2999 (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 146.0885 146.0885 146.0885 146.0885 146.0885 146.0885 146.0885 146.0885 146.0885 146.0885 146.0885 (66)
 Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 167.5283 185.4777 167.5283 173.1125 167.5283 173.1125 167.5283 167.5283 173.1125 167.5283 173.1125 167.5283 (67)
 Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 312.2819 315.5224 307.3564 289.9720 268.0274 247.4024 233.6237 230.3832 238.5492 255.9336 277.8783 298.5032 (68)
 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 37.6089 37.6089 37.6089 37.6089 37.6089 37.6089 37.6089 37.6089 37.6089 37.6089 37.6089 37.6089 (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) -116.8708 -116.8708 -116.8708 -116.8708 -116.8708 -116.8708 -116.8708 -116.8708 -116.8708 -116.8708 -116.8708 -116.8708 (71)
 Water heating gains (Table 5) 122.8432 120.1153 114.8607 103.3445 96.2905 88.9173 84.3888 88.1305 92.5173 100.6987 111.7384 121.3708 (72)
 Total internal gains 672.4799 690.9420 659.5720 636.2557 601.6727 576.2588 552.3674 552.8686 571.0057 593.9872 632.5558 657.2288 (73)

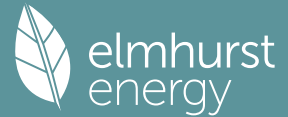
6. Solar gains

[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	7.7200	10.6334	0.6300	0.7000	0.7700	25.0877 (74)						
Northeast	8.0300	11.2829	0.6300	0.7000	0.7700	27.6892 (75)						
Southwest	5.0200	36.7938	0.6300	0.7000	0.7700	56.4483 (79)						
Solar gains	109.2251	200.4582	314.5747	460.6366	583.0324	608.9639	574.5129	478.1671	364.1388	232.2186	133.4010	91.8347 (83)
Total gains	781.7051	891.4003	974.1467	1096.8923	1184.7051	1185.2228	1126.8803	1031.0356	935.1445	826.2058	765.9568	749.0635 (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
 27.3482 27.4171 27.4849 27.8081 27.8694 28.1583 28.1583 28.2125 28.0463 27.8694 27.7456 27.6174
 alpha 2.8232 2.8278 2.8323 2.8539 2.8580 2.8772 2.8772 2.8808 2.8698 2.8580 2.8497 2.8412
 util living area

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	0.9717	0.9579	0.9350	0.8785	0.7797	0.6332	0.5001	0.5536	0.7565	0.9063	0.9581	0.9748 (86)
MIT	18.5119	18.7905	19.2292	19.8538	20.3994	20.7733	20.9164	20.8865	20.5962	19.8990	19.1149	18.4725 (87)
Th 2	20.0703	20.0724	20.0745	20.0842	20.0861	20.0946	20.0946	20.0962	20.0913	20.0861	20.0824	20.0785 (88)
util rest of house												
	0.9676	0.9518	0.9251	0.8591	0.7429	0.5700	0.4125	0.4660	0.7033	0.8874	0.9510	0.9711 (89)
MIT 2	17.1305	17.4849	18.0407	18.8249	19.4825	19.9059	20.0430	20.0216	19.7257	18.8946	17.9064	17.0852 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	17.4110	17.7500	18.2820	19.0338	19.6687	20.0820	20.2204	20.1972	19.9024	19.0986	18.1517	17.3669 (92)
Temperature adjustment												0.0000
adjusted MIT	17.4110	17.7500	18.2820	19.0338	19.6687	20.0820	20.2204	20.1972	19.9024	19.0986	18.1517	17.3669 (93)

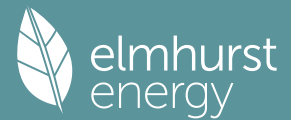
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9503	0.9305	0.8996	0.8319	0.7238	0.5691	0.4254	0.4764	0.6907	0.8611	0.9300	0.9551	(94)
Useful gains	742.8327	829.4063	876.3794	912.5176	857.4314	674.5087	479.3389	491.2356	645.8836	711.4453	712.3280	715.4017	(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	1898.1957	1855.7322	1697.3048	1442.8966	1132.1204	770.8429	509.0723	532.9154	819.1616	1207.4024	1577.1418	1887.7066	(97)
Space heating kWh	859.5901	689.6910	610.7685	381.8728	204.3687	0.0000	0.0000	0.0000	0.0000	368.9921	622.6659	872.1949	(98a)
Space heating requirement - total per year (kWh/year)												4610.1440	
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	859.5901	689.6910	610.7685	381.8728	204.3687	0.0000	0.0000	0.0000	0.0000	368.9921	622.6659	872.1949	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4610.1440	
Space heating per m2										(98c) / (4) =			32.3428 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.4000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	859.5901	689.6910	610.7685	381.8728	204.3687	0.0000	0.0000	0.0000	0.0000	368.9921	622.6659	872.1949	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	930.2923	746.4188	661.0049	413.2823	221.1782	0.0000	0.0000	0.0000	0.0000	399.3421	673.8809	943.9339	(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	254.0494	224.5805	238.6611	210.3550	204.1844	184.3114	182.2870	189.4430	191.3981	213.0023	225.9141	251.3745	(64)
Efficiency of water heater (217)m	86.7798	86.6212	86.3031	85.6421	84.3834	80.3000	80.3000	80.3000	80.3000	85.5469	86.4355	86.8197	(216)
Fuel for water heating, kWh/month	292.7517	259.2674	276.5384	245.6210	241.9723	229.5285	227.0074	235.9191	238.3538	248.9890	261.3672	289.5362	(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	34.8091	27.9251	25.1435	18.4212	14.2291	11.6253	12.9802	16.8722	21.9153	28.7541	32.4776	35.7765	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-25.9740	-38.7597	-58.9118	-70.1330	-79.0197	-74.9512	-73.9966	-68.1522	-58.4774	-45.9750	-29.2931	-22.2107	(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	-8.8104	-18.9938	-38.6424	-59.3890	-79.8968	-80.8292	-79.9202	-67.0655	-48.3465	-27.6392	-11.9094	-6.9359	(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												4989.3334	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												3046.8521	(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)												280.9291	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1174.2328	(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												7228.8817	(238)

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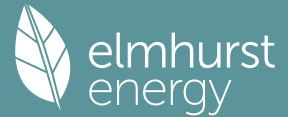
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4989.3334	0.2100	1047.7600 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3046.8521	0.2100	639.8389 (264)
Space and water heating			1687.5989 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	280.9291	0.1443	40.5468 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-645.8544	0.1334	-86.1797
PV Unit electricity exported	-528.3783	0.1252	-66.1603
Total			-152.3400 (269)
Total CO2, kg/year			1587.7349 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.1400 (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	4989.3334	1.1300	5637.9467 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3046.8521	1.1300	3442.9428 (278)
Space and water heating			9080.8895 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	280.9291	1.5338	430.8984 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-645.8544	1.4931	-964.3178
PV Unit electricity exported	-528.3783	0.4596	-242.8357
Total			-1207.1535 (283)
Total Primary energy kWh/year			8434.7352 (286)
Target Primary Energy Rate (TPER)			59.1700 (287)

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Property Reference	Flat 3.01			Issued on Date	22/04/2024
Assessment Reference	Additional Measures	Prop Type Ref			
Property	Christchurch Hall, , 38, Portland Street, Bristol, BS8 4JB				
SAP Rating	80 C	DER	17.04	TER	11.14
Environmental	83 B	% DER < TER			-52.96
CO ₂ Emissions (t/year)	2.01	DFEE	64.15	TFEE	36.91
Compliance Check	See BREL	% DFEE < TFEE			-73.80
% DPER < TPER	-64.48	DPER	97.32	TPER	59.17
Assessor Details	Mr. Jordan Howlett			Assessor ID	H055-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	74.7400 (1b)	x 3.0000 (2b)	= 224.2200 (1b) - (3b)
First floor	67.8000 (1c)	x 2.4000 (2c)	= 162.7200 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	142.5400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 386.9400 (5)

2. Ventilation rate

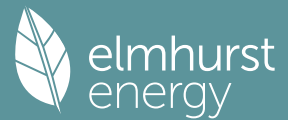
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	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) = 0.1034 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8534 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7254 (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	0.9248	0.9067	0.8886	0.7979	0.7798	0.6891	0.6891	0.6710	0.7254	0.7798	0.8160	0.8523 (22b)
Effective ac	0.9277	0.9111	0.8948	0.8183	0.8040	0.7374	0.7374	0.7251	0.7631	0.8040	0.8330	0.8632 (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
External Door			2.1000	1.4000	2.9400		(26)
Window (Uw = 1.40)			20.7700	1.3258	27.5360		(27)
Exposed Floor			7.7300	0.1800	1.3914		(28b)
External Wall	36.3100	12.7700	23.5400	0.2600	6.1204		(29a)
Corridor wall	33.9600	2.1000	31.8600	0.2600	8.2836		(29a)
Loft Wall	61.5100		61.5100	0.1800	11.0718		(29a)
Dormer Wall	18.9600	8.0000	10.9600	0.1800	1.9728		(29a)
Exposed Roof	18.2100		18.2100	0.1600	2.9136		(30)
Loft Roof	67.6800		67.6800	0.1500	10.1520		(30)
Total net area of external elements Aum(A, m ²)			244.3600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	72.3816		(33)
Party Wall			61.9200	0.0000	0.0000		(32)
Party Floor			59.9500				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							48.8720 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	121.2536 (37)

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Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 118.4543	Feb 116.3338	Mar 114.2552	Apr 104.4923	May 102.6657	Jun 94.1625	Jul 94.1625	Aug 92.5879	Sep 97.4378	Oct 102.6657	Nov 106.3609	Dec 110.2241 (38)
Heat transfer coeff	239.7079	237.5873	235.5088	225.7459	223.9193	215.4161	215.4161	213.8415	218.6914	223.9193	227.6145	231.4777 (39)
Average = Sum(39)m / 12 =												225.7372

HLP	Jan 1.6817	Feb 1.6668	Mar 1.6522	Apr 1.5837	May 1.5709	Jun 1.5113	Jul 1.5113	Aug 1.5002	Sep 1.5342	Oct 1.5709	Nov 1.5968	Dec 1.6239 (40)
HLP (average)												1.5837
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9218 (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	(42a)
Hot water usage for baths	31.6052	31.1358	30.4748	29.2561	28.3435	27.3316	26.7850	27.4414	28.1560	29.2388	30.4827	31.4983 (42b)
Hot water usage for other uses	44.5519	42.9318	41.3117	39.6916	38.0716	36.4515	36.4515	38.0716	39.6916	41.3117	42.9318	44.5519 (42c)
Average daily hot water use (litres/day)												69.8047 (43)
Daily hot water use	Jan 76.1570	Feb 74.0676	Mar 71.7865	Apr 68.9477	May 66.4151	Jun 63.7831	Jul 63.2365	Aug 65.5130	Sep 67.8477	Oct 70.5505	Nov 73.4144	Dec 76.0502 (44)
Energy conte	120.6141	105.4713	110.3332	94.3860	89.4075	78.4288	76.4791	81.1187	83.6630	95.7364	104.5923	119.0762 (45)
Energy content (annual)										Total = Sum(45)m =		1159.3067
Distribution loss (46)m = 0.15 x (45)m	18.0921	15.8207	16.5500	14.1579	13.4111	11.7643	11.4719	12.1678	12.5494	14.3605	15.6888	17.8614 (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	(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	25.3665	22.9044	25.3475	24.5125	25.3178	24.4899	25.3013	25.3084	24.5000	25.3300	24.5301	25.3646 (61)
Total heat required for water heating calculated for each month	145.9807	128.3757	135.6808	118.8985	114.7253	102.9187	101.7804	106.4272	108.1630	121.0665	129.1224	144.4408 (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	145.9807	128.3757	135.6808	118.8985	114.7253	102.9187	101.7804	106.4272	108.1630	121.0665	129.1224	144.4408 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											1457.5799 (64)
Electric shower(s)	58.6277	52.2377	57.0416	54.4341	55.4555	52.8992	54.6625	55.4555	54.4341	57.0416	55.9690	58.6277 (64a)
Heat gains from water heating, kWh/month	61.1027	53.8547	57.2831	51.1200	49.9213	45.4249	45.4202	47.1630	47.5515	52.4253	54.9017	60.5909 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												
												666.8863 (64a)

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	146.0885	146.0885	146.0885	146.0885	146.0885	146.0885	146.0885	146.0885	146.0885	146.0885	146.0885	146.0885 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	167.5283	185.4777	167.5283	173.1125	167.5283	173.1125	167.5283	167.5283	173.1125	167.5283	173.1125	167.5283 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	312.2819	315.5224	307.3564	289.9720	268.0274	247.4024	233.6237	230.3832	238.5492	255.9336	277.8783	298.5032 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6089	37.6089	37.6089	37.6089	37.6089	37.6089	37.6089	37.6089	37.6089	37.6089	37.6089	37.6089 (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)	-116.8708	-116.8708	-116.8708	-116.8708	-116.8708	-116.8708	-116.8708	-116.8708	-116.8708	-116.8708	-116.8708	-116.8708 (71)
Water heating gains (Table 5)	82.1274	80.1410	76.9934	71.0000	67.0985	63.0901	61.0487	63.3911	66.0437	70.4641	76.2524	81.4394 (72)
Total internal gains	631.7641	650.9677	621.7047	603.9111	572.4807	550.4316	529.0273	528.1292	544.5320	563.7525	597.0698	617.2974 (73)

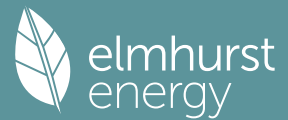
6. Solar gains

[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			7.7200		10.6334		0.6300		0.7000		0.7700		25.0877 (74)
Northeast			8.0300		11.2829		0.6300		0.7000		0.7700		27.6892 (75)
Southwest			5.0200		36.7938		0.6300		0.7000		0.7700		56.4483 (79)
Solar gains	109.2251	200.4582	314.5747	460.6366	583.0324	608.9639	574.5129	478.1671	364.1388	232.2186	133.4010		91.8347 (83)
Total gains	740.9892	851.4259	936.2793	1064.5477	1155.5132	1159.3956	1103.5402	1006.2962	908.6708	795.9711	730.4708		709.1321 (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	16.5178	16.6652	16.8123	17.5394	17.6825	18.3804	18.3804	18.5158	18.1052	17.6825	17.3954	17.1051
alpha	2.1012	2.1110	2.1208	2.1693	2.1788	2.2254	2.2254	2.2344	2.2070	2.1788	2.1597	2.1403
util living area	0.9763	0.9671	0.9525	0.9168	0.8542	0.7473	0.6361	0.6829	0.8383	0.9344	0.9672	0.9785 (86)
MIT	17.0379	17.3578	17.9254	18.8166	19.6324	20.3487	20.6874	20.6218	20.0566	19.0210	17.9558	17.0739 (87)
Th 2	19.5540	19.5647	19.5753	19.6253	19.6347	19.6791	19.6791	19.6873	19.6619	19.6347	19.6156	19.5958 (88)

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util rest of house												
MIT 2	0.9719	0.9609	0.9429	0.8982	0.8163	0.6697	0.5053	0.5610	0.7812	0.9162	0.9601	0.9746 (89)
Living area fraction	15.0260	15.4338	16.1557	17.2934	18.3024	19.1614	19.5068	19.4609	18.8427	17.5668	16.2120	15.0824 (90)
MIT	15.4345	15.8244	16.5150	17.6026	18.5724	19.4025	19.7465	19.6966	19.0892	17.8620	16.5661	15.4868 (92)
Temperature adjustment												0.0000
adjusted MIT	15.4345	15.8244	16.5150	17.6026	18.5724	19.4025	19.7465	19.6966	19.0892	17.8620	16.5661	15.4868 (93)

8. Space heating requirement

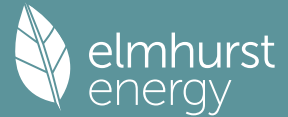
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9502	0.9340	0.9100	0.8584	0.7768	0.6498	0.5131	0.5620	0.7485	0.8800	0.9339	0.9545	(94)
Useful gains	704.0556	795.2738	851.9905	913.8416	897.5658	753.4104	566.2626	565.5497	680.0984	700.4224	682.1969	676.8984	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	2669.0158	2595.4985	2358.6180	1964.5820	1538.8720	1034.5326	677.8066	704.9447	1091.0867	1626.1078	2154.6136	2612.6365	(97)
Space heating kWh	1461.9304	1209.7509	1120.9309	756.5330	477.1319	0.0000	0.0000	0.0000	0.0000	688.7099	1060.1400	1440.1892	(98a)
Space heating requirement - total per year (kWh/year)												8215.3162	
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	1461.9304	1209.7509	1120.9309	756.5330	477.1319	0.0000	0.0000	0.0000	0.0000	688.7099	1060.1400	1440.1892	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												8215.3162	
Space heating per m2										(98c) / (4) =		57.6352	(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 %)													89.2000 (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	1461.9304	1209.7509	1120.9309	756.5330	477.1319	0.0000	0.0000	0.0000	0.0000	688.7099	1060.1400	1440.1892	(98)
Space heating efficiency (main heating system 1)	89.2000	89.2000	89.2000	89.2000	89.2000	0.0000	0.0000	0.0000	0.0000	89.2000	89.2000	89.2000	(210)
Space heating fuel (main heating system)	1638.9354	1356.2230	1256.6490	848.1312	534.9012	0.0000	0.0000	0.0000	0.0000	772.0963	1188.4978	1614.5618	(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	145.9807	128.3757	135.6808	118.8985	114.7253	102.9187	101.7804	106.4272	108.1630	121.0665	129.1224	144.4408	(64)
Efficiency of water heater	89.0146	89.0042	88.9796	88.9230	88.8052	87.2000	87.2000	87.2000	87.2000	88.8952	88.9784	89.0139	(216)
Fuel for water heating, kWh/month	163.9962	144.2356	152.4852	133.7095	129.1876	118.0260	116.7206	122.0495	124.0402	136.1901	145.1165	162.2677	(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	37.3921	29.9973	27.0093	19.7882	15.2849	12.4879	13.9434	18.1242	23.5415	30.8878	34.8877	38.4314	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												9209.9958	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.2000	
Water heating fuel used												1648.0249	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												301.7758	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												11912.6827	(238)

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

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	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	9209.9958	0.2100	1934.0991 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1648.0249	0.2100	346.0852 (264)
Energy for instantaneous electric shower(s)	666.8863	0.1391	92.7786 (264a)
Space and water heating			2280.1843 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	301.7758	0.1443	43.5556 (268)
Total CO2, kg/year			2428.4478 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			17.0400 (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	9209.9958	1.1300	10407.2952 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1648.0249	1.1300	1862.2681 (278)
Energy for instantaneous electric shower(s)	666.8863	1.5143	1009.8887 (278a)
Space and water heating			12269.5633 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	301.7758	1.5338	462.8738 (282)
Total Primary energy kWh/year			13872.4265 (286)
Dwelling Primary energy Rate (DPER)			97.3200 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	74.7400 (1b)	x 3.0000 (2b)	= 224.2200 (1b) - (3b)
First floor	67.8000 (1c)	x 2.4000 (2c)	= 162.7200 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	142.5400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 386.9400 (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	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) = 0.1034 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3534	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3004 (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	0.3830	0.3755	0.3680	0.3304	0.3229	0.2854	0.2854	0.2778	0.3004	0.3229	0.3379	0.3529 (22b)
Effective ac	0.5733	0.5705	0.5677	0.5546	0.5521	0.5407	0.5407	0.5386	0.5451	0.5521	0.5571	0.5623 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type (Uw = 1.20)			20.7700	1.1450	23.7824		(27)
Exposed Floor			7.7300	0.1300	1.0049		(28b)
External Wall	36.3100	12.7700	23.5400	0.1800	4.2372		(29a)
Corridor wall	33.9600	2.1000	31.8600	0.1800	5.7348		(29a)
Loft Wall	61.5100		61.5100	0.1800	11.0718		(29a)
Dormer Wall	18.9600	8.0000	10.9600	0.1800	1.9728		(29a)
Exposed Roof	18.2100		18.2100	0.1100	2.0031		(30)
Loft Roof	67.6800		67.6800	0.1100	7.4448		(30)
Total net area of external elements Aum(A, m ²)			244.3600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	59.3518		(33)
Party Wall			61.9200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)

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Thermal bridges (User defined value 0.050 * total exposed area)
 Point Thermal bridges (36a) = 12.2180 (36)
 Total fabric heat loss (33) + (36) + (36a) = 71.5698 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
 (38)m Jan 73.2090 Feb 72.8454 Mar 72.4890 Apr 70.8149 May 70.5017 Jun 69.0437 Jul 69.0437 Aug 68.7737 Sep 69.6053 Oct 70.5017 Nov 71.1354 Dec 71.7978 (38)
 Heat transfer coeff 144.7789 144.4153 144.0588 142.3848 142.0716 140.6135 140.6135 140.3435 141.1751 142.0716 142.7052 143.3676 (39)
 Average = Sum(39)m / 12 = 142.3833

HLP Jan 1.0157 Feb 1.0132 Mar 1.0107 Apr 0.9989 May 0.9967 Jun 0.9865 Jul 0.9865 Aug 0.9846 Sep 0.9904 Oct 0.9967 Nov 1.0012 Dec 1.0058 (40)
 HLP (average) 0.9989
 Days in mont 31 28 31 30 31 30 31 31 30 31 30 31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9218 (42)
 Hot water usage for mixer showers 73.2083 72.1081 70.5050 67.4376 65.1739 62.6495 61.2146 62.8057 64.5498 67.2602 70.3935 72.9278 (42a)
 Hot water usage for baths 31.6052 31.1358 30.4748 29.2561 28.3435 27.3316 26.7850 27.4414 28.1560 29.2388 30.4827 31.4983 (42b)
 Hot water usage for other uses 44.5519 42.9318 41.3117 39.6916 38.0716 36.4515 36.4515 38.0716 39.6916 41.3117 42.9318 44.5519 (42c)
 Average daily hot water use (litres/day) 137.3003 (43)
 Daily hot water use Jan 149.3654 Feb 146.1757 Mar 142.2915 Apr 136.3853 May 131.5890 Jun 126.4326 Jul 124.4512 Aug 128.3186 Sep 132.3975 Oct 137.8107 Nov 143.8079 Dec 148.9780 (44)
 Energy conte 236.5582 208.1523 218.6968 186.7047 177.1441 155.4637 150.5129 158.8853 163.2593 187.0079 204.8808 233.2636 (45)
 Energy content (annual) Total = Sum(45)m = 2280.5295
 Distribution loss (46)m = 0.15 x (45)m 35.4837 31.2228 32.8045 28.0057 26.5716 23.3196 22.5769 23.8328 24.4889 28.0512 30.7321 34.9895 (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
 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 (57)
 Combi loss 50.9589 46.0274 50.9589 49.3151 50.9589 49.3151 50.9589 50.9589 49.3151 50.9589 49.3151 50.9589 (61)
 Total heat required for water heating calculated for each month
 WWHRS 287.5171 254.1797 269.6557 236.0197 228.1030 204.7787 201.4718 209.8442 212.5744 237.9668 254.1958 284.2225 (62)
 PV diverter -33.4678 -29.5992 -30.9946 -25.6647 -23.9186 -20.4673 -19.1848 -20.4012 -21.1763 -24.9645 -28.2817 -32.8480 (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)
 FGHR 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 254.0494 224.5805 238.6611 210.3550 204.1844 184.3114 182.2870 189.4430 191.3981 213.0023 225.9141 251.3745 (64)
 Total per year (kWh/year) = Sum(64)m = 2569.5608 (64)
 12Total per year (kWh/year) 2570 (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 91.3953 80.7175 85.4564 74.4081 71.6401 64.0204 62.7853 65.5691 66.6125 74.9198 80.4516 90.2999 (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 146.0885 146.0885 146.0885 146.0885 146.0885 146.0885 146.0885 146.0885 146.0885 146.0885 146.0885 (66)
 Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 167.5283 185.4777 167.5283 173.1125 167.5283 173.1125 167.5283 167.5283 173.1125 167.5283 173.1125 167.5283 (67)
 Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 312.2819 315.5224 307.3564 289.9720 268.0274 247.4024 233.6237 230.3832 238.5492 255.9336 277.8783 298.5032 (68)
 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 37.6089 37.6089 37.6089 37.6089 37.6089 37.6089 37.6089 37.6089 37.6089 37.6089 37.6089 37.6089 (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) -116.8708 -116.8708 -116.8708 -116.8708 -116.8708 -116.8708 -116.8708 -116.8708 -116.8708 -116.8708 -116.8708 -116.8708 (71)
 Water heating gains (Table 5) 122.8432 120.1153 114.8607 103.3445 96.2905 88.9173 84.3888 88.1305 92.5173 100.6987 111.7384 121.3708 (72)
 Total internal gains 672.4799 690.9420 659.5720 636.2557 601.6727 576.2588 552.3674 552.8686 571.0057 593.9872 632.5558 657.2288 (73)

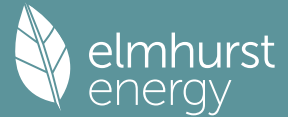
6. Solar gains

[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 7.7200 10.6334 0.6300 0.7700 25.0877 (74)
 Northeast 8.0300 11.2829 0.6300 0.7700 27.6892 (75)
 Southwest 5.0200 36.7938 0.6300 0.7700 56.4483 (79)
 Solar gains 109.2251 200.4582 314.5747 460.6366 583.0324 608.9639 574.5129 478.1671 364.1388 232.2186 133.4010 91.8347 (83)
 Total gains 781.7051 891.4003 974.1467 1096.8923 1184.7051 1185.2228 1126.8803 1031.0356 935.1445 826.2058 765.9568 749.0635 (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 27.3482 Feb 27.4171 Mar 27.4849 Apr 27.8081 May 27.8694 Jun 28.1583 Jul 28.1583 Aug 28.2125 Sep 28.0463 Oct 27.8694 Nov 27.7456 Dec 27.6174
 alpha 2.8232 2.8278 2.8323 2.8539 2.8580 2.8772 2.8772 2.8808 2.8698 2.8580 2.8497 2.8412
 util living area

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	0.9717	0.9579	0.9350	0.8785	0.7797	0.6332	0.5001	0.5536	0.7565	0.9063	0.9581	0.9748 (86)
MIT	18.5119	18.7905	19.2292	19.8538	20.3994	20.7733	20.9164	20.8865	20.5962	19.8990	19.1149	18.4725 (87)
Th 2	20.0703	20.0724	20.0745	20.0842	20.0861	20.0946	20.0946	20.0962	20.0913	20.0861	20.0824	20.0785 (88)
util rest of house												
	0.9676	0.9518	0.9251	0.8591	0.7429	0.5700	0.4125	0.4660	0.7033	0.8874	0.9510	0.9711 (89)
MIT 2	17.1305	17.4849	18.0407	18.8249	19.4825	19.9059	20.0430	20.0216	19.7257	18.8946	17.9064	17.0852 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	17.4110	17.7500	18.2820	19.0338	19.6687	20.0820	20.2204	20.1972	19.9024	19.0986	18.1517	17.3669 (92)
Temperature adjustment												0.0000
adjusted MIT	17.4110	17.7500	18.2820	19.0338	19.6687	20.0820	20.2204	20.1972	19.9024	19.0986	18.1517	17.3669 (93)

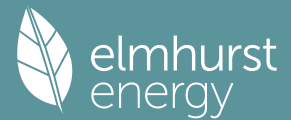
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9503	0.9305	0.8996	0.8319	0.7238	0.5691	0.4254	0.4764	0.6907	0.8611	0.9300	0.9551	(94)
Useful gains	742.8327	829.4063	876.3794	912.5176	857.4314	674.5087	479.3389	491.2356	645.8836	711.4453	712.3280	715.4017	(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	1898.1957	1855.7322	1697.3048	1442.8966	1132.1204	770.8429	509.0723	532.9154	819.1616	1207.4024	1577.1418	1887.7066	(97)
Space heating kWh	859.5901	689.6910	610.7685	381.8728	204.3687	0.0000	0.0000	0.0000	0.0000	368.9921	622.6659	872.1949	(98a)
Space heating requirement - total per year (kWh/year)												4610.1440	
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	859.5901	689.6910	610.7685	381.8728	204.3687	0.0000	0.0000	0.0000	0.0000	368.9921	622.6659	872.1949	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4610.1440	
Space heating per m2										(98c) / (4) =		32.3428	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.4000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	859.5901	689.6910	610.7685	381.8728	204.3687	0.0000	0.0000	0.0000	0.0000	368.9921	622.6659	872.1949	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	930.2923	746.4188	661.0049	413.2823	221.1782	0.0000	0.0000	0.0000	0.0000	399.3421	673.8809	943.9339	(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	254.0494	224.5805	238.6611	210.3550	204.1844	184.3114	182.2870	189.4430	191.3981	213.0023	225.9141	251.3745	(64)
Efficiency of water heater (217)m	86.7798	86.6212	86.3031	85.6421	84.3834	80.3000	80.3000	80.3000	80.3000	85.5469	86.4355	86.8197	(216)
Fuel for water heating, kWh/month	292.7517	259.2674	276.5384	245.6210	241.9723	229.5285	227.0074	235.9191	238.3538	248.9890	261.3672	289.5362	(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	34.8091	27.9251	25.1435	18.4212	14.2291	11.6253	12.9802	16.8722	21.9153	28.7541	32.4776	35.7765	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-25.9740	-38.7597	-58.9118	-70.1330	-79.0197	-74.9512	-73.9966	-68.1522	-58.4774	-45.9750	-29.2931	-22.2107	(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	-8.8104	-18.9938	-38.6424	-59.3890	-79.8968	-80.8292	-79.9202	-67.0655	-48.3465	-27.6392	-11.9094	-6.9359	(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												4989.3334	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												3046.8521	(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)												280.9291	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1174.2328	(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												7228.8817	(238)

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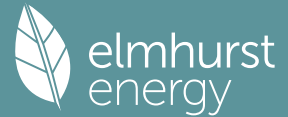
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4989.3334	0.2100	1047.7600 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3046.8521	0.2100	639.8389 (264)
Space and water heating			1687.5989 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	280.9291	0.1443	40.5468 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-645.8544	0.1334	-86.1797
PV Unit electricity exported	-528.3783	0.1252	-66.1603
Total			-152.3400 (269)
Total CO2, kg/year			1587.7349 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.1400 (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	4989.3334	1.1300	5637.9467 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3046.8521	1.1300	3442.9428 (278)
Space and water heating			9080.8895 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	280.9291	1.5338	430.8984 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-645.8544	1.4931	-964.3178
PV Unit electricity exported	-528.3783	0.4596	-242.8357
Total			-1207.1535 (283)
Total Primary energy kWh/year			8434.7352 (286)
Target Primary Energy Rate (TPER)			59.1700 (287)

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Property Reference	Flat 3.01			Issued on Date	22/04/2024
Assessment Reference	Renewables	Prop Type Ref			
Property	Christchurch Hall, , 38, Portland Street, Bristol, BS8 4JB				
SAP Rating	78 C	DER	4.42	TER	10.96
Environmental	96 A	% DER < TER			59.67
CO ₂ Emissions (t/year)	0.55	DFEE	64.15	TFEE	36.91
Compliance Check	See BREL	% DFEE < TFEE			-73.80
% DPER < TPER	20.69	DPER	46.18	TPER	58.23
Assessor Details	Mr. Jordan Howlett			Assessor ID	H055-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	74.7400 (1b)	x 3.0000 (2b)	= 224.2200 (1b) - (3b)
First floor	67.8000 (1c)	x 2.4000 (2c)	= 162.7200 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	142.5400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 386.9400 (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	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) =	Air changes per hour 40.0000 / (5) = 0.1034 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8534 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7254 (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	0.9248	0.9067	0.8886	0.7979	0.7798	0.6891	0.6891	0.6710	0.7254	0.7798	0.8160	0.8523 (22b)
Effective ac	0.9277	0.9111	0.8948	0.8183	0.8040	0.7374	0.7374	0.7251	0.7631	0.8040	0.8330	0.8632 (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
External Door			2.1000	1.4000	2.9400		(26)
Window (Uw = 1.40)			20.7700	1.3258	27.5360		(27)
Exposed Floor			7.7300	0.1800	1.3914		(28b)
External Wall	36.3100	12.7700	23.5400	0.2600	6.1204		(29a)
Corridor wall	33.9600	2.1000	31.8600	0.2600	8.2836		(29a)
Loft Wall	61.5100		61.5100	0.1800	11.0718		(29a)
Dormer Wall	18.9600	8.0000	10.9600	0.1800	1.9728		(29a)
Exposed Roof	18.2100		18.2100	0.1600	2.9136		(30)
Loft Roof	67.6800		67.6800	0.1500	10.1520		(30)
Total net area of external elements Aum(A, m ²)			244.3600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	72.3816		(33)
Party Wall			61.9200	0.0000	0.0000		(32)
Party Floor			59.9500				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							48.8720 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	121.2536 (37)

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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	118.4543	116.3338	114.2552	104.4923	102.6657	94.1625	94.1625	92.5879	97.4378	102.6657	106.3609	110.2241 (38)
Average = Sum(39)m / 12 =	239.7079	237.5873	235.5088	225.7459	223.9193	215.4161	215.4161	213.8415	218.6914	223.9193	227.6145	231.4777 (39)
												225.7372

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.6817	1.6668	1.6522	1.5837	1.5709	1.5113	1.5113	1.5002	1.5342	1.5709	1.5968	1.6239 (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												2.9218 (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	(42a)
Hot water usage for baths	31.6052	31.1358	30.4748	29.2561	28.3435	27.3316	26.7850	27.4414	28.1560	29.2388	30.4827	31.4983 (42b)
Hot water usage for other uses	44.5519	42.9318	41.3117	39.6916	38.0716	36.4515	36.4515	38.0716	39.6916	41.3117	42.9318	44.5519 (42c)
Average daily hot water use (litres/day)												69.8047 (43)
Daily hot water use	76.1570	74.0676	71.7865	68.9477	66.4151	63.7831	63.2365	65.5130	67.8477	70.5505	73.4144	76.0502 (44)
Energy conte	120.6141	105.4713	110.3332	94.3860	89.4075	78.4288	76.4791	81.1187	83.6630	95.7364	104.5923	119.0762 (45)
Energy content (annual)										Total = Sum(45)m =		1159.3067
Distribution loss (46)m = 0.15 x (45)m	18.0921	15.8207	16.5500	14.1579	13.4111	11.7643	11.4719	12.1678	12.5494	14.3605	15.6888	17.8614 (46)
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0044 (55)
Total storage loss	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364 (56)
If cylinder contains dedicated solar storage	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364 (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	175.0129	154.6057	164.7320	147.0300	143.8063	131.0728	130.8779	135.5175	136.3070	150.1352	157.2363	173.4750 (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	175.0129	154.6057	164.7320	147.0300	143.8063	131.0728	130.8779	135.5175	136.3070	150.1352	157.2363	173.4750 (64)
12Total per year (kWh/year)												1799.8087 (64a)
Electric shower(s)	58.6277	52.2377	57.0416	54.4341	55.4555	52.8992	54.6625	55.4555	54.4341	57.0416	55.9690	58.6277 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												666.8863 (64a)
Heat gains from water heating, kWh/month	98.2802	87.4362	94.4652	87.1071	87.1109	81.4176	82.6140	84.3549	83.5417	89.6118	90.8844	97.7688 (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	146.0885	146.0885	146.0885	146.0885	146.0885	146.0885	146.0885	146.0885	146.0885	146.0885	146.0885	146.0885 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	167.5283	185.4777	167.5283	173.1125	167.5283	173.1125	167.5283	167.5283	173.1125	167.5283	173.1125	167.5283 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	312.2819	315.5224	307.3564	289.9720	268.0274	247.4024	233.6237	230.3832	238.5492	255.9336	277.8783	298.5032 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6089	37.6089	37.6089	37.6089	37.6089	37.6089	37.6089	37.6089	37.6089	37.6089	37.6089	37.6089 (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)	-116.8708	-116.8708	-116.8708	-116.8708	-116.8708	-116.8708	-116.8708	-116.8708	-116.8708	-116.8708	-116.8708	-116.8708 (71)
Water heating gains (Table 5)	132.0970	130.1133	126.9694	120.9820	117.0846	113.0800	111.0403	113.3802	116.0301	120.4460	126.2283	131.4097 (72)
Total internal gains	678.7337	697.9400	668.6807	650.8932	619.4667	600.4215	579.0189	578.1183	594.5184	610.7344	644.0457	664.2677 (73)

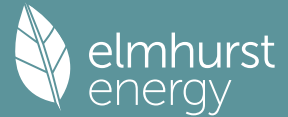
6. Solar gains

[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			7.7200		10.6334		0.6300		0.7000		0.7700		25.0877 (74)
Northeast			8.0300		11.2829		0.6300		0.7000		0.7700		27.6892 (75)
Southwest			5.0200		36.7938		0.6300		0.7000		0.7700		56.4483 (79)
Solar gains	109.2251	200.4582	314.5747	460.6366	583.0324	608.9639	574.5129	478.1671	364.1388	232.2186	133.4010		91.8347 (83)
Total gains	787.9588	898.3983	983.2553	1111.5298	1202.4992	1209.3854	1153.5317	1056.2854	958.6572	842.9530	777.4468	756.1024	(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	16.5178	16.6652	16.8123	17.5394	17.6825	18.3804	18.3804	18.5158	18.1052	17.6825	17.3954	17.1051
alpha	2.1012	2.1110	2.1208	2.1693	2.1788	2.2254	2.2254	2.2344	2.2070	2.1788	2.1597	2.1403
util living area												

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	0.9734	0.9637	0.9481	0.9105	0.8453	0.7338	0.6200	0.6659	0.8252	0.9274	0.9632	0.9757 (86)
Living	17.0905	17.4092	17.9747	18.8614	19.6691	20.3754	20.7042	20.6424	20.0936	19.0685	18.0082	17.1278
Non living	15.0922	15.4981	16.2168	17.3474	18.3436	19.1865	19.5179	19.4758	18.8813	17.6241	16.2775	15.1504
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	9	0	0	0	0	0	0	0	0	0	0	0
16 / 9	22	26	0	0	0	0	0	0	0	0	0	31
MIT	19.4286	18.8550	17.9747	18.8614	19.6691	20.3754	20.7042	20.6424	20.0936	19.0685	18.0082	18.8069 (87)
Th 2	19.5540	19.5647	19.5753	19.6253	19.6347	19.6791	19.6791	19.6873	19.6619	19.6347	19.6156	19.5958 (88)
util rest of house	0.9685	0.9569	0.9378	0.8908	0.8058	0.6548	0.4893	0.5431	0.7654	0.9077	0.9552	0.9713 (89)
MIT 2	18.1491	17.5995	16.2168	17.3474	18.3436	19.1865	19.5179	19.4758	18.8813	17.6241	16.2775	17.6266 (90)
Living area fraction									FLA = Living area /	(4) =		0.2030 (91)
MIT	18.4088	17.8544	16.5737	17.6548	18.6127	19.4279	19.7588	19.7127	19.1274	17.9174	16.6289	17.8662 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4088	17.8544	16.5737	17.6548	18.6127	19.4279	19.7588	19.7127	19.1274	17.9174	16.6289	17.8662 (93)

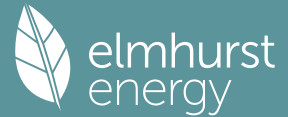
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9637	0.9462	0.9034	0.8503	0.7667	0.6365	0.4985	0.5459	0.7339	0.8702	0.9272	0.9640	(94)
Useful gains	759.3359	850.0725	888.2651	945.1061	922.0096	769.8082	575.0260	576.6505	703.5409	733.5360	720.8328	728.9099	(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	3382.0022	3077.8064	2372.4487	1976.3665	1547.8848	1040.0019	680.4536	708.3901	1099.4569	1638.4968	2168.9131	3163.4290	(97)
Space heating kWh	1951.2638	1497.0372	1104.2326	742.5075	465.6512	0.0000	0.0000	0.0000	0.0000	673.2909	1042.6178	1811.2822	(98a)
Space heating requirement - total per year (kWh/year)												9287.8830	
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	1951.2638	1497.0372	1104.2326	742.5075	465.6512	0.0000	0.0000	0.0000	0.0000	673.2909	1042.6178	1811.2822	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												9287.8830	
Space heating per m2										(98c) / (4) =		65.1598	(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 %)													400.9407 (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	1951.2638	1497.0372	1104.2326	742.5075	465.6512	0.0000	0.0000	0.0000	0.0000	673.2909	1042.6178	1811.2822	(98)
Space heating efficiency (main heating system 1)	400.9407	400.9407	400.9407	400.9407	400.9407	0.0000	0.0000	0.0000	0.0000	400.9407	400.9407	400.9407	(210)
Space heating fuel (main heating system)	486.6714	373.3812	275.4104	185.1914	116.1397	0.0000	0.0000	0.0000	0.0000	167.9278	260.0429	451.7581	(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	175.0129	154.6057	164.7320	147.0300	143.8063	131.0728	130.8779	135.5175	136.3070	150.1352	157.2363	173.4750	(64)
Efficiency of water heater (217)m	186.6680	186.6680	186.6680	186.6680	186.6680	186.6680	186.6680	186.6680	186.6680	186.6680	186.6680	186.6680	(216)
Fuel for water heating, kWh/month	93.7563	82.8239	88.2487	78.7655	77.0385	70.2171	70.1127	72.5982	73.0211	80.4290	84.2331	92.9324	(219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	37.3921	29.9973	27.0093	19.7882	15.2849	12.4879	13.9434	18.1242	23.5415	30.8878	34.8877	38.4314	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2316.5229	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												186.6680	
Water heating fuel used												964.1764	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												301.7758	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)

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Total delivered energy for all uses

4249.3613 (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	2316.5229	0.1549	358.7603	(261)
Total CO ₂ associated with community systems			0.0000	(373)
Water heating (other fuel)	964.1764	0.1406	135.5223	(264)
Energy for instantaneous electric shower(s)	666.8863	0.1391	92.7786	(264a)
Space and water heating			494.2826	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	301.7758	0.1443	43.5556	(268)
Total CO ₂ , kg/year			630.6168	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.4200	(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	2316.5229	1.5733	3644.6601	(275)
Total CO ₂ associated with community systems			0.0000	(473)
Water heating (other fuel)	964.1764	1.5197	1465.2718	(278)
Energy for instantaneous electric shower(s)	666.8863	1.5143	1009.8887	(278a)
Space and water heating			5109.9320	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	301.7758	1.5338	462.8738	(282)
Total Primary energy kWh/year			6582.6944	(286)
Dwelling Primary energy Rate (DPER)			46.1800	(287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)	
Ground floor	74.7400 (1b)	x 3.0000 (2b)	= 224.2200	(1b) - (3b)
First floor	67.8000 (1c)	x 2.4000 (2c)	= 162.7200	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	142.5400			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 386.9400	(5)

2. Ventilation rate

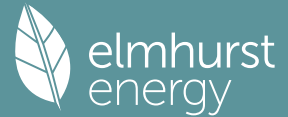
	m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	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) =	0.1034 (8)
Pressure Test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3534	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3004 (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													
Effective ac	0.3830	0.3755	0.3680	0.3304	0.3229	0.2854	0.2854	0.2778	0.3004	0.3229	0.3379	0.3529	(22b)
	0.5733	0.5705	0.5677	0.5546	0.5521	0.5407	0.5407	0.5386	0.5451	0.5521	0.5571	0.5623	(25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K	
TER Opaque door			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			20.7700	1.1450	23.7824			(27)
Exposed Floor			7.7300	0.1300	1.0049			(28b)
External Wall	36.3100	12.7700	23.5400	0.1800	4.2372			(29a)
Corridor wall	33.9600	2.1000	31.8600	0.1800	5.7348			(29a)
Loft Wall	61.5100		61.5100	0.1800	11.0718			(29a)
Dormer Wall	18.9600	8.0000	10.9600	0.1800	1.9728			(29a)

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Exposed Roof	18.2100	18.2100	0.1100	2.0031	(30)
Loft Roof	67.6800	67.6800	0.1100	7.4448	(30)
Total net area of external elements Aum(A, m2)		244.3600			(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		59.3518	(33)
Party Wall		61.9200	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K					100.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)					12.2180 (36)
Point Thermal bridges				(36a) =	0.0000
Total fabric heat loss				(33) + (36) + (36a) =	71.5698 (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	73.2090	72.8454	72.4890	70.8149	70.5017	69.0437	69.0437	68.7737	69.6053	70.5017	71.1354	71.7978 (38)
Average = Sum(39)m / 12 =	144.7789	144.4153	144.0588	142.3848	142.0716	140.6135	140.6135	140.3435	141.1751	142.0716	142.7052	143.3676 (39)
												142.3833
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0157	1.0132	1.0107	0.9989	0.9967	0.9865	0.9865	0.9846	0.9904	0.9967	1.0012	1.0058 (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												2.9218 (42)
Hot water usage for mixer showers												
Hot water usage for baths	73.2083	72.1081	70.5050	67.4376	65.1739	62.6495	61.2146	62.8057	64.5498	67.2602	70.3935	72.9278 (42a)
Hot water usage for other uses	31.6052	31.1358	30.4748	29.2561	28.3435	27.3316	26.7850	27.4414	28.1560	29.2388	30.4827	31.4983 (42b)
Average daily hot water use (litres/day)	44.5519	42.9318	41.3117	39.6916	38.0716	36.4515	36.4515	38.0716	39.6916	41.3117	42.9318	44.5519 (42c)
												137.3003 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	149.3654	146.1757	142.2915	136.3853	131.5890	126.4326	124.4512	128.3186	132.3975	137.8107	143.8079	148.9780 (44)
Energy content (annual)	236.5582	208.1523	218.6968	186.7047	177.1441	155.4637	150.5129	158.8853	163.2593	187.0079	204.8808	233.2636 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2280.5295
Water storage loss:	35.4837	31.2228	32.8045	28.0057	26.5716	23.3196	22.5769	23.8328	24.4889	28.0512	30.7321	34.9895 (46)
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8381 (55)
Total storage loss	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (56)
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (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	285.8009	252.6296	267.9394	234.3589	226.3868	203.1179	199.7556	208.1280	210.9135	236.2506	252.5350	282.5063 (62)
WWHRS	-33.4678	-29.5992	-30.9946	-25.6647	-23.9186	-20.4673	-19.1848	-20.4012	-21.1763	-24.9645	-28.2817	-32.8480 (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	252.3331	223.0304	236.9449	208.6942	202.4682	182.6506	180.5707	187.7268	189.7372	211.2861	224.2532	249.6583 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2549.3535 (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	118.0498	104.7924	112.1108	100.2027	98.2946	89.8150	89.4397	92.2235	92.4071	101.5743	106.2462	116.9543 (65)

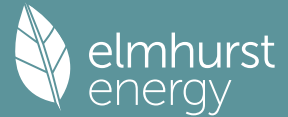
5. Internal gains (see Table 5 and 5a)

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	146.0885	146.0885	146.0885	146.0885	146.0885	146.0885	146.0885	146.0885	146.0885	146.0885	146.0885	146.0885 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	167.5283	167.5283	167.5283	167.5283	167.5283	167.5283	167.5283	167.5283	167.5283	167.5283	167.5283	167.5283 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	312.2819	315.5224	307.3564	289.9720	268.0274	247.4024	233.6237	230.3832	238.5492	255.9336	277.8783	298.5032 (68)
Pumps, fans	37.6089	37.6089	37.6089	37.6089	37.6089	37.6089	37.6089	37.6089	37.6089	37.6089	37.6089	37.6089 (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)	-116.8708	-116.8708	-116.8708	-116.8708	-116.8708	-116.8708	-116.8708	-116.8708	-116.8708	-116.8708	-116.8708	-116.8708 (71)
Total internal gains	158.6690	155.9411	150.6866	139.1704	132.1163	124.7431	120.2146	123.9563	128.3432	136.5245	147.5642	157.1966 (72)
	708.3058	726.7678	695.3978	672.0815	637.4985	612.0846	588.1932	588.6944	606.8315	629.8130	668.3816	693.0546 (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	7.7200				10.6334		0.6300		0.7000		0.7700		25.0877 (74)	
Northeast	8.0300				11.2829		0.6300		0.7000		0.7700		27.6892 (75)	
Southwest	5.0200				36.7938		0.6300		0.7000		0.7700		56.4483 (79)	
Solar gains	109.2251	200.4582	314.5747	460.6366	583.0324	608.9639	574.5129	478.1671	364.1388	232.2186	133.4010	91.8347 (83)		
Total gains	817.5309	927.2261	1009.9725	1132.7181	1220.5310	1221.0486	1162.7061	1066.8614	970.9703	862.0316	801.7826	784.8893 (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	27.3482	27.4171	27.4849	27.8081	27.8694	28.1583	28.1583	28.2125	28.0463	27.8694	27.7456	27.6174
alpha	2.8232	2.8278	2.8323	2.8539	2.8580	2.8772	2.8772	2.8808	2.8698	2.8580	2.8497	2.8412
util living area	0.9685	0.9540	0.9297	0.8708	0.7694	0.6209	0.4877	0.5396	0.7428	0.8979	0.9535	0.9717 (86)
MIT	18.5602	18.8365	19.2715	19.8882	20.4226	20.7850	20.9217	20.8939	20.6170	19.9371	19.1611	18.5215 (87)
Th 2	20.0703	20.0724	20.0745	20.0842	20.0861	20.0946	20.0946	20.0962	20.0913	20.0861	20.0824	20.0785 (88)
util rest of house	0.9640	0.9474	0.9192	0.8506	0.7318	0.5578	0.4014	0.4529	0.6885	0.8777	0.9457	0.9677 (89)
MIT 2	17.1916	17.5426	18.0931	18.8658	19.5078	19.9164	20.0466	20.0270	19.7467	18.9401	17.9640	17.1473 (90)
Living area fraction									fLA = Living area / (4) =			0.2030 (91)
MIT	17.4695	17.8053	18.3324	19.0734	19.6936	20.0928	20.2243	20.2030	19.9234	19.1425	18.2071	17.4263 (92)
Temperature adjustment												0.0000
adjusted MIT	17.4695	17.8053	18.3324	19.0734	19.6936	20.0928	20.2243	20.2030	19.9234	19.1425	18.2071	17.4263 (93)

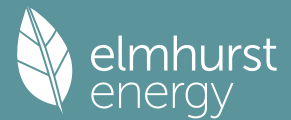
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9456	0.9250	0.8931	0.8235	0.7135	0.5576	0.4144	0.4638	0.6771	0.8513	0.9236	0.9505 (94)
Useful gains	773.0255	857.7197	901.9806	932.8354	870.8950	680.8852	481.8131	494.8084	657.4656	733.8270	740.5253	746.0485 (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	1906.6610	1863.7239	1704.5559	1448.5370	1135.6578	772.3572	509.6211	533.7229	822.1211	1213.6492	1585.0376	1896.2215 (97)
Space heating kWh	843.4248	676.0348	597.1160	371.3052	196.9835	0.0000	0.0000	0.0000	0.0000	356.9877	608.0489	855.7287 (98a)
Space heating requirement - total per year (kWh/year)												4505.6297
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	843.4248	676.0348	597.1160	371.3052	196.9835	0.0000	0.0000	0.0000	0.0000	356.9877	608.0489	855.7287 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4505.6297
Space heating per m2										(98c) / (4) =		31.6096 (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	843.4248	676.0348	597.1160	371.3052	196.9835	0.0000	0.0000	0.0000	0.0000	356.9877	608.0489	855.7287 (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)	913.7864	732.4321	646.9296	402.2808	213.4166	0.0000	0.0000	0.0000	0.0000	386.7689	658.7745	927.1167 (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	252.3331	223.0304	236.9449	208.6942	202.4682	182.6506	180.5707	187.7268	189.7372	211.2861	224.2532	249.6583 (64)
Efficiency of water heater (217)m	86.5521	86.3832	86.0432	85.3369	83.9982	79.8000	79.8000	79.8000	79.8000	85.2262	86.1812	79.8000 (216)
Fuel for water heating, kWh/month	291.5390	258.1872	275.3790	244.5531	241.0386	228.8854	226.2791	235.2466	237.7659	247.9120	260.2114	86.5942 (217)
Space cooling fuel requirement												288.3082 (219)
(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	34.8091	27.9251	25.1435	18.4212	14.2291	11.6253	12.9802	16.8722	21.9153	28.7541	32.4776	35.7765 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-25.9740	-38.7597	-58.9118	-70.1330	-79.0197	-74.9512	-73.9966	-68.1522	-58.4774	-45.9750	-29.2931	-22.2107 (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	-8.8104	-18.9938	-38.6424	-59.3890	-79.8968	-80.8292	-79.9202	-67.0655	-48.3465	-27.6392	-11.9094	-6.9359 (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												4881.5056 (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												3035.3056 (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)												280.9291 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1174.2328 (233)

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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	7109.5076 (238)

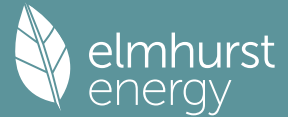
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4881.5056	0.2100	1025.1162 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3035.3056	0.2100	637.4142 (264)
Space and water heating			1662.5304 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	280.9291	0.1443	40.5468 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-645.8544	0.1334	-86.1797
PV Unit electricity exported	-528.3783	0.1252	-66.1603
Total			-152.3400 (269)
Total CO2, kg/year			1562.6663 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.9600 (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	4881.5056	1.1300	5516.1013 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3035.3056	1.1300	3429.8954 (278)
Space and water heating			8945.9967 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	280.9291	1.5338	430.8984 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-645.8544	1.4931	-964.3178
PV Unit electricity exported	-528.3783	0.4596	-242.8357
Total			-1207.1535 (283)
Total Primary energy kWh/year			8299.8424 (286)
Target Primary Energy Rate (TPER)			58.2300 (287)

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Property Reference	Flat 3.02				Issued on Date	22/04/2024	
Assessment Reference	Baseline			Prop Type Ref			
Property	Christchurch Hall, , 38, Portland Street, Bristol, BS8 4JB						
SAP Rating	80 C	DER	16.93	TER	10.15		
Environmental	83 B	% DER < TER				-66.80	
CO ₂ Emissions (t/year)	2.04	DFEE	59.14	TFEE	33.04		
Compliance Check	See BREL	% DFEE < TFEE				-78.97	
% DPER < TPER	-79.59	DPER	96.69	TPER	53.84		
Assessor Details	Mr. Jordan Howlett				Assessor ID	H055-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	83.4800 (1b)	x 3.0000 (2b)	= 250.4400 (1b) - (3b)
First floor	64.3600 (1c)	x 2.4000 (2c)	= 154.4640 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	147.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 404.9040 (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	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) = 0.0988 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8488 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7215 (21)

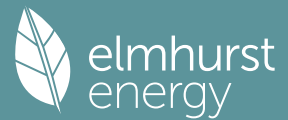
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.9199	0.9018	0.8838	0.7936	0.7756	0.6854	0.6854	0.6674	0.7215	0.7756	0.8117	0.8477 (22b)
Effective ac	0.9231	0.9067	0.8906	0.8149	0.8008	0.7349	0.7349	0.7227	0.7603	0.8008	0.8294	0.8593 (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
External Door			2.1000	1.4000	2.9400		(26)
Window (Uw = 1.40)			20.1000	1.3258	26.6477		(27)
External Wall	64.5000	14.1000	50.4000	0.3000	15.1200		(29a)
Corridor wall	3.6000	2.1000	1.5000	0.3000	0.4500		(29a)
Loft Wall	47.0400		47.0400	0.1800	8.4672		(29a)
Dormer Wall	15.8400	6.0000	9.8400	0.1800	1.7712		(29a)
Exposed Roof	19.0600		19.0600	0.1600	3.0496		(30)
Loft Roof	64.3600		64.3600	0.1500	9.6540		(30)
Total net area of external elements Aum (A, m ²)			214.4000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	68.0997		(33)
Party Wall			74.9400	0.0000	0.0000		(32)
Party Floor			83.4800				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							42.8800 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	110.9797 (37)

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

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(38)m	Jan 123.3411	Feb 121.1459	Mar 118.9941	Apr 108.8875	May 106.9966	Jun 98.1940	Jul 98.1940	Aug 96.5639	Sep 101.5846	Oct 106.9966	Nov 110.8219	Dec 114.8211	(38)
Heat transfer coeff	234.3208	232.1256	229.9738	219.8672	217.9763	209.1738	209.1738	207.5437	212.5644	217.9763	221.8016	225.8008	(39)
Average = Sum(39)m / 12 =												219.8582	
HLP	Jan 1.5850	Feb 1.5701	Mar 1.5556	Apr 1.4872	May 1.4744	Jun 1.4149	Jul 1.4149	Aug 1.4038	Sep 1.4378	Oct 1.4744	Nov 1.5003	Dec 1.5273	(40)
HLP (average)												1.4871	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9308	(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	0.0000	(42a)
Hot water usage for baths														
31.6700	31.1997	30.5373	29.3161	28.4016	27.3877	26.8400	27.4977	28.2138	29.2988	30.5452	31.5630	31.5630		(42b)
Hot water usage for other uses														
44.6439	43.0205	41.3971	39.7737	38.1503	36.5269	36.5269	38.1503	39.7737	41.3971	43.0205	44.6439	44.6439		(42c)
Average daily hot water use (litres/day)													69.9485	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use														
76.3140	74.2202	71.9344	69.0898	66.5519	63.9145	63.3668	65.6479	67.9875	70.6959	73.5657	76.2069	76.2069		(44)
Energy conte	120.8627	105.6886	110.5606	94.5805	89.5917	78.5904	76.6367	81.2859	83.8354	95.9337	104.8078	119.3216		(45)
Energy content (annual)														
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1161.6952		
18.1294	15.8533	16.5841	14.1871	13.4387	11.7886	11.4955	12.1929	12.5753	14.3900	15.7212	17.8982	17.8982		(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	25.3671	22.9049	25.3480	24.5129	25.3182	24.4902	25.3016	25.3088	24.5004	25.3305	24.5306	25.3651		(61)
Total heat required for water heating calculated for each month														
146.2297	128.5935	135.9086	119.0934	114.9098	103.0806	101.9382	106.5946	108.3358	121.2641	129.3384	144.6867	144.6867		(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														
146.2297	128.5935	135.9086	119.0934	114.9098	103.0806	101.9382	106.5946	108.3358	121.2641	129.3384	144.6867	144.6867		(64)
12Total per year (kWh/year)									Total per year (kWh/year) = Sum(64)m =			1459.9734		(64)
Electric shower(s)												1460		(64)
58.7484	52.3453	57.1591	54.5462	55.5697	53.0081	54.7751	55.5697	54.5462	57.1591	56.0843	58.7484	58.7484		(64a)
												668.2596		(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =														
Heat gains from water heating, kWh/month														
61.2157	53.9540	57.3882	51.2128	50.0112	45.5059	45.5009	47.2472	47.6369	52.5203	55.0023	60.7028	60.7028		(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan 146.5381	Feb 146.5381	Mar 146.5381	Apr 146.5381	May 146.5381	Jun 146.5381	Jul 146.5381	Aug 146.5381	Sep 146.5381	Oct 146.5381	Nov 146.5381	Dec 146.5381	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	173.2685	191.8329	173.2685	179.0441	173.2685	179.0441	173.2685	173.2685	179.0441	173.2685	179.0441	173.2685	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	318.1632	321.4648	313.1450	295.4332	273.0752	252.0619	238.0237	234.7221	243.0419	260.7537	283.1117	304.1250	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6538	37.6538	37.6538	37.6538	37.6538	37.6538	37.6538	37.6538	37.6538	37.6538	37.6538	37.6538	(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)	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	(71)
Water heating gains (Table 5)	82.2792	80.2887	77.1346	71.1289	67.2194	63.2026	61.1571	63.5043	66.1624	70.5918	76.3921	81.5898	(72)
Total internal gains	643.6723	663.5478	633.5095	615.5676	583.5245	561.2700	539.4106	538.4563	555.2098	574.5754	608.5093	628.9447	(73)

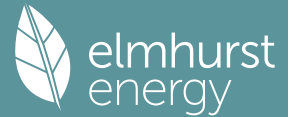
6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Northeast				10.0500	11.2829	0.6300	0.7000	0.7700	34.6545 (75)			
Southwest				10.0500	36.7938	0.6300	0.7000	0.7700	113.0090 (79)			
Solar gains	147.6635	263.0364	390.4728	535.0628	646.0919	661.9953	629.6714	543.6932	440.0492	298.9551	178.9631	125.0128 (83)
Total gains	791.3358	926.5843	1023.9823	1150.6304	1229.6163	1223.2653	1169.0821	1082.1495	995.2590	873.5305	787.4724	753.9575 (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	17.5258	17.6916	17.8571	18.6779	18.8400	19.6328	19.6328	19.7870	19.3196	18.8400	18.5150	18.1871
alpha	2.1684	2.1794	2.1905	2.2452	2.2560	2.3089	2.3089	2.3191	2.2880	2.2560	2.2343	2.2125
util living area												
	0.9749	0.9636	0.9466	0.9075	0.8415	0.7286	0.6109	0.6539	0.8163	0.9251	0.9643	0.9774 (86)
MIT	17.2341	17.5751	18.1394	19.0039	19.7694	20.4347	20.7396	20.6867	20.1794	19.1911	18.1417	17.2715 (87)
Th 2	19.6244	19.6353	19.6461	19.6971	19.7067	19.7520	19.7520	19.7604	19.7345	19.7067	19.6873	19.6671 (88)
util rest of house												
	0.9704	0.9570	0.9363	0.8880	0.8029	0.6525	0.4868	0.5367	0.7573	0.9056	0.9568	0.9734 (89)

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MIT 2	16.2406	16.5846	17.1492	18.0271	18.7668	19.3988	19.6381	19.6125	19.1776	18.2262	17.1799	16.3020 (90)
Living area fraction									FLA = Living area / (4) =			0.1614 (91)
MIT	16.4009	16.7444	17.3090	18.1847	18.9286	19.5660	19.8158	19.7859	19.3393	18.3820	17.3352	16.4585 (92)
Temperature adjustment												0.0000
adjusted MIT	16.4009	16.7444	17.3090	18.1847	18.9286	19.5660	19.8158	19.7859	19.3393	18.3820	17.3352	16.4585 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9539	0.9360	0.9104	0.8574	0.7734	0.6390	0.4941	0.5395	0.7339	0.8773	0.9366	0.9584 (94)	
Useful gains	754.8555	867.3158	932.2684	986.5032	951.0149	781.6804	577.6943	583.8227	730.4657	766.3804	737.5601	722.6017 (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	2835.5010	2749.3945	2485.7947	2041.4025	1575.6706	1038.7600	672.6671	702.7128	1113.6905	1696.2845	2270.1750	2767.9744 (97)	
Space heating kWh	1548.0002	1264.7569	1155.8235	759.5275	464.7439	0.0000	0.0000	0.0000	0.0000	691.8487	1103.4828	1521.7573 (98a)	
Space heating requirement - total per year (kWh/year)												8509.9407	
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	1548.0002	1264.7569	1155.8235	759.5275	464.7439	0.0000	0.0000	0.0000	0.0000	691.8487	1103.4828	1521.7573 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												8509.9407	
Space heating per m2										(98c) / (4) =		57.5618 (99)	

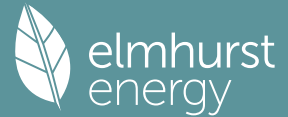
9a. Energy requirements - Individual heating systems, including micro-CHP

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 %)													89.2000 (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	1548.0002	1264.7569	1155.8235	759.5275	464.7439	0.0000	0.0000	0.0000	0.0000	691.8487	1103.4828	1521.7573 (98)	
Space heating efficiency (main heating system 1)	89.2000	89.2000	89.2000	89.2000	89.2000	0.0000	0.0000	0.0000	0.0000	89.2000	89.2000	89.2000 (210)	
Space heating fuel (main heating system)	1735.4263	1417.8889	1295.7663	851.4882	521.0133	0.0000	0.0000	0.0000	0.0000	775.6151	1237.0883	1706.0059 (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 requirement	146.2297	128.5935	135.9086	119.0934	114.9098	103.0806	101.9382	106.5946	108.3358	121.2641	129.3384	144.6867 (64)	
Efficiency of water heater (217)m	89.0238	89.0116	88.9853	88.9236	88.7963	87.2000	87.2000	87.2000	87.2000	88.8959	88.9859	87.2000 (216)	
Fuel for water heating, kWh/month	164.2592	144.4682	152.7316	133.9278	129.4084	118.2117	116.9017	122.2416	124.2383	136.4113	145.3471	162.5278 (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	40.9406	32.8441	29.5725	21.6661	16.7355	13.6730	15.2667	19.8442	25.7756	33.8190	38.1985	42.0785 (232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1												9540.2922 (211)	
Space heating fuel - main system 2												0.0000 (213)	
Space heating fuel - secondary												0.0000 (215)	
Efficiency of water heater												87.2000	
Water heating fuel used												1650.6746 (219)	
Space cooling fuel												0.0000 (221)	
Electricity for pumps and fans:													
central heating pump												41.0000 (230c)	
main heating flue fan												45.0000 (230e)	
Total electricity for the above, kWh/year												86.0000 (231)	
Electricity for lighting (calculated in Appendix L)												330.4143 (232)	
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000 (233)	
Wind generation												0.0000 (234)	
Hydro-electric generation (Appendix N)												0.0000 (235a)	
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)	
Appendix Q - special features													
Energy saved or generated												-0.0000 (236)	
Energy used												0.0000 (237)	
Total delivered energy for all uses												12275.6408 (238)	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
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Space heating - main system 1	9540.2922	0.2100	2003.4614 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1650.6746	0.2100	346.6417 (264)
Energy for instantaneous electric shower(s)	668.2596	0.1391	92.9697 (264a)
Space and water heating			2350.1030 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	330.4143	0.1443	47.6890 (268)
Total CO2, kg/year			2502.6910 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			16.9300 (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	9540.2922	1.1300	10780.5302 (275)	
Total CO2 associated with community systems			0.0000 (473)	
Water heating (other fuel)	1650.6746	1.1300	1865.2623 (278)	
Energy for instantaneous electric shower(s)	668.2596	1.5143	1011.9683 (278a)	
Space and water heating			12645.7926 (279)	
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)	
Energy for lighting	330.4143	1.5338	506.8005 (282)	
Total Primary energy kWh/year			14294.6622 (286)	
Dwelling Primary energy Rate (DPER)			96.6900 (287)	

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)	
Ground floor	83.4800 (1b)	x 3.0000 (2b)	= 250.4400 (1b) - (3b)	
First floor	64.3600 (1c)	x 2.4000 (2c)	= 154.4640 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	147.8400		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	404.9040 (5)	

2. Ventilation rate

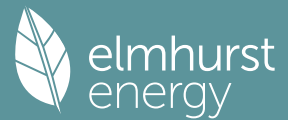
	m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	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) =	0.0988 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000 (17)	
Infiltration rate	0.3488 (18)	
Number of sides sheltered	2 (19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2965 (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	0.3780	0.3706	0.3632	0.3261	0.3187	0.2816	0.2816	0.2742	0.2965	0.3187	0.3335	0.3484	(22b)
Effective ac	0.5714	0.5687	0.5659	0.5532	0.5508	0.5397	0.5397	0.5376	0.5439	0.5508	0.5556	0.5607	(25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K	
TER Opaque door			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			20.1000	1.1450	23.0153			(27)
External Wall	64.5000	14.1000	50.4000	0.1800	9.0720			(29a)
Corridor wall	3.6000	2.1000	1.5000	0.1800	0.2700			(29a)
Loft Wall	47.0400		47.0400	0.1800	8.4672			(29a)
Dormer Wall	15.8400	6.0000	9.8400	0.1800	1.7712			(29a)
Exposed Roof	19.0600		19.0600	0.1100	2.0966			(30)
Loft Roof	64.3600		64.3600	0.1100	7.0796			(30)
Total net area of external elements Aum(A, m ²)			214.4000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	53.8719			(33)
Party Wall			74.9400	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)							10.7200	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss						(33) + (36) + (36a) =	64.5919	(37)

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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	76.3551	75.9844	75.6211	73.9145	73.5952	72.1088	72.1088	71.8335	72.6813	73.5952	74.2411	74.9164	(38)
Heat transfer coeff	140.9470	140.5763	140.2130	138.5064	138.1871	136.7007	136.7007	136.4254	137.2732	138.1871	138.8330	139.5083	(39)
Average = Sum(39)m / 12 =												138.5048	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9534	0.9509	0.9484	0.9369	0.9347	0.9247	0.9247	0.9228	0.9285	0.9347	0.9391	0.9436	(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													2.9308 (42)
Hot water usage for mixer showers	73.3591	72.2566	70.6502	67.5765	65.3081	62.7785	61.3407	62.9350	64.6827	67.3987	70.5384	73.0780	(42a)
Hot water usage for baths	31.6700	31.1997	30.5373	29.3161	28.4016	27.3877	26.8400	27.4977	28.2138	29.2988	30.5452	31.5630	(42b)
Hot water usage for other uses	44.6439	43.0205	41.3971	39.7737	38.1503	36.5269	36.5269	38.1503	39.7737	41.3971	43.0205	44.6439	(42c)
Average daily hot water use (litres/day)												137.5831	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	149.6730	146.4768	142.5846	136.6662	131.8600	126.6930	124.7075	128.5830	132.6702	138.0946	144.1041	149.2849	(44)
Energy content (annual)	237.0455	208.5811	219.1472	187.0892	177.5090	155.7839	150.8229	159.2126	163.5956	187.3931	205.3028	233.7441	(45)
Distribution loss (46)m = 0.15 x (45)m												2285.2269	
Water storage loss:	35.5568	31.2872	32.8721	28.0634	26.6263	23.3676	22.6234	23.8819	24.5393	28.1090	30.7954	35.0616	(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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	288.0044	254.6085	270.1061	236.4043	228.4679	205.0989	201.7818	210.1715	212.9107	238.3520	254.6178	284.7030	(62)
WWHRS	-33.5367	-29.6601	-31.0584	-25.7176	-23.9679	-20.5095	-19.2244	-20.4432	-21.2199	-25.0159	-28.3400	-32.9157	(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	254.4677	224.9483	239.0477	210.6867	204.5000	184.5895	182.5575	189.7283	191.6908	213.3361	226.2779	251.7873	(64)
12Total per year (kWh/year)												2573.6178	(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	91.5574	80.8601	85.6062	74.5359	71.7615	64.1269	62.8884	65.6779	66.7243	75.0479	80.5919	90.4596	(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	146.5381	146.5381	146.5381	146.5381	146.5381	146.5381	146.5381	146.5381	146.5381	146.5381	146.5381	146.5381	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	173.2685	191.8329	173.2685	179.0441	173.2685	179.0441	173.2685	173.2685	179.0441	173.2685	179.0441	173.2685	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	318.1632	321.4648	313.1450	295.4332	273.0752	252.0619	238.0237	234.7221	243.0419	260.7537	283.1117	304.1250	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6538	37.6538	37.6538	37.6538	37.6538	37.6538	37.6538	37.6538	37.6538	37.6538	37.6538	37.6538	(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)	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	(71)
Water heating gains (Table 5)	123.0610	120.3275	115.0621	103.5221	96.4536	89.0651	84.5274	88.2768	92.6726	100.8709	111.9332	121.5855	(72)
Total internal gains	684.4541	703.5866	671.4370	647.9608	612.7587	587.1325	562.7809	563.2288	581.7201	604.8545	644.0504	668.9405	(73)

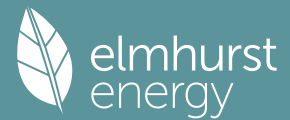
6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
Northeast					10.0500	11.2829		0.6300	0.7000	0.7700		34.6545 (75)	
Southwest					10.0500	36.7938		0.6300	0.7000	0.7700		113.0090 (79)	
Solar gains	147.6635	263.0364	390.4728	535.0628	646.0919	661.9953	629.6714	543.6932	440.0492	298.9551	178.9631	125.0128 (83)	
Total gains	832.1176	966.6230	1061.9097	1183.0237	1258.8505	1249.1278	1192.4524	1106.9219	1021.7692	903.8095	823.0135	793.9532 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.1363	29.2131	29.2888	29.6497	29.7182	30.0413	30.0413	30.1019	29.9160	29.7182	29.5799	29.4367	
alpha	2.9424	2.9475	2.9526	2.9766	2.9812	3.0028	3.0028	3.0068	2.9944	2.9812	2.9720	2.9624	
util living area	0.9692	0.9516	0.9240	0.8609	0.7565	0.6056	0.4702	0.5173	0.7206	0.8894	0.9528	0.9729	(86)
MIT	18.7096	19.0097	19.4401	20.0208	20.5039	20.8228	20.9389	20.9177	20.6849	20.0561	19.2953	18.6657	(87)
Th 2	20.1224	20.1245	20.1265	20.1363	20.1381	20.1466	20.1466	20.1482	20.1433	20.1381	20.1344	20.1306	(88)

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util rest of house	0.9648	0.9449	0.9130	0.8403	0.7195	0.5454	0.3899	0.4364	0.6671	0.8687	0.9452	0.9690 (89)
MIT 2	17.4115	17.7922	18.3359	19.0619	19.6402	19.9988	20.1085	20.0939	19.8596	19.1189	18.1643	17.3606 (90)
Living area fraction									FLA = Living area / (4) =			0.1614 (91)
MIT	17.6210	17.9887	18.5141	19.2166	19.7796	20.1318	20.2425	20.2268	19.9928	19.2701	18.3469	17.5712 (92)
Temperature adjustment												0.0000
adjusted MIT	17.6210	17.9887	18.5141	19.2166	19.7796	20.1318	20.2425	20.2268	19.9928	19.2701	18.3469	17.5712 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9471	0.9227	0.8871	0.8143	0.7023	0.5443	0.3994	0.4443	0.6566	0.8428	0.9235	0.9527	(94)
Useful gains	788.0679	891.9292	942.0670	963.2885	884.0632	679.8410	476.2138	491.7923	670.9107	761.7500	760.0385	756.3724	(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	1877.5512	1839.9570	1684.5299	1428.9213	1116.4920	756.1970	497.9384	522.0766	808.9228	1198.1001	1561.4353	1865.3979	(97)
Space heating kWh	810.5755	637.0746	552.3924	335.2557	172.9270	0.0000	0.0000	0.0000	0.0000	324.6445	577.0057	825.1150	(98a)
Space heating requirement - total per year (kWh/year)												4234.9904	
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	810.5755	637.0746	552.3924	335.2557	172.9270	0.0000	0.0000	0.0000	0.0000	324.6445	577.0057	825.1150	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4234.9904	
Space heating per m2											(98c) / (4) =	28.6458	(99)

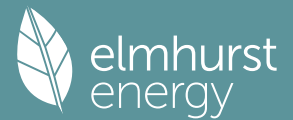
9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.4000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	810.5755	637.0746	552.3924	335.2557	172.9270	0.0000	0.0000	0.0000	0.0000	324.6445	577.0057	825.1150	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	877.2463	689.4747	597.8273	362.8308	187.1504	0.0000	0.0000	0.0000	0.0000	351.3468	624.4651	892.9816	(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	254.4677	224.9483	239.0477	210.6867	204.5000	184.5895	182.5575	189.7283	191.6908	213.3361	226.2779	251.7873	(64)
Efficiency of water heater													80.3000 (216)
(217)m	86.6819	86.4830	86.1144	85.3715	84.0242	80.3000	80.3000	80.3000	80.3000	85.2782	86.2965	86.7283	(217)
Fuel for water heating, kWh/month	293.5649	260.1070	277.5933	246.7881	243.3823	229.8748	227.3443	236.2743	238.7183	250.1647	262.2096	290.3174	(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	36.0018	28.8820	26.0050	19.0524	14.7166	12.0236	13.4250	17.4503	22.6662	29.7393	33.5905	37.0024	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-26.8685	-40.0545	-60.8174	-72.3224	-81.4137	-77.1928	-76.2093	-70.2270	-60.3108	-47.4784	-30.2882	-22.9799	(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)	-9.2093	-19.8465	-40.3641	-62.0157	-83.4118	-84.3798	-83.4305	-70.0185	-50.4850	-28.8729	-12.4463	-7.2504	(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												4583.3230	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												3056.3391	(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)												290.5549	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1217.8937	(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												6798.3232	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
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Space heating - main system 1	4583.3230	0.2100	962.4978 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3056.3391	0.2100	641.8312 (264)
Space and water heating			1604.3290 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	290.5549	0.1443	41.9360 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-666.1629	0.1335	-88.9041
PV Unit electricity exported	-551.7309	0.1252	-69.0893
Total			-157.9933 (269)
Total CO2, kg/year			1500.2010 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.1500 (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	4583.3230	1.1300	5179.1550 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3056.3391	1.1300	3453.6632 (278)
Space and water heating			8632.8182 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	290.5549	1.5338	445.6627 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-666.1629	1.4932	-994.6946
PV Unit electricity exported	-551.7309	0.4596	-253.5864
Total			-1248.2809 (283)
Total Primary energy kWh/year			7960.3008 (286)
Target Primary Energy Rate (TPER)			53.8400 (287)

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Property Reference	Flat 3.02				Issued on Date	22/04/2024	
Assessment Reference	Additional Measures			Prop Type Ref			
Property	Christchurch Hall, , 38, Portland Street, Bristol, BS8 4JB						
SAP Rating	81 B		DER	15.65		TER	10.15
Environmental	84 B		% DER < TER				-54.19
CO ₂ Emissions (t/year)	1.9		DFEE	58.56		TFEE	33.04
Compliance Check	See BREL		% DFEE < TFEE				-77.23
% DPER < TPER	-66.31		DPER	89.54		TPER	53.84
Assessor Details	Mr. Jordan Howlett					Assessor ID	H055-0001
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	83.4800 (1b)	x 3.0000 (2b)	= 250.4400 (1b) - (3b)
First floor	64.3600 (1c)	x 2.4000 (2c)	= 154.4640 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	147.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 404.9040 (5)

2. Ventilation rate

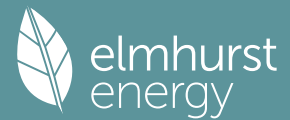
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	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) = 0.0988 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8488 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7215 (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	0.9199	0.9018	0.8838	0.7936	0.7756	0.6854	0.6854	0.6674	0.7215	0.7756	0.8117	0.8477 (22b)
Effective ac	0.9231	0.9067	0.8906	0.8149	0.8008	0.7349	0.7349	0.7227	0.7603	0.8008	0.8294	0.8593 (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
External Door			2.1000	1.4000	2.9400		(26)
Window (Uw = 1.40)			20.1000	1.3258	26.6477		(27)
External Wall	64.5000	14.1000	50.4000	0.2600	13.1040		(29a)
Corridor wall	3.6000	2.1000	1.5000	0.2600	0.3900		(29a)
Loft Wall	47.0400		47.0400	0.1800	8.4672		(29a)
Dormer Wall	15.8400	6.0000	9.8400	0.1800	1.7712		(29a)
Exposed Roof	19.0600		19.0600	0.1600	3.0496		(30)
Loft Roof	64.3600		64.3600	0.1500	9.6540		(30)
Total net area of external elements Aum(A, m ²)			214.4000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	66.0237		(33)
Party Wall			74.9400	0.0000	0.0000		(32)
Party Floor			83.4800				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							42.8800 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	108.9037 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							

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(38)m	Jan 123.3411	Feb 121.1459	Mar 118.9941	Apr 108.8875	May 106.9966	Jun 98.1940	Jul 98.1940	Aug 96.5639	Sep 101.5846	Oct 106.9966	Nov 110.8219	Dec 114.8211	(38)
Heat transfer coeff	232.2448	230.0496	227.8978	217.7912	215.9003	207.0978	207.0978	205.4677	210.4884	215.9003	219.7256	223.7248	(39)
Average = Sum(39)m / 12 =												217.7822	
HLP	Jan 1.5709	Feb 1.5561	Mar 1.5415	Apr 1.4732	May 1.4604	Jun 1.4008	Jul 1.4008	Aug 1.3898	Sep 1.4238	Oct 1.4604	Nov 1.4862	Dec 1.5133	(40)
HLP (average)												1.4731	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9308 (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													
31.6700	31.1997	30.5373	29.3161	28.4016	27.3877	26.8400	27.4977	28.2138	29.2988	30.5452	31.5630		(42b)
Hot water usage for other uses													
44.6439	43.0205	41.3971	39.7737	38.1503	36.5269	36.5269	38.1503	39.7737	41.3971	43.0205	44.6439		(42c)
Average daily hot water use (litres/day)												69.9485	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	76.3140	74.2202	71.9344	69.0898	66.5519	63.9145	63.3668	65.6479	67.9875	70.6959	73.5657	76.2069	(44)
Energy content (annual)	120.8627	105.6886	110.5606	94.5805	89.5917	78.5904	76.6367	81.2859	83.8354	95.9337	104.8078	119.3216	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1161.6952	
	18.1294	15.8533	16.5841	14.1871	13.4387	11.7886	11.4955	12.1929	12.5753	14.3900	15.7212	17.8982	(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	25.3671	22.9049	25.3480	24.5129	25.3182	24.4902	25.3016	25.3088	24.5004	25.3305	24.5306	25.3651	(61)
Total heat required for water heating calculated for each month													
	146.2297	128.5935	135.9086	119.0934	114.9098	103.0806	101.9382	106.5946	108.3358	121.2641	129.3384	144.6867	(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													
	146.2297	128.5935	135.9086	119.0934	114.9098	103.0806	101.9382	106.5946	108.3358	121.2641	129.3384	144.6867	(64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				1459.9734	(64)
Electric shower(s)	58.7484	52.3453	57.1591	54.5462	55.5697	53.0081	54.7751	55.5697	54.5462	57.1591	56.0843	58.7484	(64a)
												668.2596	(64a)
Heat gains from water heating, kWh/month													
	61.2157	53.9540	57.3882	51.2128	50.0112	45.5059	45.5009	47.2472	47.6369	52.5203	55.0023	60.7028	(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	146.5381	146.5381	146.5381	146.5381	146.5381	146.5381	146.5381	146.5381	146.5381	146.5381	146.5381	146.5381	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	173.2685	191.8329	173.2685	179.0441	173.2685	179.0441	173.2685	173.2685	179.0441	173.2685	179.0441	173.2685	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	318.1632	321.4648	313.1450	295.4332	273.0752	252.0619	238.0237	234.7221	243.0419	260.7537	283.1117	304.1250	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6538	37.6538	37.6538	37.6538	37.6538	37.6538	37.6538	37.6538	37.6538	37.6538	37.6538	37.6538	(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)	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	(71)
Water heating gains (Table 5)	82.2792	80.2887	77.1346	71.1289	67.2194	63.2026	61.1571	63.5043	66.1624	70.5918	76.3921	81.5898	(72)
Total internal gains	643.6723	663.5478	633.5095	615.5676	583.5245	561.2700	539.4106	538.4563	555.2098	574.5754	608.5093	628.9447	(73)

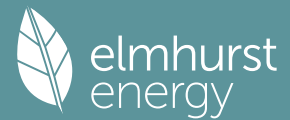
6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Northeast				10.0500	11.2829	0.6300	0.7000	0.7700	34.6545 (75)			
Southwest				10.0500	36.7938	0.6300	0.7000	0.7700	113.0090 (79)			
Solar gains	147.6635	263.0364	390.4728	535.0628	646.0919	661.9953	629.6714	543.6932	440.0492	298.9551	178.9631	125.0128 (83)
Total gains	791.3358	926.5843	1023.9823	1150.6304	1229.6163	1223.2653	1169.0821	1082.1495	995.2590	873.5305	787.4724	753.9575 (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	17.6825	17.8512	18.0198	18.8560	19.0211	19.8296	19.8296	19.9869	19.5102	19.0211	18.6900	18.3559
alpha	2.1788	2.1901	2.2013	2.2571	2.2681	2.3220	2.3220	2.3325	2.3007	2.2681	2.2460	2.2237
util living area	0.9749	0.9635	0.9464	0.9069	0.8404	0.7265	0.6082	0.6513	0.8149	0.9248	0.9642	0.9774 (86)
MIT	17.2598	17.6009	18.1634	19.0256	19.7863	20.4457	20.7460	20.6939	20.1920	19.2097	18.1649	17.2981 (87)
Th 2	19.6347	19.6457	19.6565	19.7077	19.7174	19.7627	19.7627	19.7712	19.7452	19.7174	19.6978	19.6775 (88)
util rest of house	0.9704	0.9569	0.9361	0.8874	0.8018	0.6507	0.4851	0.5349	0.7561	0.9052	0.9568	0.9734 (89)

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MIT 2	15.3297	15.7657	16.4828	17.5876	18.5273	19.3178	19.6197	19.5852	19.0408	17.8361	16.5065	15.3927 (90)
Living area fraction									FLA = Living area / (4) =			0.1614 (91)
MIT	15.6412	16.0619	16.7540	17.8197	18.7305	19.4998	19.8014	19.7642	19.2266	18.0578	16.7741	15.7002 (92)
Temperature adjustment												0.0000
adjusted MIT	15.6412	16.0619	16.7540	17.8197	18.7305	19.4998	19.8014	19.7642	19.2266	18.0578	16.7741	15.7002 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9479	0.9287	0.9016	0.8472	0.7633	0.6314	0.4896	0.5342	0.7247	0.8678	0.9295	0.9530	(94)
Useful gains	750.1348	860.4935	923.2508	974.8626	938.5360	772.4144	572.3308	578.0351	721.2526	758.0420	731.9708	718.4993	(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	2633.9334	2567.7896	2336.8705	1942.6240	1517.8800	1014.7475	663.0103	691.2241	1079.0905	1610.1324	2125.6490	2572.8852	(97)
Space heating kWh	1401.5462	1147.3030	1051.7330	696.7882	431.0319	0.0000	0.0000	0.0000	0.0000	633.9553	1003.4483	1379.6632	(98a)
Space heating requirement - total per year (kWh/year)												7745.4691	
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	1401.5462	1147.3030	1051.7330	696.7882	431.0319	0.0000	0.0000	0.0000	0.0000	633.9553	1003.4483	1379.6632	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7745.4691	
Space heating per m2										(98c) / (4) =		52.3909	(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 %)													89.2000 (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	1401.5462	1147.3030	1051.7330	696.7882	431.0319	0.0000	0.0000	0.0000	0.0000	633.9553	1003.4483	1379.6632	(98)
Space heating efficiency (main heating system 1)	89.2000	89.2000	89.2000	89.2000	89.2000	0.0000	0.0000	0.0000	0.0000	89.2000	89.2000	89.2000	(210)
Space heating fuel (main heating system)	1571.2401	1286.2141	1179.0729	781.1527	483.2196	0.0000	0.0000	0.0000	0.0000	710.7122	1124.9421	1546.7076	(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 requirement	146.2297	128.5935	135.9086	119.0934	114.9098	103.0806	101.9382	106.5946	108.3358	121.2641	129.3384	144.6867	(64)
Efficiency of water heater	89.0071	88.9943	88.9665	88.9024	88.7715	87.2000	87.2000	87.2000	87.2000	88.8727	88.9670	87.2000	(216)
Fuel for water heating, kWh/month	164.2899	144.4963	152.7638	133.9597	129.4446	118.2117	116.9017	122.2416	124.2383	136.4470	145.3779	162.5579	(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	33.7526	27.0775	24.3803	17.8621	13.7972	11.2724	12.5862	16.3601	21.2501	27.8813	31.4919	34.6906	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												8683.2613	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.2000	
Water heating fuel used												1650.9303	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												272.4024	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												11360.8536	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
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Space heating - main system 1	8683.2613	0.2100	1823.4849 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1650.9303	0.2100	346.6954 (264)
Energy for instantaneous electric shower(s)	668.2596	0.1391	92.9697 (264a)
Space and water heating			2170.1802 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	272.4024	0.1443	39.3161 (268)
Total CO2, kg/year			2314.3953 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			15.6500 (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	8683.2613	1.1300	9812.0853 (275)	
Total CO2 associated with community systems			0.0000 (473)	
Water heating (other fuel)	1650.9303	1.1300	1865.5513 (278)	
Energy for instantaneous electric shower(s)	668.2596	1.5143	1011.9683 (278a)	
Space and water heating			11677.6366 (279)	
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)	
Energy for lighting	272.4024	1.5338	417.8199 (282)	
Total Primary energy kWh/year			13237.5256 (286)	
Dwelling Primary energy Rate (DPER)			89.5400 (287)	

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)
Ground floor	83.4800 (1b)	x	3.0000 (2b)	=	250.4400 (1b) - (3b)
First floor	64.3600 (1c)	x	2.4000 (2c)	=	154.4640 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	147.8400				(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)... (3n)	=	404.9040 (5)

2. Ventilation rate

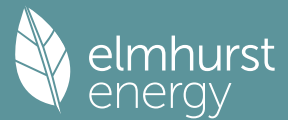
	m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	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) =	0.0988 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000 (17)	
Infiltration rate	0.3488 (18)	
Number of sides sheltered	2 (19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2965 (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	0.3780	0.3706	0.3632	0.3261	0.3187	0.2816	0.2816	0.2742	0.2965	0.3187	0.3335	0.3484 (22b)
Effective ac	0.5714	0.5687	0.5659	0.5532	0.5508	0.5397	0.5397	0.5376	0.5439	0.5508	0.5556	0.5607 (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	
TER Opaque door			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			20.1000	1.1450	23.0153			(27)
External Wall	64.5000	14.1000	50.4000	0.1800	9.0720			(29a)
Corridor wall	3.6000	2.1000	1.5000	0.1800	0.2700			(29a)
Loft Wall	47.0400		47.0400	0.1800	8.4672			(29a)
Dormer Wall	15.8400	6.0000	9.8400	0.1800	1.7712			(29a)
Exposed Roof	19.0600		19.0600	0.1100	2.0966			(30)
Loft Roof	64.3600		64.3600	0.1100	7.0796			(30)
Total net area of external elements Aum(A, m2)			214.4000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)... (30) + (32) =	53.8719			(33)
Party Wall			74.9400	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)							10.7200	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss						(33) + (36) + (36a) =	64.5919	(37)

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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	76.3551	75.9844	75.6211	73.9145	73.5952	72.1088	72.1088	71.8335	72.6813	73.5952	74.2411	74.9164	(38)
Heat transfer coeff	140.9470	140.5763	140.2130	138.5064	138.1871	136.7007	136.7007	136.4254	137.2732	138.1871	138.8330	139.5083	(39)
Average = Sum(39)m / 12 =												138.5048	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9534	0.9509	0.9484	0.9369	0.9347	0.9247	0.9247	0.9228	0.9285	0.9347	0.9391	0.9436	(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													2.9308 (42)
Hot water usage for mixer showers	73.3591	72.2566	70.6502	67.5765	65.3081	62.7785	61.3407	62.9350	64.6827	67.3987	70.5384	73.0780	(42a)
Hot water usage for baths	31.6700	31.1997	30.5373	29.3161	28.4016	27.3877	26.8400	27.4977	28.2138	29.2988	30.5452	31.5630	(42b)
Hot water usage for other uses	44.6439	43.0205	41.3971	39.7737	38.1503	36.5269	36.5269	38.1503	39.7737	41.3971	43.0205	44.6439	(42c)
Average daily hot water use (litres/day)												137.5831	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	149.6730	146.4768	142.5846	136.6662	131.8600	126.6930	124.7075	128.5830	132.6702	138.0946	144.1041	149.2849	(44)
Energy content (annual)	237.0455	208.5811	219.1472	187.0892	177.5090	155.7839	150.8229	159.2126	163.5956	187.3931	205.3028	233.7441	(45)
Distribution loss (46)m = 0.15 x (45)m												2285.2269	
Water storage loss:	35.5568	31.2872	32.8721	28.0634	26.6263	23.3676	22.6234	23.8819	24.5393	28.1090	30.7954	35.0616	(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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	288.0044	254.6085	270.1061	236.4043	228.4679	205.0989	201.7818	210.1715	212.9107	238.3520	254.6178	284.7030	(62)
WWHRS	-33.5367	-29.6601	-31.0584	-25.7176	-23.9679	-20.5095	-19.2244	-20.4432	-21.2199	-25.0159	-28.3400	-32.9157	(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	254.4677	224.9483	239.0477	210.6867	204.5000	184.5895	182.5575	189.7283	191.6908	213.3361	226.2779	251.7873	(64)
12Total per year (kWh/year)												2573.6178	(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	91.5574	80.8601	85.6062	74.5359	71.7615	64.1269	62.8884	65.6779	66.7243	75.0479	80.5919	90.4596	(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	146.5381	146.5381	146.5381	146.5381	146.5381	146.5381	146.5381	146.5381	146.5381	146.5381	146.5381	146.5381	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	173.2685	191.8329	173.2685	179.0441	173.2685	179.0441	173.2685	173.2685	179.0441	173.2685	179.0441	173.2685	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	318.1632	321.4648	313.1450	295.4332	273.0752	252.0619	238.0237	234.7221	243.0419	260.7537	283.1117	304.1250	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6538	37.6538	37.6538	37.6538	37.6538	37.6538	37.6538	37.6538	37.6538	37.6538	37.6538	37.6538	(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)	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	(71)
Water heating gains (Table 5)	123.0610	120.3275	115.0621	103.5221	96.4536	89.0651	84.5274	88.2768	92.6726	100.8709	111.9332	121.5855	(72)
Total internal gains	684.4541	703.5866	671.4370	647.9608	612.7587	587.1325	562.7809	563.2288	581.7201	604.8545	644.0504	668.9405	(73)

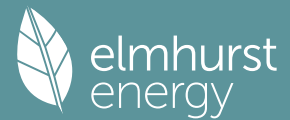
6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
Northeast					10.0500	11.2829		0.6300	0.7000	0.7700		34.6545 (75)	
Southwest					10.0500	36.7938		0.6300	0.7000	0.7700		113.0090 (79)	
Solar gains	147.6635	263.0364	390.4728	535.0628	646.0919	661.9953	629.6714	543.6932	440.0492	298.9551	178.9631	125.0128 (83)	
Total gains	832.1176	966.6230	1061.9097	1183.0237	1258.8505	1249.1278	1192.4524	1106.9219	1021.7692	903.8095	823.0135	793.9532 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.1363	29.2131	29.2888	29.6497	29.7182	30.0413	30.0413	30.1019	29.9160	29.7182	29.5799	29.4367	
alpha	2.9424	2.9475	2.9526	2.9766	2.9812	3.0028	3.0028	3.0068	2.9944	2.9812	2.9720	2.9624	
util living area	0.9692	0.9516	0.9240	0.8609	0.7565	0.6056	0.4702	0.5173	0.7206	0.8894	0.9528	0.9729	(86)
MIT	18.7096	19.0097	19.4401	20.0208	20.5039	20.8228	20.9389	20.9177	20.6849	20.0561	19.2953	18.6657	(87)
Th 2	20.1224	20.1245	20.1265	20.1363	20.1381	20.1466	20.1466	20.1482	20.1433	20.1381	20.1344	20.1306	(88)

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util rest of house	0.9648	0.9449	0.9130	0.8403	0.7195	0.5454	0.3899	0.4364	0.6671	0.8687	0.9452	0.9690 (89)
MIT 2	17.4115	17.7922	18.3359	19.0619	19.6402	19.9988	20.1085	20.0939	19.8596	19.1189	18.1643	17.3606 (90)
Living area fraction									FLA = Living area / (4) =			0.1614 (91)
MIT	17.6210	17.9887	18.5141	19.2166	19.7796	20.1318	20.2425	20.2268	19.9928	19.2701	18.3469	17.5712 (92)
Temperature adjustment												0.0000
adjusted MIT	17.6210	17.9887	18.5141	19.2166	19.7796	20.1318	20.2425	20.2268	19.9928	19.2701	18.3469	17.5712 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9471	0.9227	0.8871	0.8143	0.7023	0.5443	0.3994	0.4443	0.6566	0.8428	0.9235	0.9527	(94)
Useful gains	788.0679	891.9292	942.0670	963.2885	884.0632	679.8410	476.2138	491.7923	670.9107	761.7500	760.0385	756.3724	(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	1877.5512	1839.9570	1684.5299	1428.9213	1116.4920	756.1970	497.9384	522.0766	808.9228	1198.1001	1561.4353	1865.3979	(97)
Space heating kWh	810.5755	637.0746	552.3924	335.2557	172.9270	0.0000	0.0000	0.0000	0.0000	324.6445	577.0057	825.1150	(98a)
Space heating requirement - total per year (kWh/year)												4234.9904	
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	810.5755	637.0746	552.3924	335.2557	172.9270	0.0000	0.0000	0.0000	0.0000	324.6445	577.0057	825.1150	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4234.9904	
Space heating per m2											(98c) / (4) =	28.6458	(99)

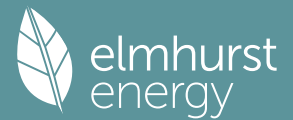
9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.4000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	810.5755	637.0746	552.3924	335.2557	172.9270	0.0000	0.0000	0.0000	0.0000	324.6445	577.0057	825.1150	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	877.2463	689.4747	597.8273	362.8308	187.1504	0.0000	0.0000	0.0000	0.0000	351.3468	624.4651	892.9816	(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	254.4677	224.9483	239.0477	210.6867	204.5000	184.5895	182.5575	189.7283	191.6908	213.3361	226.2779	251.7873	(64)
Efficiency of water heater													80.3000 (216)
(217)m	86.6819	86.4830	86.1144	85.3715	84.0242	80.3000	80.3000	80.3000	80.3000	85.2782	86.2965	86.7283	(217)
Fuel for water heating, kWh/month	293.5649	260.1070	277.5933	246.7881	243.3823	229.8748	227.3443	236.2743	238.7183	250.1647	262.2096	290.3174	(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	36.0018	28.8820	26.0050	19.0524	14.7166	12.0236	13.4250	17.4503	22.6662	29.7393	33.5905	37.0024	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-26.8685	-40.0545	-60.8174	-72.3224	-81.4137	-77.1928	-76.2093	-70.2270	-60.3108	-47.4784	-30.2882	-22.9799	(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)	-9.2093	-19.8465	-40.3641	-62.0157	-83.4118	-84.3798	-83.4305	-70.0185	-50.4850	-28.8729	-12.4463	-7.2504	(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												4583.3230	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												3056.3391	(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)												290.5549	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1217.8937	(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												6798.3232	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
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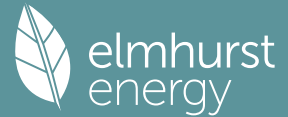


Space heating - main system 1	4583.3230	0.2100	962.4978 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3056.3391	0.2100	641.8312 (264)
Space and water heating			1604.3290 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	290.5549	0.1443	41.9360 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-666.1629	0.1335	-88.9041
PV Unit electricity exported	-551.7309	0.1252	-69.0893
Total			-157.9933 (269)
Total CO2, kg/year			1500.2010 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.1500 (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	4583.3230	1.1300	5179.1550 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3056.3391	1.1300	3453.6632 (278)
Space and water heating			8632.8182 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	290.5549	1.5338	445.6627 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-666.1629	1.4932	-994.6946
PV Unit electricity exported	-551.7309	0.4596	-253.5864
Total			-1248.2809 (283)
Total Primary energy kWh/year			7960.3008 (286)
Target Primary Energy Rate (TPER)			53.8400 (287)

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Property Reference	Flat 3.02			Issued on Date	22/04/2024
Assessment Reference	Renewables	Prop Type Ref			
Property	Christchurch Hall, , 38, Portland Street, Bristol, BS8 4JB				
SAP Rating	80 C	DER	4.08	TER	9.98
Environmental	96 A	% DER < TER			59.12
CO ₂ Emissions (t/year)	0.52	DFEE	58.56	TFEE	33.04
Compliance Check	See BREL	% DFEE < TFEE			-77.23
% DPER < TPER	19.46	DPER	42.65	TPER	52.96
Assessor Details	Mr. Jordan Howlett			Assessor ID	H055-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	83.4800 (1b)	x 3.0000 (2b)	= 250.4400 (1b) - (3b)
First floor	64.3600 (1c)	x 2.4000 (2c)	= 154.4640 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	147.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 404.9040 (5)

2. Ventilation rate

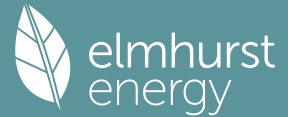
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	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) = 0.0988 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8488 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7215 (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	0.9199	0.9018	0.8838	0.7936	0.7756	0.6854	0.6854	0.6674	0.7215	0.7756	0.8117	0.8477 (22b)
Effective ac	0.9231	0.9067	0.8906	0.8149	0.8008	0.7349	0.7349	0.7227	0.7603	0.8008	0.8294	0.8593 (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
External Door			2.1000	1.4000	2.9400		(26)
Window (Uw = 1.40)			20.1000	1.3258	26.6477		(27)
External Wall	64.5000	14.1000	50.4000	0.2600	13.1040		(29a)
Corridor wall	3.6000	2.1000	1.5000	0.2600	0.3900		(29a)
Loft Wall	47.0400		47.0400	0.1800	8.4672		(29a)
Dormer Wall	15.8400	6.0000	9.8400	0.1800	1.7712		(29a)
Exposed Roof	19.0600		19.0600	0.1600	3.0496		(30)
Loft Roof	64.3600		64.3600	0.1500	9.6540		(30)
Total net area of external elements Aum (A, m ²)			214.4000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	66.0237		(33)
Party Wall			74.9400	0.0000	0.0000		(32)
Party Floor			83.4800				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							42.8800 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	108.9037 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							

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(38)m	Jan 123.3411	Feb 121.1459	Mar 118.9941	Apr 108.8875	May 106.9966	Jun 98.1940	Jul 98.1940	Aug 96.5639	Sep 101.5846	Oct 106.9966	Nov 110.8219	Dec 114.8211	(38)
Heat transfer coeff	232.2448	230.0496	227.8978	217.7912	215.9003	207.0978	207.0978	205.4677	210.4884	215.9003	219.7256	223.7248	(39)
Average = Sum(39)m / 12 =	217.7822												
HLP	Jan 1.5709	Feb 1.5561	Mar 1.5415	Apr 1.4732	May 1.4604	Jun 1.4008	Jul 1.4008	Aug 1.3898	Sep 1.4238	Oct 1.4604	Nov 1.4862	Dec 1.5133	(40)
HLP (average)	1.4731												
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9308 (42)												
Hot water usage for mixer showers	0.0000 (42a)												
Hot water usage for baths	31.6700 (42b)												
Hot water usage for other uses	44.6439 (42c)												
Average daily hot water use (litres/day)	69.9485 (43)												
Daily hot water use	Jan 76.3140	Feb 74.2202	Mar 71.9344	Apr 69.0898	May 66.5519	Jun 63.9145	Jul 63.3668	Aug 65.6479	Sep 67.9875	Oct 70.6959	Nov 73.5657	Dec 76.2069	(44)
Energy conte	120.8627	105.6886	110.5606	94.5805	89.5917	78.5904	76.6367	81.2859	83.8354	95.9337	104.8078	119.3216	(45)
Energy content (annual)	Total = Sum(45)m = 1161.6952												
Distribution loss (46)m = 0.15 x (45)m	18.1294 (46)												
Water storage loss:	Store volume 180.0000 (47)												
a) If manufacturer declared loss factor is known (kWh/day):	1.8600 (48)												
Temperature factor from Table 2b	0.5400 (49)												
Enter (49) or (54) in (55)	1.0044 (55)												
Total storage loss	31.1364 (56)												
If cylinder contains dedicated solar storage	31.1364 (57)												
Primary loss	23.2624 (59)												
Combi loss	0.0000 (61)												
Total heat required for water heating calculated for each month	175.2615	154.8230	164.9594	147.2245	143.9905	131.2344	131.0355	135.6847	136.4794	150.3325	157.4518	173.7204	(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	175.2615	154.8230	164.9594	147.2245	143.9905	131.2344	131.0355	135.6847	136.4794	150.3325	157.4518	173.7204	(64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m = 1802.1972 (64)												
Electric shower(s)	58.7484	52.3453	57.1591	54.5462	55.5697	53.0081	54.7751	55.5697	54.5462	57.1591	56.0843	58.7484	(64a)
Heat gains from water heating, kWh/month	98.3930	87.5353	94.5702	87.1998	87.2007	81.4985	82.6945	84.4390	83.6270	89.7067	90.9849	97.8806	(65)

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

Metabolic gains (Table 5), Watts	Jan 146.5381	Feb 146.5381	Mar 146.5381	Apr 146.5381	May 146.5381	Jun 146.5381	Jul 146.5381	Aug 146.5381	Sep 146.5381	Oct 146.5381	Nov 146.5381	Dec 146.5381	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	173.2685	191.8329	173.2685	179.0441	173.2685	179.0441	173.2685	173.2685	179.0441	173.2685	179.0441	173.2685	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	318.1632	321.4648	313.1450	295.4332	273.0752	252.0619	238.0237	234.7221	243.0419	260.7537	283.1117	304.1250	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6538	37.6538	37.6538	37.6538	37.6538	37.6538	37.6538	37.6538	37.6538	37.6538	37.6538	37.6538	(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)	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	-117.2305	(71)
Water heating gains (Table 5)	132.2486	130.2609	127.1105	121.1108	117.2052	113.1924	111.1485	113.4933	116.1486	120.5736	126.3679	131.5599	(72)
Total internal gains	690.6418	710.5200	680.4854	662.5495	630.5104	611.2598	589.4021	588.4453	605.1960	621.5572	655.4851	675.9148	(73)

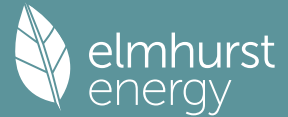
6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	Gains W	
Northeast				10.0500	11.2829	0.6300		0.7000		0.7700	34.6545 (75)	
Southwest				10.0500	36.7938	0.6300		0.7000		0.7700	113.0090 (79)	
Solar gains	147.6635	263.0364	390.4728	535.0628	646.0919	661.9953	629.6714	543.6932	440.0492	298.9551	178.9631	125.0128 (83)
Total gains	838.3053	973.5564	1070.9581	1197.6123	1276.6022	1273.2550	1219.0735	1132.1385	1045.2452	920.5122	834.4482	800.9276 (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 17.6825	Feb 17.8512	Mar 18.0198	Apr 18.8560	May 19.0211	Jun 19.8296	Jul 19.8296	Aug 19.9869	Sep 19.5102	Oct 19.0211	Nov 18.6900	Dec 18.3559	
tau	2.1788	2.1901	2.2013	2.2571	2.2681	2.3220	2.3220	2.3325	2.3007	2.2681	2.2460	2.2237	
util living area	0.9719	0.9599	0.9418	0.9004	0.8312	0.7129	0.5925	0.6346	0.8014	0.9174	0.9600	0.9745	(86)

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Living	17.3120	17.6514	18.2115	19.0686	19.8209	20.4699	20.7603	20.7113	20.2256	19.2554	18.2164	17.3515
Non living	15.3955	15.8291	16.5424	17.6394	18.5658	19.3402	19.6291	19.5977	19.0753	17.8910	16.5710	15.4603
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	7	0	0	0	0	0	0	0	0	0	0	0
16 / 9	24	17	0	0	0	0	0	0	0	0	0	31
MIT	19.3829	18.5330	18.2115	19.0686	19.8209	20.4699	20.7603	20.7113	20.2256	19.2554	18.2164	18.9336 (87)
Th 2	19.6347	19.6457	19.6565	19.7077	19.7174	19.7627	19.7627	19.7712	19.7452	19.7174	19.6978	19.6775 (88)
util rest of house												
MIT 2	0.9670	0.9528	0.9308	0.8798	0.7912	0.6360	0.4700	0.5181	0.7403	0.8964	0.9518	0.9701 (89)
Living area fraction	18.1828	17.1215	16.5424	17.6394	18.5658	19.3402	19.6291	19.5977	19.0753	17.8910	16.5710	17.8140 (90)
MIT	18.3764	17.3493	16.8117	17.8700	18.7684	19.5225	19.8117	19.7775	19.2610	18.1112	16.8366	17.9947 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3764	17.3493	16.8117	17.8700	18.7684	19.5225	19.8117	19.7775	19.2610	18.1112	16.8366	17.9947 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9612	0.9358	0.8950	0.8391	0.7533	0.6183	0.4755	0.5188	0.7103	0.8580	0.9228	0.9626 (94)
Useful gains	805.7415	911.0697	958.5308	1004.8829	961.6154	787.2022	579.6855	587.3306	742.4898	789.7960	769.9902	771.0031 (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	3269.1811	2863.9567	2350.0236	1953.5974	1526.0650	1019.4435	665.1271	693.9606	1086.3216	1621.6725	2139.3767	3086.2098 (97)
Space heating kWh	1832.7991	1312.3401	1035.2707	683.0744	419.9505	0.0000	0.0000	0.0000	0.0000	618.9161	985.9583	1722.5138 (98a)
Space heating requirement - total per year (kWh/year)												8610.8229
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	1832.7991	1312.3401	1035.2707	683.0744	419.9505	0.0000	0.0000	0.0000	0.0000	618.9161	985.9583	1722.5138 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												8610.8229
Space heating per m2										(98c) / (4) =		58.2442 (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 %)												397.5094 (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	1832.7991	1312.3401	1035.2707	683.0744	419.9505	0.0000	0.0000	0.0000	0.0000	618.9161	985.9583	1722.5138 (98)
Space heating efficiency (main heating system 1)	397.5094	397.5094	397.5094	397.5094	397.5094	0.0000	0.0000	0.0000	0.0000	397.5094	397.5094	397.5094 (210)
Space heating fuel (main heating system)	461.0706	330.1406	260.4393	171.8385	105.6454	0.0000	0.0000	0.0000	0.0000	155.6985	248.0339	433.3265 (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	175.2615	154.8230	164.9594	147.2245	143.9905	131.2344	131.0355	135.6847	136.4794	150.3325	157.4518	173.7204 (64)
Efficiency of water heater (217)m	186.6532	186.6532	186.6532	186.6532	186.6532	186.6532	186.6532	186.6532	186.6532	186.6532	186.6532	186.6532 (216)
Fuel for water heating, kWh/month	93.8968	82.9469	88.3775	78.8759	77.1433	70.3092	70.2026	72.6935	73.1192	80.5411	84.3553	93.0712 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	33.7526	27.0775	24.3803	17.8621	13.7972	11.2724	12.5862	16.3601	21.2501	27.8813	31.4919	34.6906 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												2166.1933 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												186.6532
Water heating fuel used												965.5325 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												272.4024 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												4072.3878 (238)

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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	2166.1933	0.1549	335.6026 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	965.5325	0.1406	135.7143 (264)
Energy for instantaneous electric shower(s)	668.2596	0.1391	92.9697 (264a)
Space and water heating			471.3169 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	272.4024	0.1443	39.3161 (268)
Total CO2, kg/year			603.6027 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.0800 (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	2166.1933	1.5735	3408.5885 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	965.5325	1.5197	1467.3377 (278)
Energy for instantaneous electric shower(s)	668.2596	1.5143	1011.9683 (278a)
Space and water heating			4875.9262 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	272.4024	1.5338	417.8199 (282)
Total Primary energy kWh/year			6305.7144 (286)
Dwelling Primary energy Rate (DPER)			42.6500 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	83.4800 (1b)	x 3.0000 (2b)	= 250.4400 (1b) - (3b)
First floor	64.3600 (1c)	x 2.4000 (2c)	= 154.4640 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	147.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	404.9040 (5)

2. Ventilation rate

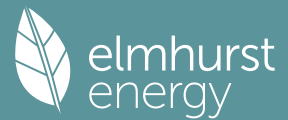
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.0988 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3488 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2965 (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	0.3780	0.3706	0.3632	0.3261	0.3187	0.2816	0.2816	0.2742	0.2965	0.3187	0.3335	0.3484 (22b)
Effective ac	0.5714	0.5687	0.5659	0.5532	0.5508	0.5397	0.5397	0.5376	0.5439	0.5508	0.5556	0.5607 (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
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type (Uw = 1.20)			20.1000	1.1450	23.0153		(27)
External Wall	64.5000	14.1000	50.4000	0.1800	9.0720		(29a)
Corridor wall	3.6000	2.1000	1.5000	0.1800	0.2700		(29a)
Loft Wall	47.0400		47.0400	0.1800	8.4672		(29a)
Dormer Wall	15.8400	6.0000	9.8400	0.1800	1.7712		(29a)
Exposed Roof	19.0600		19.0600	0.1100	2.0966		(30)
Loft Roof	64.3600		64.3600	0.1100	7.0796		(30)
Total net area of external elements Aum(A, m2)			214.4000				(31)

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Fabric heat loss, W/K = Sum (A x U)
 Party Wall (26)...(30) + (32) = 53.8719 (33)
 74.9400 0.0000 0.0000 (32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 100.0000 (35)
 Thermal bridges (User defined value 0.050 * total exposed area) 10.7200 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 64.5919 (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 76.3551 75.9844 75.6211 73.9145 73.5952 72.1088 72.1088 71.8335 72.6813 73.5952 74.2411 74.9164 (38)
 Average = Sum(39)m / 12 = 140.9470 140.5763 140.2130 138.5064 138.1871 136.7007 136.7007 136.4254 137.2732 138.1871 138.8330 139.5083 (39)
 138.5048
 HLP Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 HLP (average) 0.9534 0.9509 0.9484 0.9369 0.9347 0.9247 0.9247 0.9228 0.9285 0.9347 0.9391 0.9436 (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 2.9308 (42)
 Hot water usage for mixer showers 73.3591 72.2566 70.6502 67.5765 65.3081 62.7785 61.3407 62.9350 64.6827 67.3987 70.5384 73.0780 (42a)
 Hot water usage for baths 31.6700 31.1997 30.5373 29.3161 28.4016 27.3877 26.8400 27.4977 28.2138 29.2988 30.5452 31.5630 (42b)
 Hot water usage for other uses 44.6439 43.0205 41.3971 39.7737 38.1503 36.5269 36.5269 38.1503 39.7737 41.3971 43.0205 44.6439 (42c)
 Average daily hot water use (litres/day) 137.5831 (43)
 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 Daily hot water use 149.6730 146.4768 142.5846 136.6662 131.8600 126.6930 124.7075 128.5830 132.6702 138.0946 144.1041 149.2849 (44)
 Energy content (annual) 237.0455 208.5811 219.1472 187.0892 177.5090 155.7839 150.8229 159.2126 163.5956 187.3931 205.3028 233.7441 (45)
 Distribution loss (46)m = 0.15 x (45)m Total = Sum(45)m = 2285.2269
 35.5568 31.2872 32.8721 28.0634 26.6263 23.3676 22.6234 23.8819 24.5393 28.1090 30.7954 35.0616 (46)
 Water storage loss:
 Store volume 180.0000 (47)
 a) If manufacturer declared loss factor is known (kWh/day): 1.5520 (48)
 Temperature factor from Table 2b 0.5400 (49)
 Enter (49) or (54) in (55) 0.8381 (55)
 Total storage loss
 25.9803 23.4661 25.9803 25.1422 25.9803 25.1422 25.9803 25.9803 25.1422 25.9803 25.1422 25.9803 (56)
 If cylinder contains dedicated solar storage
 25.9803 23.4661 25.9803 25.1422 25.9803 25.1422 25.9803 25.9803 25.1422 25.9803 25.1422 25.9803 (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
 286.2882 253.0583 268.3899 234.7434 226.7516 203.4381 200.0656 208.4552 211.2498 236.6358 252.9570 282.9868 (62)
 WWHRs -33.5367 -29.6601 -31.0584 -25.7176 -23.9679 -20.5095 -19.2244 -20.4432 -21.2199 -25.0159 -28.3400 -32.9157 (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 252.7515 223.3982 237.3315 209.0259 202.7838 182.9286 180.8412 188.0121 190.0299 211.6199 224.6170 250.0711 (64)
 Total per year (kWh/year) = Sum(64)m = 2553.4105 (64)
 2553 (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 118.2118 104.9350 112.2606 100.3305 98.4159 89.9215 89.5428 92.3323 92.5189 101.7023 106.3865 117.1140 (65)

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

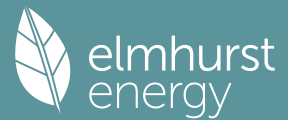
Metabolic gains (Table 5), Watts
 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 (66)m 146.5381 146.5381 146.5381 146.5381 146.5381 146.5381 146.5381 146.5381 146.5381 146.5381 146.5381 (66)
 Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 173.2685 191.8329 173.2685 179.0441 173.2685 179.0441 173.2685 173.2685 179.0441 173.2685 179.0441 173.2685 (67)
 Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 318.1632 321.4648 313.1450 295.4332 273.0752 252.0619 238.0237 234.7221 243.0419 260.7537 283.1117 304.1250 (68)
 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 37.6538 37.6538 37.6538 37.6538 37.6538 37.6538 37.6538 37.6538 37.6538 37.6538 37.6538 37.6538 (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) -117.2305 -117.2305 -117.2305 -117.2305 -117.2305 -117.2305 -117.2305 -117.2305 -117.2305 -117.2305 -117.2305 -117.2305 (71)
 Water heating gains (Table 5) 158.8868 156.1533 150.8879 139.3480 132.2794 124.8910 120.3532 124.1026 128.4985 136.6967 147.7591 157.4113 (72)
 Total internal gains 720.2799 739.4124 707.2628 683.7867 648.5845 622.9584 598.6067 599.0546 617.5459 640.6803 679.8763 704.7663 (73)

6. Solar gains

[Jan] Area m2 Solar flux Table 6a W/m2 g Specific data or Table 6b FF Specific data or Table 6c Access factor Table 6d Gains W
 Northeast 10.0500 11.2829 0.6300 0.7000 0.7700 34.6545 (75)
 Southwest 10.0500 36.7938 0.6300 0.7000 0.7700 113.0090 (79)
 Solar gains 147.6635 263.0364 390.4728 535.0628 646.0919 661.9953 629.6714 543.6932 440.0492 298.9551 178.9631 125.0128 (83)
 Total gains 867.9434 1002.4488 1097.7356 1218.8495 1294.6764 1284.9536 1228.2782 1142.7478 1057.5950 939.6354 858.8394 829.7791 (84)

7. Mean internal temperature (heating season)

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Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	29.1363	29.2131	29.2888	29.6497	29.7182	30.0413	30.0413	30.1019	29.9160	29.7182	29.5799	29.4367
alpha	2.9424	2.9475	2.9526	2.9766	2.9812	3.0028	3.0028	3.0068	2.9944	2.9812	2.9720	2.9624
util living area	0.9658	0.9474	0.9183	0.8528	0.7460	0.5936	0.4586	0.5043	0.7069	0.8804	0.9479	0.9697 (86)
MIT	18.7567	19.0538	19.4799	20.0521	20.5241	20.8323	20.9429	20.9232	20.7019	20.0910	19.3397	18.7136 (87)
Th 2	20.1224	20.1245	20.1265	20.1363	20.1381	20.1466	20.1466	20.1482	20.1433	20.1381	20.1344	20.1306 (88)
util rest of house	0.9610	0.9402	0.9067	0.8315	0.7084	0.5336	0.3797	0.4245	0.6528	0.8585	0.9395	0.9655 (89)
MIT 2	17.4709	17.8474	18.3849	19.0989	19.6621	20.0073	20.1112	20.0978	19.8764	19.1601	18.2197	17.4212 (90)
Living area fraction									fLA = Living area /	(4) =		0.1614 (91)
MIT	17.6784	18.0421	18.5616	19.2527	19.8012	20.1405	20.2454	20.2310	20.0097	19.3104	18.4005	17.6297 (92)
Temperature adjustment												0.0000
adjusted MIT	17.6784	18.0421	18.5616	19.2527	19.8012	20.1405	20.2454	20.2310	20.0097	19.3104	18.4005	17.6297 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9423	0.9171	0.8804	0.8057	0.6921	0.5332	0.3892	0.4327	0.6434	0.8328	0.9169	0.9480 (94)
Useful gains	817.8215	919.3758	966.4193	982.0700	896.0133	685.0835	478.0537	494.4291	680.4954	782.4907	787.4728	786.6619 (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	1885.6469	1847.4714	1691.1971	1433.9167	1119.4801	757.3836	498.3302	522.6460	811.2375	1203.6596	1568.8799	1873.5603 (97)
Space heating kWh	794.4622	623.6802	539.2347	325.3296	166.2593	0.0000	0.0000	0.0000	0.0000	313.3497	562.6131	808.6524 (98a)
Space heating requirement - total per year (kWh/year)												4133.5812
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	794.4622	623.6802	539.2347	325.3296	166.2593	0.0000	0.0000	0.0000	0.0000	313.3497	562.6131	808.6524 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4133.5812
Space heating per m2										(98c) / (4) =		27.9598 (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	794.4622	623.6802	539.2347	325.3296	166.2593	0.0000	0.0000	0.0000	0.0000	313.3497	562.6131	808.6524 (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)	860.7391	675.7099	584.2196	352.4698	180.1293	0.0000	0.0000	0.0000	0.0000	339.4904	609.5483	876.1131 (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	252.7515	223.3982	237.3315	209.0259	202.7838	182.9286	180.8412	188.0121	190.0299	211.6199	224.6170	250.0711 (64)
Efficiency of water heater (217)m	86.4469	86.2350	85.8412	85.0479	83.6180	79.8000	79.8000	79.8000	79.8000	84.9384	86.0315	79.8000 (216)
Fuel for water heating, kWh/month	292.3778	259.0573	276.4773	245.7742	242.5121	229.2339	226.6181	235.6041	238.1327	249.1451	261.0868	289.1135 (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	36.0018	28.8820	26.0050	19.0524	14.7166	12.0236	13.4250	17.4503	22.6662	29.7393	33.5905	37.0024 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-26.8685	-40.0545	-60.8174	-72.3224	-81.4137	-77.1928	-76.2093	-70.2270	-60.3108	-47.4784	-30.2882	-22.9799 (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)	-9.2093	-19.8465	-40.3641	-62.0157	-83.4118	-84.3798	-83.4305	-70.0185	-50.4850	-28.8729	-12.4463	-7.2504 (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												4478.4195 (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												3045.1328 (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)												290.5549 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1217.8937 (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												

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Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	6682.2134 (238)

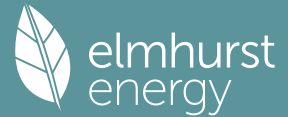
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4478.4195	0.2100	940.4681 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3045.1328	0.2100	639.4779 (264)
Space and water heating			1579.9460 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	290.5549	0.1443	41.9360 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-666.1629	0.1335	-88.9041
PV Unit electricity exported	-551.7309	0.1252	-69.0893
Total			-157.9933 (269)
Total CO2, kg/year			1475.8180 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.9800 (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	4478.4195	1.1300	5060.6140 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3045.1328	1.1300	3441.0001 (278)
Space and water heating			8501.6141 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	290.5549	1.5338	445.6627 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-666.1629	1.4932	-994.6946
PV Unit electricity exported	-551.7309	0.4596	-253.5864
Total			-1248.2809 (283)
Total Primary energy kWh/year			7829.0967 (286)
Target Primary Energy Rate (TPER)			52.9600 (287)

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Property Reference	Flat 3.03			Issued on Date	22/04/2024
Assessment Reference	Baseline	Prop Type Ref			
Property	Christchurch Hall, , 38, Portland Street, Bristol, BS8 4JB				
SAP Rating	77 C	DER	20.69	TER	12.57
Environmental	81 B	% DER < TER			-64.60
CO ₂ Emissions (t/year)	1.87	DFEE	71.57	TFEE	38.54
Compliance Check	See BREL	% DFEE < TFEE			-85.73
% DPER < TPER	-76.63	DPER	118.32	TPER	66.99
Assessor Details	Mr. Jordan Howlett			Assessor ID	H055-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	59.7500 (1b)	x 3.0000 (2b)	= 179.2500 (1b) - (3b)
First floor	50.7700 (1c)	x 2.4000 (2c)	= 121.8480 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	110.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 301.0980 (5)

2. Ventilation rate

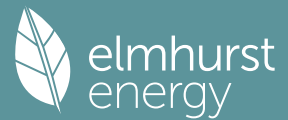
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	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) = 0.1328 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8828 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.8166 (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	1.0412	1.0208	1.0004	0.8983	0.8779	0.7758	0.7758	0.7554	0.8166	0.8779	0.9187	0.9595 (22b)
Effective ac	1.0412	1.0208	1.0004	0.9035	0.8853	0.8009	0.8009	0.7853	0.8334	0.8853	0.9220	0.9604 (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
External Door			2.1000	1.4000	2.9400		(26)
Window (Uw = 1.40)			19.7700	1.3258	26.2102		(27)
Exposed Floor			7.4700	0.1800	1.3446		(28b)
External Wall	47.2500	7.7700	39.4800	0.3000	11.8440		(29a)
Corridor wall	34.6500	2.1000	32.5500	0.3000	9.7650		(29a)
Loft Wall	49.2000		49.2000	0.1800	8.8560		(29a)
Dormer Wall	15.3600	12.0000	3.3600	0.1800	0.6048		(29a)
Exposed Roof	13.4200		13.4200	0.1600	2.1472		(30)
Loft Roof	50.7700		50.7700	0.1500	7.6155		(30)
Total net area of external elements Aum(A, m ²)			218.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	71.3273		(33)
Party Wall			37.2000	0.0000	0.0000		(32)
Party Floor			59.7500				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							43.6240 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	114.9513 (37)

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Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 103.4568	Feb 101.4283	Mar 99.3997	Apr 89.7708	May 87.9692	Jun 79.5827	Jul 79.5827	Aug 78.0296	Sep 82.8131	Oct 87.9692	Nov 91.6137	Dec 95.4239 (38)
Heat transfer coeff	218.4082	216.3796	214.3510	204.7221	202.9205	194.5340	194.5340	192.9810	197.7644	202.9205	206.5651	210.3752 (39)
Average = Sum(39)m / 12 =												204.7046

HLP	Jan 1.9762	Feb 1.9578	Mar 1.9395	Apr 1.8524	May 1.8361	Jun 1.7602	Jul 1.7602	Aug 1.7461	Sep 1.7894	Oct 1.8361	Nov 1.8690	Dec 1.9035 (40)
HLP (average)												1.8522
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8179 (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	30.8563	30.3981	29.7527	28.5629	27.6719	26.6840	26.1504	26.7912	27.4889	28.5460	29.7604	30.7520 (42b)
Hot water usage for other uses	43.4882	41.9068	40.3255	38.7441	37.1627	35.5813	35.5813	37.1627	38.7441	40.3255	41.9068	43.4882 (42c)
Average daily hot water use (litres/day)												68.1434 (43)
Daily hot water use	Jan 74.3446	Feb 72.3049	Mar 70.0782	Apr 67.3069	May 64.8346	Jun 62.2653	Jul 61.7316	Aug 63.9538	Sep 66.2330	Oct 68.8715	Nov 71.6672	Dec 74.2403 (44)
Energy conte	117.7436	102.9612	107.7076	92.1398	87.2798	76.5624	74.6591	79.1882	81.6719	93.4579	102.1031	116.2423 (45)
Energy content (annual)										Total = Sum(45)m =		1131.7171
Distribution loss (46)m = 0.15 x (45)m	17.6615	15.4442	16.1561	13.8210	13.0920	11.4844	11.1989	11.8782	12.2508	14.0187	15.3155	17.4363 (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	25.3600	22.8989	25.3419	24.5079	25.3136	24.4864	25.2979	25.3047	24.4960	25.3253	24.5247	25.3582 (61)
Total heat required for water heating calculated for each month	143.1037	125.8601	133.0495	116.6478	112.5934	101.0488	99.9569	104.4929	106.1679	118.7832	126.6278	141.6005 (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	143.1037	125.8601	133.0495	116.6478	112.5934	101.0488	99.9569	104.4929	106.1679	118.7832	126.6278	141.6005 (64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				1429.9326 (64)
Electric shower(s)	57.2331	50.9952	55.6848	53.1393	54.1364	51.6409	53.3623	54.1364	53.1393	55.6848	54.6377	57.2331 (64a)
												651.0231 (64a)
Heat gains from water heating, kWh/month	59.7980	52.7081	56.0694	50.0483	48.8831	44.4888	44.4892	46.1904	46.5647	51.3273	53.7399	59.2984 (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	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	140.4185	155.4633	140.4185	145.0991	140.4185	145.0991	140.4185	140.4185	145.0991	140.4185	145.0991	140.4185 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	272.3010	275.1266	268.0061	252.8474	233.7123	215.7279	203.7133	200.8877	208.0082	223.1669	242.3020	260.2864 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896 (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)	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165 (71)
Water heating gains (Table 5)	80.3737	78.4347	75.3622	69.5115	65.7030	61.7900	59.7973	62.0838	64.6732	68.9883	74.6387	79.7021 (72)
Total internal gains	561.3619	577.2934	552.0555	535.7267	508.1025	487.8858	469.1977	468.6587	483.0492	500.8423	530.3085	548.6756 (73)

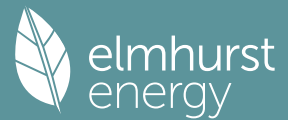
6. Solar gains

[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Northeast			7.0500		11.2829		0.6300		0.7000		0.7700		24.3099 (75)
Southeast			9.7200		36.7938		0.6300		0.7000		0.7700		109.2982 (77)
Southwest			3.0000		36.7938		0.6300		0.7000		0.7700		33.7340 (79)
Solar gains	167.3422	293.1204	422.5081	559.4582	659.4535	669.1183	639.0948	562.2872	469.5875	329.7434	201.9078	142.2585	(83)
Total gains	728.7040	870.4137	974.5636	1095.1849	1167.5559	1157.0040	1108.2925	1030.9458	952.6367	830.5857	732.2163	690.9341	(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 14.0563	Feb 14.1880	Mar 14.3223	Apr 14.9959	May 15.1291	Jun 15.7813	Jul 15.7813	Aug 15.9083	Sep 15.5235	Oct 15.1291	Nov 14.8621	Dec 14.5930
alpha	1.9371	1.9459	1.9548	1.9997	2.0086	2.0521	2.0521	2.0606	2.0349	2.0086	1.9908	1.9729
util living area	0.9643	0.9487	0.9265	0.8806	0.8098	0.6967	0.5826	0.6218	0.7812	0.9008	0.9501	0.9676 (86)
MIT	16.7847	17.1752	17.8101	18.7564	19.5968	20.3314	20.6798	20.6227	20.0630	18.9702	17.7887	16.8116 (87)
Th 2	19.3493	19.3616	19.3740	19.4336	19.4449	19.4980	19.4980	19.5080	19.4774	19.4449	19.4221	19.3984 (88)

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util rest of house	0.9574	0.9387	0.9113	0.8539	0.7605	0.6053	0.4372	0.4833	0.7066	0.8732	0.9389	0.9614 (89)
MIT 2	15.6429	16.0345	16.6669	17.6222	18.4262	19.1134	19.3773	19.3527	18.8879	17.8512	16.6798	15.6963 (90)
Living area fraction									FLA =	Living area /	(4) =	0.2971 (91)
MIT	15.9821	16.3733	17.0065	17.9592	18.7739	19.4752	19.7642	19.7300	19.2370	18.1836	17.0092	16.0276 (92)
Temperature adjustment												0.0000
adjusted MIT	15.9821	16.3733	17.0065	17.9592	18.7739	19.4752	19.7642	19.7300	19.2370	18.1836	17.0092	16.0276 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9353	0.9115	0.8795	0.8201	0.7337	0.6037	0.4668	0.5074	0.6918	0.8419	0.9130	0.9410	(94)
Useful gains	681.5688	793.3609	857.1655	898.2126	856.6531	698.4378	517.3572	523.0972	659.0408	699.2695	668.5220	650.1875	(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	2551.4581	2482.5971	2252.0837	1854.6084	1435.4402	948.4012	615.5432	642.6253	1015.9171	1538.8623	2046.8975	2488.2338	(97)
Space heating kWh	1391.1976	1135.1667	1037.8191	688.6050	430.6176	0.0000	0.0000	0.0000	0.0000	624.6570	992.4304	1367.5065	(98a)
Space heating requirement - total per year (kWh/year)												7668.0000	
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	1391.1976	1135.1667	1037.8191	688.6050	430.6176	0.0000	0.0000	0.0000	0.0000	624.6570	992.4304	1367.5065	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7668.0000	
Space heating per m2										(98c) / (4) =		69.3811	(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 %)													89.2000 (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	1391.1976	1135.1667	1037.8191	688.6050	430.6176	0.0000	0.0000	0.0000	0.0000	624.6570	992.4304	1367.5065	(98)
Space heating efficiency (main heating system 1)	89.2000	89.2000	89.2000	89.2000	89.2000	0.0000	0.0000	0.0000	0.0000	89.2000	89.2000	89.2000	(210)
Space heating fuel (main heating system)	1559.6386	1272.6084	1163.4744	771.9787	482.7552	0.0000	0.0000	0.0000	0.0000	700.2881	1112.5901	1533.0790	(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	143.1037	125.8601	133.0495	116.6478	112.5934	101.0488	99.9569	104.4929	106.1679	118.7832	126.6278	141.6005	(64)
Efficiency of water heater	89.0096	88.9963	88.9681	88.9046	88.7780	87.2000	87.2000	87.2000	87.2000	88.8743	88.9691	89.0084	(216)
Fuel for water heating, kWh/month	160.7733	141.4218	149.5474	131.2055	126.8259	115.8817	114.6295	119.8313	121.7522	133.6530	142.3278	159.0866	(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	33.9312	27.2209	24.5094	17.9566	13.8702	11.3321	12.6529	16.4467	21.3626	28.0289	31.6586	34.8742	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1													8596.4126 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													87.2000
Water heating fuel used													1616.9361 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
central heating pump													41.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													86.0000 (231)
Electricity for lighting (calculated in Appendix L)													273.8441 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													0.0000 (233)
Wind generation													0.0000 (234)
Hydro-electric generation (Appendix N)													0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (235)
Appendix Q - special features													
Energy saved or generated													-0.0000 (236)
Energy used													0.0000 (237)
Total delivered energy for all uses													11224.2159 (238)

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

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	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	8596.4126	0.2100	1805.2466 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1616.9361	0.2100	339.5566 (264)
Energy for instantaneous electric shower(s)	651.0231	0.1391	90.5717 (264a)
Space and water heating			2144.8032 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	273.8441	0.1443	39.5242 (268)
Total CO2, kg/year			2286.8284 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			20.6900 (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	8596.4126	1.1300	9713.9462 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1616.9361	1.1300	1827.1378 (278)
Energy for instantaneous electric shower(s)	651.0231	1.5143	985.8665 (278a)
Space and water heating			11541.0840 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	273.8441	1.5338	420.0313 (282)
Total Primary energy kWh/year			13077.0826 (286)
Dwelling Primary energy Rate (DPER)			118.3200 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	59.7500 (1b)	x 3.0000 (2b)	= 179.2500 (1b) - (3b)
First floor	50.7700 (1c)	x 2.4000 (2c)	= 121.8480 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	110.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 301.0980 (5)

2. Ventilation rate

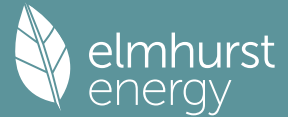
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.1328 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3828 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3541 (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	0.4515	0.4427	0.4338	0.3895	0.3807	0.3364	0.3364	0.3276	0.3541	0.3807	0.3984	0.4161 (22b)
Effective ac	0.6019	0.5980	0.5941	0.5759	0.5725	0.5566	0.5566	0.5537	0.5627	0.5725	0.5794	0.5866 (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
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type (Uw = 1.20)			19.7700	1.1450	22.6374		(27)
Exposed Floor			7.4700	0.1300	0.9711		(28b)
External Wall	47.2500	7.7700	39.4800	0.1800	7.1064		(29a)
Corridor wall	34.6500	2.1000	32.5500	0.1800	5.8590		(29a)
Loft Wall	49.2000		49.2000	0.1800	8.8560		(29a)
Dormer Wall	15.3600	12.0000	3.3600	0.1800	0.6048		(29a)
Exposed Roof	13.4200		13.4200	0.1100	1.4762		(30)
Loft Roof	50.7700		50.7700	0.1100	5.5847		(30)
Total net area of external elements Aum(A, m2)			218.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	55.1956		(33)
Party Wall			37.2000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)

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Thermal bridges (User defined value 0.050 * total exposed area)
Point Thermal bridges (36a) = 10.9060 (36)
Total fabric heat loss (33) + (36) + (36a) = 66.1016 (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	59.8097	59.4164	59.0309	57.2201	56.8813	55.3042	55.3042	55.0122	55.9117	56.8813	57.5667	58.2832	(38)
Heat transfer coeff	125.9113	125.5180	125.1325	123.3217	122.9829	121.4058	121.4058	121.1138	122.0133	122.9829	123.6683	124.3848	(39)
Average = Sum(39)m / 12 =												123.3201	
HLP	1.1393	1.1357	1.1322	1.1158	1.1128	1.0985	1.0985	1.0959	1.1040	1.1128	1.1190	1.1255	(40)
HLP (average)												1.1158	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8179 (42)
Hot water usage for mixer showers	71.4669	70.3929	68.8279	65.8334	63.6236	61.1593	59.7585	61.3117	63.0143	65.6603	68.7190	71.1931	(42a)
Hot water usage for baths	30.8563	30.3981	29.7527	28.5629	27.6719	26.6840	26.1504	26.7912	27.4889	28.5460	29.7604	30.7520	(42b)
Hot water usage for other uses	43.4882	41.9068	40.3255	38.7441	37.1627	35.5813	35.5813	37.1627	38.7441	40.3255	41.9068	43.4882	(42c)
Average daily hot water use (litres/day)												134.0335	(43)
Daily hot water use	145.8115	142.6978	138.9061	133.1404	128.4582	123.4246	121.4902	125.2656	129.2473	134.5318	140.3863	145.4334	(44)
Energy conte	230.9298	203.1998	213.4935	182.2625	172.9295	151.7649	146.9318	155.1050	159.3748	182.5583	200.0060	227.7135	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m	34.6395	30.4800	32.0240	27.3394	25.9394	22.7647	22.0398	23.2657	23.9062	27.3838	30.0009	34.1570	(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													
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	(57)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
WWHRS	281.8887	249.2272	264.4524	231.5776	223.8884	201.0800	197.8907	206.0639	208.6899	233.5172	249.3211	278.6724	(62)
PV diverter	-32.6717	-28.8951	-30.2573	-25.0542	-23.3496	-19.9805	-18.7285	-19.9159	-20.6726	-24.3707	-27.6090	-32.0667	(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	249.2170	220.3321	234.1951	206.5234	200.5387	181.0995	179.1623	186.1480	188.0173	209.1466	221.7121	246.6057	(64)
12Total per year (kWh/year)												2522.6977	(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	89.5239	79.0708	83.7263	72.9311	70.2388	62.7906	61.5946	64.3121	65.3209	73.4404	78.8308	88.4545	(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	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	140.4185	155.4633	140.4185	145.0991	140.4185	145.0991	140.4185	140.4185	145.0991	140.4185	145.0991	140.4185	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	272.3010	275.1266	268.0061	252.8474	233.7123	215.7279	203.7133	200.8877	208.0082	223.1669	242.3020	260.2864	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	(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)	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	(71)
Water heating gains (Table 5)	120.3278	117.6649	112.5353	101.2931	94.4070	87.2092	82.7884	86.4410	90.7235	98.7102	109.4872	118.8904	(72)
Total internal gains	601.3159	616.5235	589.2286	567.5083	536.8064	513.3049	492.1889	493.0159	509.0994	530.5642	565.1570	587.8639	(73)

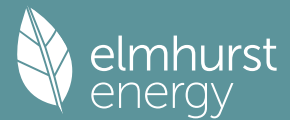
6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Northeast				7.0500	11.2829		0.6300		0.7000		0.7700		24.3099 (75)
Southeast				9.7200	36.7938		0.6300		0.7000		0.7700		109.2982 (77)
Southwest				3.0000	36.7938		0.6300		0.7000		0.7700		33.7340 (79)
Solar gains	167.3422	293.1204	422.5081	559.4582	659.4535	669.1183	639.0948	562.2872	469.5875	329.7434	201.9078		142.2585 (83)
Total gains	768.6581	909.6438	1011.7367	1126.9665	1196.2599	1182.4231	1131.2836	1055.3031	978.6869	860.3076	767.0648		730.1224 (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	24.3822	24.4586	24.5340	24.8942	24.9628	25.2871	25.2871	25.3481	25.1612	24.9628	24.8245	24.6815	
alpha	2.6255	2.6306	2.6356	2.6596	2.6642	2.6858	2.6858	2.6899	2.6774	2.6642	2.6550	2.6454	
util living area													

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	0.9536	0.9287	0.8922	0.8193	0.7106	0.5645	0.4367	0.4785	0.6712	0.8514	0.9314	0.9588 (86)
MIT	18.4633	18.8193	19.3073	19.9378	20.4510	20.7942	20.9247	20.9020	20.6532	19.9784	19.1264	18.4140 (87)
Th 2	19.9689	19.9718	19.9746	19.9879	19.9904	20.0021	20.0021	20.0042	19.9976	19.9904	19.9854	19.9801 (88)
util rest of house												
	0.9469	0.9187	0.8767	0.7927	0.6668	0.4974	0.3492	0.3902	0.6091	0.8236	0.9200	0.9528 (89)
MIT 2	17.0100	17.4588	18.0707	18.8522	19.4580	19.8389	19.9588	19.9444	19.7005	18.9200	17.8606	16.9543 (90)
Living area fraction									FLA = Living area / (4) =			
MIT	17.4417	17.8629	18.4381	19.1747	19.7530	20.1227	20.2457	20.2289	19.9835	19.2344	18.2366	17.3879 (91)
Temperature adjustment												0.0000
adjusted MIT	17.4417	17.8629	18.4381	19.1747	19.7530	20.1227	20.2457	20.2289	19.9835	19.2344	18.2366	17.3879 (93)

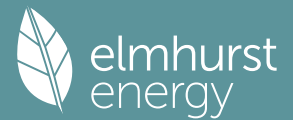
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9237	0.8913	0.8474	0.7678	0.6554	0.5060	0.3715	0.4111	0.6081	0.7985	0.8938	0.9312 (94)
Useful gains	710.0382	810.7918	857.3946	865.3190	784.0450	598.3106	420.2351	433.8272	595.1821	686.9357	685.6214	679.8942 (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	1654.6914	1627.0823	1493.8404	1267.0930	990.3814	670.4823	442.6092	463.7313	717.8677	1061.8855	1377.2411	1640.3732 (97)
Space heating kWh	702.8220	548.5472	473.5157	289.2773	153.5142	0.0000	0.0000	0.0000	0.0000	278.9626	497.9662	714.5964 (98a)
Space heating requirement - total per year (kWh/year)												3659.2017
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	702.8220	548.5472	473.5157	289.2773	153.5142	0.0000	0.0000	0.0000	0.0000	278.9626	497.9662	714.5964 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3659.2017
Space heating per m2												(98c) / (4) = 33.1090 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	702.8220	548.5472	473.5157	289.2773	153.5142	0.0000	0.0000	0.0000	0.0000	278.9626	497.9662	714.5964 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	760.6299	593.6658	512.4629	313.0706	166.1409	0.0000	0.0000	0.0000	0.0000	301.9076	538.9245	773.3727 (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	249.2170	220.3321	234.1951	206.5234	200.5387	181.0995	179.1623	186.1480	188.0173	209.1466	221.7121	246.6057 (64)
Efficiency of water heater (217)m	86.4756	86.2529	85.8571	85.1034	83.8156	80.3000	80.3000	80.3000	80.3000	84.9994	86.0605	86.5226 (216)
Fuel for water heating, kWh/month	288.1933	255.4490	272.7729	242.6734	239.2618	225.5286	223.1161	231.8157	234.1436	246.0566	257.6234	285.0188 (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	29.1762	23.4062	21.0747	15.4402	11.9265	9.7440	10.8797	14.1419	18.3689	24.1010	27.2220	29.9871 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-20.5001	-30.7927	-47.1136	-56.4824	-64.0016	-60.8521	-60.0872	-55.1674	-47.0751	-36.6970	-23.1915	-17.5085 (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	-6.4704	-13.9872	-28.5261	-43.9440	-59.2161	-59.9340	-59.2539	-49.6752	-35.7520	-20.3806	-8.7554	-5.0907 (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												3960.1750 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												3001.6533 (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)												235.4686 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-910.4547 (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												6372.8423 (238)

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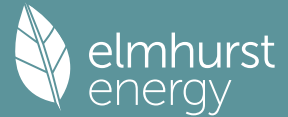
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3960.1750	0.2100	831.6368 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3001.6533	0.2100	630.3472 (264)
Space and water heating			1461.9840 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	235.4686	0.1443	33.9854 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-519.4691	0.1333	-69.2424
PV Unit electricity exported	-390.9855	0.1252	-48.9321
Total			-118.1744 (269)
Total CO2, kg/year			1389.7242 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.5700 (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	3960.1750	1.1300	4474.9978 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3001.6533	1.1300	3391.8682 (278)
Space and water heating			7866.8660 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	235.4686	1.5338	361.1695 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-519.4691	1.4926	-775.3389
PV Unit electricity exported	-390.9855	0.4594	-179.5997
Total			-954.9386 (283)
Total Primary energy kWh/year			7403.1977 (286)
Target Primary Energy Rate (TPER)			66.9900 (287)

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Property Reference	Flat 3.03			Issued on Date	22/04/2024
Assessment Reference	Additional Measures	Prop Type Ref			
Property	Christchurch Hall, , 38, Portland Street, Bristol, BS8 4JB				
SAP Rating	78 C	DER	19.24	TER	12.57
Environmental	82 B	% DER < TER			-53.06
CO ₂ Emissions (t/year)	1.75	DFEE	70.55	TFEE	38.54
Compliance Check	See BREL	% DFEE < TFEE			-83.08
% DPER < TPER	-64.50	DPER	110.20	TPER	66.99
Assessor Details	Mr. Jordan Howlett			Assessor ID	H055-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	59.7500 (1b)	x 3.0000 (2b)	= 179.2500 (1b) - (3b)
First floor	50.7700 (1c)	x 2.4000 (2c)	= 121.8480 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	110.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 301.0980 (5)

2. Ventilation rate

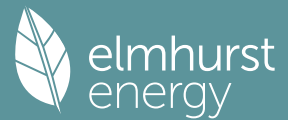
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	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) = 0.1328 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8828 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.8166 (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	1.0412	1.0208	1.0004	0.8983	0.8779	0.7758	0.7758	0.7554	0.8166	0.8779	0.9187	0.9595 (22b)
Effective ac	1.0412	1.0208	1.0004	0.9035	0.8853	0.8009	0.8009	0.7853	0.8334	0.8853	0.9220	0.9604 (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
External Door			2.1000	1.4000	2.9400		(26)
Window (Uw = 1.40)			19.7700	1.3258	26.2102		(27)
Exposed Floor			7.4700	0.1800	1.3446		(28b)
External Wall	47.2500	7.7700	39.4800	0.2600	10.2648		(29a)
Corridor wall	34.6500	2.1000	32.5500	0.2600	8.4630		(29a)
Loft Wall	49.2000		49.2000	0.1800	8.8560		(29a)
Dormer Wall	15.3600	12.0000	3.3600	0.1800	0.6048		(29a)
Exposed Roof	13.4200		13.4200	0.1600	2.1472		(30)
Loft Roof	50.7700		50.7700	0.1500	7.6155		(30)
Total net area of external elements Aum(A, m ²)			218.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	68.4461		(33)
Party Wall			37.2000	0.0000	0.0000		(32)
Party Floor			59.7500				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							43.6240 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	112.0701 (37)

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Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 103.4568	Feb 101.4283	Mar 99.3997	Apr 89.7708	May 87.9692	Jun 79.5827	Jul 79.5827	Aug 78.0296	Sep 82.8131	Oct 87.9692	Nov 91.6137	Dec 95.4239 (38)
Heat transfer coeff	215.5270	213.4984	211.4698	201.8409	200.0393	191.6528	191.6528	190.0998	194.8832	200.0393	203.6839	207.4940 (39)
Average = Sum(39)m / 12 =												201.8234
HLP	Jan 1.9501	Feb 1.9318	Mar 1.9134	Apr 1.8263	May 1.8100	Jun 1.7341	Jul 1.7341	Aug 1.7200	Sep 1.7633	Oct 1.8100	Nov 1.8430	Dec 1.8774 (40)
HLP (average)												1.8261
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

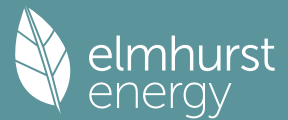
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.8179 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	30.8563	30.3981	29.7527	28.5629	27.6719	26.6840	26.1504	26.7912	27.4889	28.5460	29.7604	30.7520 (42b)
Hot water usage for other uses	43.4882	41.9068	40.3255	38.7441	37.1627	35.5813	35.5813	37.1627	38.7441	40.3255	41.9068	43.4882 (42c)
Average daily hot water use (litres/day)												68.1434 (43)
Daily hot water use	Jan 74.3446	Feb 72.3049	Mar 70.0782	Apr 67.3069	May 64.8346	Jun 62.2653	Jul 61.7316	Aug 63.9538	Sep 66.2330	Oct 68.8715	Nov 71.6672	Dec 74.2403 (44)
Energy conte	117.7436	102.9612	107.7076	92.1398	87.2798	76.5624	74.6591	79.1882	81.6719	93.4579	102.1031	116.2423 (45)
Energy content (annual)										Total = Sum(45)m =		1131.7171
Distribution loss (46)m = 0.15 x (45)m	17.6615	15.4442	16.1561	13.8210	13.0920	11.4844	11.1989	11.8782	12.2508	14.0187	15.3155	17.4363 (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	25.3600	22.8989	25.3419	24.5079	25.3136	24.4864	25.2979	25.3047	24.4960	25.3253	24.5247	25.3582 (61)
Total heat required for water heating calculated for each month	143.1037	125.8601	133.0495	116.6478	112.5934	101.0488	99.9569	104.4929	106.1679	118.7832	126.6278	141.6005 (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	143.1037	125.8601	133.0495	116.6478	112.5934	101.0488	99.9569	104.4929	106.1679	118.7832	126.6278	141.6005 (64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				1429.9326 (64)
Electric shower(s)	57.2331	50.9952	55.6848	53.1393	54.1364	51.6409	53.3623	54.1364	53.1393	55.6848	54.6377	57.2331 (64a)
												651.0231 (64a)
Heat gains from water heating, kWh/month	59.7980	52.7081	56.0694	50.0483	48.8831	44.4888	44.4892	46.1904	46.5647	51.3273	53.7399	59.2984 (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	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	140.4185	155.4633	140.4185	145.0991	140.4185	145.0991	140.4185	140.4185	145.0991	140.4185	145.0991	140.4185 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	272.3010	275.1266	268.0061	252.8474	233.7123	215.7279	203.7133	200.8877	208.0082	223.1669	242.3020	260.2864 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896 (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)	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165 (71)
Water heating gains (Table 5)	80.3737	78.4347	75.3622	69.5115	65.7030	61.7900	59.7973	62.0838	64.6732	68.9883	74.6387	79.7021 (72)
Total internal gains	561.3619	577.2934	552.0555	535.7267	508.1025	487.8858	469.1977	468.6587	483.0492	500.8423	530.3085	548.6756 (73)

6. Solar gains												
[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	Gains W
Northeast			7.0500		11.2829		0.6300		0.7700		0.7700	24.3099 (75)
Southeast			9.7200		36.7938		0.6300		0.7700		0.7700	109.2982 (77)
Southwest			3.0000		36.7938		0.6300		0.7700		0.7700	33.7340 (79)
Solar gains	167.3422	293.1204	422.5081	559.4582	659.4535	669.1183	639.0948	562.2872	469.5875	329.7434	201.9078	142.2585 (83)
Total gains	728.7040	870.4137	974.5636	1095.1849	1167.5559	1157.0040	1108.2925	1030.9458	952.6367	830.5857	732.2163	690.9341 (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 14.2442	Feb 14.3795	Mar 14.5174	Apr 15.2100	May 15.3470	Jun 16.0185	Jul 16.0185	Aug 16.1494	Sep 15.7530	Oct 15.3470	Nov 15.0724	Dec 14.7956
alpha	1.9496	1.9586	1.9678	2.0140	2.0231	2.0679	2.0679	2.0766	2.0502	2.0231	2.0048	1.9864
util living area	0.9642	0.9484	0.9260	0.8796	0.8079	0.6935	0.5787	0.6180	0.7789	0.9000	0.9499	0.9675 (86)
MIT	16.8226	17.2136	17.8465	18.7900	19.6231	20.3491	20.6902	20.6344	20.0829	18.9989	17.8239	16.8514 (87)
Th 2	19.3668	19.3792	19.3917	19.4517	19.4630	19.5165	19.5165	19.5265	19.4958	19.4630	19.4401	19.4163 (88)

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util rest of house	0.9574	0.9385	0.9109	0.8529	0.7588	0.6028	0.4352	0.4812	0.7047	0.8725	0.9387	0.9614 (89)
MIT 2	14.7142	15.2045	15.9973	17.1815	18.1901	19.0378	19.3666	19.3335	18.7592	17.4622	15.9914	14.7600 (90)
Living area fraction									flA =	Living area /	(4) =	0.2971 (91)
MIT	15.3405	15.8013	16.5466	17.6593	18.6158	19.4273	19.7598	19.7199	19.1524	17.9187	16.5357	15.3812 (92)
Temperature adjustment												0.0000
adjusted MIT	15.3405	15.8013	16.5466	17.6593	18.6158	19.4273	19.7598	19.7199	19.1524	17.9187	16.5357	15.3812 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9288	0.9036	0.8704	0.8101	0.7241	0.5964	0.4622	0.5022	0.6832	0.8323	0.9054	0.9349	(94)
Useful gains	676.7972	786.4651	848.2434	887.2297	845.4031	689.9956	512.2518	517.7209	650.8289	691.3273	662.9181	645.9806	(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	2379.5264	2327.4160	2124.5522	1767.9857	1383.4244	925.1709	605.5764	631.1172	984.6268	1464.0306	1921.9026	2320.0358	(97)
Space heating kWh	1266.8305	1035.5190	949.5737	634.1443	400.2878	0.0000	0.0000	0.0000	0.0000	574.8912	906.4688	1245.4971	(98a)
Space heating requirement - total per year (kWh/year)												7013.2125	
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	1266.8305	1035.5190	949.5737	634.1443	400.2878	0.0000	0.0000	0.0000	0.0000	574.8912	906.4688	1245.4971	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7013.2125	
Space heating per m2											(98c) / (4) =	63.4565	(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 %)													89.2000 (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	1266.8305	1035.5190	949.5737	634.1443	400.2878	0.0000	0.0000	0.0000	0.0000	574.8912	906.4688	1245.4971	(98)
Space heating efficiency (main heating system 1)	89.2000	89.2000	89.2000	89.2000	89.2000	0.0000	0.0000	0.0000	0.0000	89.2000	89.2000	89.2000	(210)
Space heating fuel (main heating system)	1420.2136	1160.8957	1064.5445	710.9241	448.7532	0.0000	0.0000	0.0000	0.0000	644.4969	1016.2207	1396.2971	(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	143.1037	125.8601	133.0495	116.6478	112.5934	101.0488	99.9569	104.4929	106.1679	118.7832	126.6278	141.6005	(64)
Efficiency of water heater (217)m	88.9928	88.9788	88.9493	88.8833	88.7531	87.2000	87.2000	87.2000	87.2000	88.8510	88.9499	88.9916	(216)
Fuel for water heating, kWh/month	160.8036	141.4495	149.5791	131.2370	126.8614	115.8817	114.6295	119.8313	121.7522	133.6880	142.3585	159.1166	(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	28.3567	22.7488	20.4828	15.0066	11.5915	9.4704	10.5742	13.7447	17.8530	23.4241	26.4575	29.1449	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1													7862.3459 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													87.2000
Water heating fuel used													1617.1885 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
central heating pump													41.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													86.0000 (231)
Electricity for lighting (calculated in Appendix L)													228.8551 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													0.0000 (233)
Wind generation													0.0000 (234)
Hydro-electric generation (Appendix N)													0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (235)
Appendix Q - special features													
Energy saved or generated													-0.0000 (236)
Energy used													0.0000 (237)
Total delivered energy for all uses													10445.4126 (238)

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

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	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	7862.3459	0.2100	1651.0926 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1617.1885	0.2100	339.6096 (264)
Energy for instantaneous electric shower(s)	651.0231	0.1391	90.5717 (264a)
Space and water heating			1990.7022 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	228.8551	0.1443	33.0309 (268)
Total CO2, kg/year			2126.2341 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			19.2400 (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	7862.3459	1.1300	8884.4509 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1617.1885	1.1300	1827.4230 (278)
Energy for instantaneous electric shower(s)	651.0231	1.5143	985.8665 (278a)
Space and water heating			10711.8739 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	228.8551	1.5338	351.0256 (282)
Total Primary energy kWh/year			12178.8667 (286)
Dwelling Primary energy Rate (DPER)			110.2000 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	59.7500 (1b)	x 3.0000 (2b)	= 179.2500 (1b) - (3b)
First floor	50.7700 (1c)	x 2.4000 (2c)	= 121.8480 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	110.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 301.0980 (5)

2. Ventilation rate

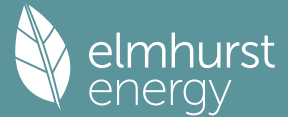
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.1328 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3828 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3541 (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	0.4515	0.4427	0.4338	0.3895	0.3807	0.3364	0.3364	0.3276	0.3541	0.3807	0.3984	0.4161 (22b)
Effective ac	0.6019	0.5980	0.5941	0.5759	0.5725	0.5566	0.5566	0.5537	0.5627	0.5725	0.5794	0.5866 (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
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type (Uw = 1.20)			19.7700	1.1450	22.6374		(27)
Exposed Floor			7.4700	0.1300	0.9711		(28b)
External Wall	47.2500	7.7700	39.4800	0.1800	7.1064		(29a)
Corridor wall	34.6500	2.1000	32.5500	0.1800	5.8590		(29a)
Loft Wall	49.2000		49.2000	0.1800	8.8560		(29a)
Dormer Wall	15.3600	12.0000	3.3600	0.1800	0.6048		(29a)
Exposed Roof	13.4200		13.4200	0.1100	1.4762		(30)
Loft Roof	50.7700		50.7700	0.1100	5.5847		(30)
Total net area of external elements Aum(A, m2)			218.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	55.1956		(33)
Party Wall			37.2000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)

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Thermal bridges (User defined value 0.050 * total exposed area)
Point Thermal bridges
Total fabric heat loss

(33) + (36) + (36a) =
66.1016 (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	59.8097	59.4164	59.0309	57.2201	56.8813	55.3042	55.3042	55.0122	55.9117	56.8813	57.5667	58.2832	(38)
Heat transfer coeff	125.9113	125.5180	125.1325	123.3217	122.9829	121.4058	121.4058	121.1138	122.0133	122.9829	123.6683	124.3848	(39)
Average = Sum(39)m / 12 =												123.3201	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1393	1.1357	1.1322	1.1158	1.1128	1.0985	1.0985	1.0959	1.1040	1.1128	1.1190	1.1255	(40)
HLP (average)												1.1158	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8179 (42)

Hot water usage for mixer showers 71.4669 70.3929 68.8279 65.8334 63.6236 61.1593 59.7585 61.3117 63.0143 65.6603 68.7190 71.1931 (42a)

Hot water usage for baths 30.8563 30.3981 29.7527 28.5629 27.6719 26.6840 26.1504 26.7912 27.4889 28.5460 29.7604 30.7520 (42b)

Hot water usage for other uses 43.4882 41.9068 40.3255 38.7441 37.1627 35.5813 35.5813 37.1627 38.7441 40.3255 41.9068 43.4882 (42c)

Average daily hot water use (litres/day) 134.0335 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	145.8115	142.6978	138.9061	133.1404	128.4582	123.4246	121.4902	125.2656	129.2473	134.5318	140.3863	145.4334	(44)
Energy conte	230.9298	203.1998	213.4935	182.2625	172.9295	151.7649	146.9318	155.1050	159.3748	182.5583	200.0060	227.7135	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m	34.6395	30.4800	32.0240	27.3394	25.9394	22.7647	22.0398	23.2657	23.9062	27.3838	30.0009	34.1570	(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													
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	(57)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
WWHRS	281.8887	249.2272	264.4524	231.5776	223.8884	201.0800	197.8907	206.0639	208.6899	233.5172	249.3211	278.6724	(62)
PV diverter	-32.6717	-28.8951	-30.2573	-25.0542	-23.3496	-19.9805	-18.7285	-19.9159	-20.6726	-24.3707	-27.6090	-32.0667	(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	249.2170	220.3321	234.1951	206.5234	200.5387	181.0995	179.1623	186.1480	188.0173	209.1466	221.7121	246.6057	(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	89.5239	79.0708	83.7263	72.9311	70.2388	62.7906	61.5946	64.3121	65.3209	73.4404	78.8308	88.4545	(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	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	140.4185	155.4633	140.4185	145.0991	140.4185	145.0991	140.4185	140.4185	145.0991	140.4185	145.0991	140.4185	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	272.3010	275.1266	268.0061	252.8474	233.7123	215.7279	203.7133	200.8877	208.0082	223.1669	242.3020	260.2864	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	(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)	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	(71)
Water heating gains (Table 5)	120.3278	117.6649	112.5353	101.2931	94.4070	87.2092	82.7884	86.4410	90.7235	98.7102	109.4872	118.8904	(72)
Total internal gains	601.3159	616.5235	589.2286	567.5083	536.8064	513.3049	492.1889	493.0159	509.0994	530.5642	565.1570	587.8639	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
Northeast	7.0500	11.2829	0.6300	0.7000	0.7700	24.3099 (75)							
Southeast	9.7200	36.7938	0.6300	0.7000	0.7700	109.2982 (77)							
Southwest	3.0000	36.7938	0.6300	0.7000	0.7700	33.7340 (79)							
Solar gains	167.3422	293.1204	422.5081	559.4582	659.4535	669.1183	639.0948	562.2872	469.5875	329.7434	201.9078	142.2585	(83)
Total gains	768.6581	909.6438	1011.7367	1126.9665	1196.2599	1182.4231	1131.2836	1055.3031	978.6869	860.3076	767.0648	730.1224	(84)

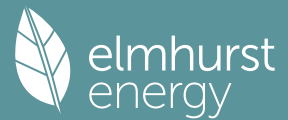
7. Mean internal temperature (heating season)

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	24.3822	24.4586	24.5340	24.8942	24.9628	25.2871	25.2871	25.3481	25.1612	24.9628	24.8245	24.6815	
alpha	2.6255	2.6306	2.6356	2.6596	2.6642	2.6858	2.6858	2.6899	2.6774	2.6642	2.6550	2.6454	
util living area													

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	0.9536	0.9287	0.8922	0.8193	0.7106	0.5645	0.4367	0.4785	0.6712	0.8514	0.9314	0.9588 (86)
MIT	18.4633	18.8193	19.3073	19.9378	20.4510	20.7942	20.9247	20.9020	20.6532	19.9784	19.1264	18.4140 (87)
Th 2	19.9689	19.9718	19.9746	19.9879	19.9904	20.0021	20.0021	20.0042	19.9976	19.9904	19.9854	19.9801 (88)
util rest of house												
	0.9469	0.9187	0.8767	0.7927	0.6668	0.4974	0.3492	0.3902	0.6091	0.8236	0.9200	0.9528 (89)
MIT 2	17.0100	17.4588	18.0707	18.8522	19.4580	19.8389	19.9588	19.9444	19.7005	18.9200	17.8606	16.9543 (90)
Living area fraction									FLA = Living area / (4) =			
MIT	17.4417	17.8629	18.4381	19.1747	19.7530	20.1227	20.2457	20.2289	19.9835	19.2344	18.2366	17.3879 (91)
Temperature adjustment												0.0000
adjusted MIT	17.4417	17.8629	18.4381	19.1747	19.7530	20.1227	20.2457	20.2289	19.9835	19.2344	18.2366	17.3879 (93)

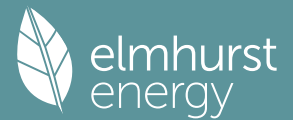
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9237	0.8913	0.8474	0.7678	0.6554	0.5060	0.3715	0.4111	0.6081	0.7985	0.8938	0.9312 (94)
Useful gains	710.0382	810.7918	857.3946	865.3190	784.0450	598.3106	420.2351	433.8272	595.1821	686.9357	685.6214	679.8942 (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	1654.6914	1627.0823	1493.8404	1267.0930	990.3814	670.4823	442.6092	463.7313	717.8677	1061.8855	1377.2411	1640.3732 (97)
Space heating kWh	702.8220	548.5472	473.5157	289.2773	153.5142	0.0000	0.0000	0.0000	0.0000	278.9626	497.9662	714.5964 (98a)
Space heating requirement - total per year (kWh/year)												3659.2017
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	702.8220	548.5472	473.5157	289.2773	153.5142	0.0000	0.0000	0.0000	0.0000	278.9626	497.9662	714.5964 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3659.2017
Space heating per m2										(98c) / (4) =		33.1090 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	702.8220	548.5472	473.5157	289.2773	153.5142	0.0000	0.0000	0.0000	0.0000	278.9626	497.9662	714.5964 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	760.6299	593.6658	512.4629	313.0706	166.1409	0.0000	0.0000	0.0000	0.0000	301.9076	538.9245	773.3727 (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	249.2170	220.3321	234.1951	206.5234	200.5387	181.0995	179.1623	186.1480	188.0173	209.1466	221.7121	246.6057 (64)
Efficiency of water heater (217)m	86.4756	86.2529	85.8571	85.1034	83.8156	80.3000	80.3000	80.3000	80.3000	84.9994	86.0605	86.5226 (217)
Fuel for water heating, kWh/month	288.1933	255.4490	272.7729	242.6734	239.2618	225.5286	223.1161	231.8157	234.1436	246.0566	257.6234	285.0188 (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	29.1762	23.4062	21.0747	15.4402	11.9265	9.7440	10.8797	14.1419	18.3689	24.1010	27.2220	29.9871 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-20.5001	-30.7927	-47.1136	-56.4824	-64.0016	-60.8521	-60.0872	-55.1674	-47.0751	-36.6970	-23.1915	-17.5085 (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	-6.4704	-13.9872	-28.5261	-43.9440	-59.2161	-59.9340	-59.2539	-49.6752	-35.7520	-20.3806	-8.7554	-5.0907 (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												3960.1750 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												3001.6533 (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)												235.4686 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-910.4547 (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												6372.8423 (238)

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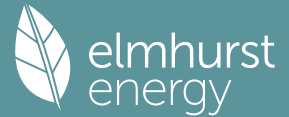
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3960.1750	0.2100	831.6368 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3001.6533	0.2100	630.3472 (264)
Space and water heating			1461.9840 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	235.4686	0.1443	33.9854 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-519.4691	0.1333	-69.2424
PV Unit electricity exported	-390.9855	0.1252	-48.9321
Total			-118.1744 (269)
Total CO2, kg/year			1389.7242 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.5700 (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	3960.1750	1.1300	4474.9978 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3001.6533	1.1300	3391.8682 (278)
Space and water heating			7866.8660 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	235.4686	1.5338	361.1695 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-519.4691	1.4926	-775.3389
PV Unit electricity exported	-390.9855	0.4594	-179.5997
Total			-954.9386 (283)
Total Primary energy kWh/year			7403.1977 (286)
Target Primary Energy Rate (TPER)			66.9900 (287)

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Property Reference	Flat 3.03			Issued on Date	22/04/2024
Assessment Reference	Renewables	Prop Type Ref			
Property	Christchurch Hall, , 38, Portland Street, Bristol, BS8 4JB				
SAP Rating	77 C	DER	5.06	TER	12.38
Environmental	95 A	% DER < TER			59.13
CO ₂ Emissions (t/year)	0.49	DFEE	70.55	TFEE	38.54
Compliance Check	See BREL	% DFEE < TFEE			-83.08
% DPER < TPER	19.63	DPER	52.98	TPER	65.92
Assessor Details	Mr. Jordan Howlett			Assessor ID	H055-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	59.7500 (1b)	x 3.0000 (2b)	= 179.2500 (1b) - (3b)
First floor	50.7700 (1c)	x 2.4000 (2c)	= 121.8480 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	110.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 301.0980 (5)

2. Ventilation rate

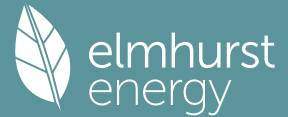
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	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) = 0.1328 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8828 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.8166 (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	1.0412	1.0208	1.0004	0.8983	0.8779	0.7758	0.7758	0.7554	0.8166	0.8779	0.9187	0.9595 (22b)
Effective ac	1.0412	1.0208	1.0004	0.9035	0.8853	0.8009	0.8009	0.7853	0.8334	0.8853	0.9220	0.9604 (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
External Door			2.1000	1.4000	2.9400		(26)
Window (Uw = 1.40)			19.7700	1.3258	26.2102		(27)
Exposed Floor			7.4700	0.1800	1.3446		(28b)
External Wall	47.2500	7.7700	39.4800	0.2600	10.2648		(29a)
Corridor wall	34.6500	2.1000	32.5500	0.2600	8.4630		(29a)
Loft Wall	49.2000		49.2000	0.1800	8.8560		(29a)
Dormer Wall	15.3600	12.0000	3.3600	0.1800	0.6048		(29a)
Exposed Roof	13.4200		13.4200	0.1600	2.1472		(30)
Loft Roof	50.7700		50.7700	0.1500	7.6155		(30)
Total net area of external elements Aum(A, m ²)			218.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	68.4461		(33)
Party Wall			37.2000	0.0000	0.0000		(32)
Party Floor			59.7500				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							43.6240 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	112.0701 (37)

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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	103.4568	101.4283	99.3997	89.7708	87.9692	79.5827	79.5827	78.0296	82.8131	87.9692	91.6137	95.4239	(38)
Heat transfer coeff	215.5270	213.4984	211.4698	201.8409	200.0393	191.6528	191.6528	190.0998	194.8832	200.0393	203.6839	207.4940	(39)
Average = Sum(39)m / 12 =												201.8234	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.9501	1.9318	1.9134	1.8263	1.8100	1.7341	1.7341	1.7200	1.7633	1.8100	1.8430	1.8774	(40)
HLP (average)												1.8261	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8179	(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	30.8563	30.3981	29.7527	28.5629	27.6719	26.6840	26.1504	26.7912	27.4889	28.5460	29.7604	30.7520	(42b)	
Hot water usage for other uses	43.4882	41.9068	40.3255	38.7441	37.1627	35.5813	35.5813	37.1627	38.7441	40.3255	41.9068	43.4882	(42c)	
Average daily hot water use (litres/day)												68.1434	(43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use	74.3446	72.3049	70.0782	67.3069	64.8346	62.2653	61.7316	63.9538	66.2330	68.8715	71.6672	74.2403	(44)	
Energy conte	117.7436	102.9612	107.7076	92.1398	87.2798	76.5624	74.6591	79.1882	81.6719	93.4579	102.1031	116.2423	(45)	
Energy content (annual)										Total = Sum(45)m =		1131.7171		
Distribution loss (46)m = 0.15 x (45)m	17.6615	15.4442	16.1561	13.8210	13.0920	11.4844	11.1989	11.8782	12.2508	14.0187	15.3155	17.4363	(46)	
Water storage loss:														
Store volume												180.0000	(47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.8600	(48)	
Temperature factor from Table 2b												0.5400	(49)	
Enter (49) or (54) in (55)												1.0044	(55)	
Total storage loss	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)	
If cylinder contains dedicated solar storage	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(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	172.1424	152.0956	162.1064	144.7838	141.6786	129.2064	129.0579	133.5870	134.3159	147.8567	154.7471	170.6411	(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	172.1424	152.0956	162.1064	144.7838	141.6786	129.2064	129.0579	133.5870	134.3159	147.8567	154.7471	170.6411	(64)	
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1772.2191	(64)	
Electric shower(s)	57.2331	50.9952	55.6848	53.1393	54.1364	51.6409	53.3623	54.1364	53.1393	55.6848	54.6377	57.2331	(64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												651.0231	(64a)	
Heat gains from water heating, kWh/month	96.9771	86.2909	93.2530	86.0365	86.0737	80.4824	81.6837	83.3832	82.5559	88.5150	89.7239	96.4779	(65)	

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	140.4185	155.4633	140.4185	145.0991	140.4185	145.0991	140.4185	140.4185	145.0991	140.4185	145.0991	140.4185	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	272.3010	275.1266	268.0061	252.8474	233.7123	215.7279	203.7133	200.8877	208.0082	223.1669	242.3020	260.2864	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	(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)	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	(71)
Water heating gains (Table 5)	130.3455	128.4091	125.3401	119.4952	115.6904	111.7812	109.7900	112.0742	114.6610	118.9718	124.6165	129.6746	(72)
Total internal gains	608.3337	624.2677	599.0334	582.7104	555.0899	537.8769	519.1904	518.6491	533.0369	547.8258	577.2863	595.6481	(73)

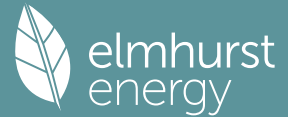
6. Solar gains

[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	
Northeast					7.0500	11.2829	0.6300	0.7000		0.7700		24.3099 (75)	
Southeast					9.7200	36.7938	0.6300	0.7000		0.7700		109.2982 (77)	
Southwest					3.0000	36.7938	0.6300	0.7000		0.7700		33.7340 (79)	
Solar gains	167.3422	293.1204	422.5081	559.4582	659.4535	669.1183	639.0948	562.2872	469.5875	329.7434	201.9078	142.2585 (83)	
Total gains	775.6758	917.3881	1021.5414	1142.1686	1214.5433	1206.9951	1158.2852	1080.9363	1002.6244	877.5692	779.1942	737.9066 (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	14.2442	14.3795	14.5174	15.2100	15.3470	16.0185	16.0185	16.1494	15.7530	15.3470	15.0724	14.7956		
alpha	1.9496	1.9586	1.9678	2.0140	2.0231	2.0679	2.0679	2.0766	2.0502	2.0231	2.0048	1.9864		
util living area														

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	0.9602	0.9437	0.9203	0.8718	0.7978	0.6795	0.5630	0.6013	0.7644	0.8911	0.9443	0.9636 (86)
Living	16.8834	17.2719	17.9013	18.8385	19.6616	20.3762	20.7067	20.6541	20.1201	19.0507	17.8838	16.9140
Non living	14.7896	15.2762	16.0636	17.2381	18.2313	19.0613	19.3761	19.3461	18.7950	17.5225	16.0649	14.8379
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	4	0	0	0	0	0	0	0	0	0	0	0
16 / 9	27	0	0	0	0	0	0	0	0	0	0	27
MIT	18.9720	17.2719	17.9013	18.8385	19.6616	20.3762	20.7067	20.6541	20.1201	19.0507	17.8838	18.4584 (87)
Th 2	19.3668	19.3792	19.3917	19.4517	19.4630	19.5165	19.5165	19.5265	19.4958	19.4630	19.4401	19.4163 (88)
util rest of house												
	0.9526	0.9330	0.9042	0.8439	0.7472	0.5878	0.4206	0.4649	0.6880	0.8618	0.9320	0.9567 (89)
MIT 2	17.5847	15.2762	16.0636	17.2381	18.2313	19.0613	19.3761	19.3461	18.7950	17.5225	16.0649	17.0461 (90)
Living area fraction									FLA = Living area / (4) =			
MIT	17.9968	15.8690	16.6095	17.7135	18.6561	19.4519	19.7714	19.7346	19.1886	17.9765	16.6052	17.4656 (92)
Temperature adjustment												0.0000
adjusted MIT	17.9968	15.8690	16.6095	17.7135	18.6561	19.4519	19.7714	19.7346	19.1886	17.9765	16.6052	17.4656 (93)

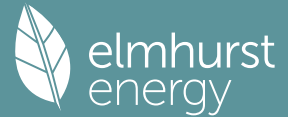
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9445	0.8965	0.8626	0.8010	0.7135	0.5831	0.4485	0.4872	0.6685	0.8212	0.8969	0.9454	(94)
Useful gains	732.6064	822.4396	881.1337	914.8921	866.6223	703.8537	519.4493	526.5826	670.2121	720.6662	698.8962	697.5983	(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	2952.0212	2341.8706	2137.8513	1778.9228	1391.5036	929.8867	607.7994	633.9094	991.6820	1475.5848	1936.0474	2752.5357	(97)
Space heating kWh	1651.2446	1021.0576	934.9979	622.1021	390.5117	0.0000	0.0000	0.0000	0.0000	561.6594	890.7489	1528.8734	(98a)
Space heating requirement - total per year (kWh/year)												7601.1957	
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	1651.2446	1021.0576	934.9979	622.1021	390.5117	0.0000	0.0000	0.0000	0.0000	561.6594	890.7489	1528.8734	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7601.1957	
Space heating per m2											(98c) / (4) =	68.7767	(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 %)													388.7346 (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	1651.2446	1021.0576	934.9979	622.1021	390.5117	0.0000	0.0000	0.0000	0.0000	561.6594	890.7489	1528.8734	(98)
Space heating efficiency (main heating system 1)	388.7346	388.7346	388.7346	388.7346	388.7346	0.0000	0.0000	0.0000	0.0000	388.7346	388.7346	388.7346	(210)
Space heating fuel (main heating system)	424.7743	262.6619	240.5235	160.0326	100.4572	0.0000	0.0000	0.0000	0.0000	144.4840	229.1406	393.2949	(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	172.1424	152.0956	162.1064	144.7838	141.6786	129.2064	129.0579	133.5870	134.3159	147.8567	154.7471	170.6411	(64)
Efficiency of water heater	186.6289	186.6289	186.6289	186.6289	186.6289	186.6289	186.6289	186.6289	186.6289	186.6289	186.6289	186.6289	(216)
Fuel for water heating, kWh/month	92.2378	81.4963	86.8603	77.5785	75.9146	69.2317	69.1521	71.5790	71.9695	79.2250	82.9170	91.4334	(217)
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	(219)
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	28.3567	22.7488	20.4828	15.0066	11.5915	9.4704	10.5742	13.7447	17.8530	23.4241	26.4575	29.1449	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	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	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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	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	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												1955.3691	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												186.6289	
Water heating fuel used												949.5951	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												228.8551	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)

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Total delivered energy for all uses

3784.8424 (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	1955.3691	0.1547	302.5664	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	949.5951	0.1405	133.4578	(264)
Energy for instantaneous electric shower(s)	651.0231	0.1391	90.5717	(264a)
Space and water heating			436.0241	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	228.8551	0.1443	33.0309	(268)
Total CO2, kg/year			559.6267	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.0600	(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	1955.3691	1.5728	3075.4296	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	949.5951	1.5197	1443.0560	(278)
Energy for instantaneous electric shower(s)	651.0231	1.5143	985.8665	(278a)
Space and water heating			4518.4856	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	228.8551	1.5338	351.0256	(282)
Total Primary energy kWh/year			5855.3777	(286)
Dwelling Primary energy Rate (DPER)			52.9800	(287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	59.7500 (1b)	x 3.0000 (2b)	= 179.2500	(1b) - (3b)
First floor	50.7700 (1c)	x 2.4000 (2c)	= 121.8480	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	110.5200			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 301.0980	(5)

2. Ventilation rate

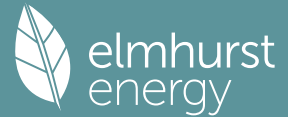
	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
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) =	0.1328 (8)
Pressure Test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3828	(18)
Number of sides sheltered	1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3541 (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	0.4515	0.4427	0.4338	0.3895	0.3807	0.3364	0.3364	0.3276	0.3541	0.3807	0.3984	0.4161	(22b)
Effective ac	0.6019	0.5980	0.5941	0.5759	0.5725	0.5566	0.5566	0.5537	0.5627	0.5725	0.5794	0.5866	(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	
TER Opaque door			2.1000	1.0000	2.1000			(26)
TER Opening Type (Uw = 1.20)			19.7700	1.1450	22.6374			(27)
Exposed Floor			7.4700	0.1300	0.9711			(28b)
External Wall	47.2500	7.7700	39.4800	0.1800	7.1064			(29a)
Corridor wall	34.6500	2.1000	32.5500	0.1800	5.8590			(29a)
Loft Wall	49.2000		49.2000	0.1800	8.8560			(29a)
Dormer Wall	15.3600	12.0000	3.3600	0.1800	0.6048			(29a)

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Exposed Roof	13.4200	13.4200	0.1100	1.4762	(30)
Loft Roof	50.7700	50.7700	0.1100	5.5847	(30)
Total net area of external elements Aum(A, m2)		218.1200			(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		55.1956	(33)
Party Wall		37.2000	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K					100.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)					10.9060 (36)
Point Thermal bridges				(36a) =	0.0000
Total fabric heat loss				(33) + (36) + (36a) =	66.1016 (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	59.8097	59.4164	59.0309	57.2201	56.8813	55.3042	55.3042	55.0122	55.9117	56.8813	57.5667	58.2832	(38)
Average = Sum(39)m / 12 =	125.9113	125.5180	125.1325	123.3217	122.9829	121.4058	121.4058	121.1138	122.0133	122.9829	123.6683	124.3848	(39)
												123.3201	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1393	1.1357	1.1322	1.1158	1.1128	1.0985	1.0985	1.0959	1.1040	1.1128	1.1190	1.1255	(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													2.8179 (42)
Hot water usage for mixer showers													
	71.4669	70.3929	68.8279	65.8334	63.6236	61.1593	59.7585	61.3117	63.0143	65.6603	68.7190	71.1931	(42a)
Hot water usage for baths													
	30.8563	30.3981	29.7527	28.5629	27.6719	26.6840	26.1504	26.7912	27.4889	28.5460	29.7604	30.7520	(42b)
Hot water usage for other uses													
	43.4882	41.9068	40.3255	38.7441	37.1627	35.5813	35.5813	37.1627	38.7441	40.3255	41.9068	43.4882	(42c)
Average daily hot water use (litres/day)													134.0335 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	145.8115	142.6978	138.9061	133.1404	128.4582	123.4246	121.4902	125.2656	129.2473	134.5318	140.3863	145.4334	(44)
Energy conte	230.9298	203.1998	213.4935	182.2625	172.9295	151.7649	146.9318	155.1050	159.3748	182.5583	200.0060	227.7135	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
	34.6395	30.4800	32.0240	27.3394	25.9394	22.7647	22.0398	23.2657	23.9062	27.3838	30.0009	34.1570	(46)
Water storage loss:													
Store volume													180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.5520 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8381 (55)
Total storage loss													
	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(56)
If cylinder contains dedicated solar storage													
	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(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	22.5120	(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													
	280.1724	247.6771	262.7361	229.9167	222.1721	199.4191	196.1745	204.3476	207.0290	231.8010	247.6602	276.9562	(62)
WWHRS	-32.6717	-28.8951	-30.2573	-25.0542	-23.3496	-19.9805	-18.7285	-19.9159	-20.6726	-24.3707	-27.6090	-32.0667	(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													
	247.5007	218.7819	232.4788	204.8625	198.8225	179.4386	177.4460	184.4317	186.3565	207.4304	220.0512	244.8895	(64)
Total per year (kWh/year)													
													2502.4904 (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													
	116.1783	103.1457	110.3807	98.7257	96.8932	88.5852	88.2490	90.9665	91.1155	100.0948	104.6253	115.1089	(65)

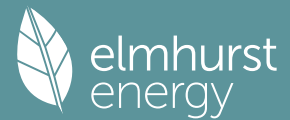
5. Internal gains (see Table 5 and 5a)

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	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	140.8956	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	140.4185	155.4633	140.4185	145.0991	140.4185	145.0991	140.4185	140.4185	145.0991	140.4185	145.0991	140.4185	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	272.3010	275.1266	268.0061	252.8474	233.7123	215.7279	203.7133	200.8877	208.0082	223.1669	242.3020	260.2864	(68)
Pumps, fans	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	37.0896	(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)	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	-112.7165	(71)
Total internal gains	156.1536	153.4907	148.3612	137.1190	130.2328	123.0350	118.6142	122.2668	126.5493	134.5360	145.3130	154.7162	(72)
	637.1418	652.3493	625.0545	603.3342	572.6322	549.1307	528.0147	528.8417	544.9252	566.3900	600.9828	623.6897	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W				
Northeast				7.0500	11.2829	0.6300	0.7000	0.7700	24.3099 (75)				
Southeast				9.7200	36.7938	0.6300	0.7000	0.7700	109.2982 (77)				
Southwest				3.0000	36.7938	0.6300	0.7000	0.7700	33.7340 (79)				
Solar gains	167.3422	293.1204	422.5081	559.4582	659.4535	669.1183	639.0948	562.2872	469.5875	329.7434	201.9078	142.2585	(83)
Total gains	804.4839	945.4697	1047.5626	1162.7924	1232.0857	1218.2490	1167.1095	1091.1289	1014.5127	896.1334	802.8906	765.9482	(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	24.3822	24.4586	24.5340	24.8942	24.9628	25.2871	25.2871	25.3481	25.1612	24.9628	24.8245	24.6815
alpha	2.6255	2.6306	2.6356	2.6596	2.6642	2.6858	2.6858	2.6899	2.6774	2.6642	2.6550	2.6454
util living area	0.9489	0.9230	0.8850	0.8100	0.6995	0.5525	0.4255	0.4659	0.6572	0.8407	0.9247	0.9543 (86)
MIT	18.5195	18.8709	19.3527	19.9725	20.4731	20.8048	20.9293	20.9083	20.6716	20.0175	19.1786	18.4715 (87)
Th 2	19.9689	19.9718	19.9746	19.9879	19.9904	20.0021	20.0021	20.0042	19.9976	19.9904	19.9854	19.9801 (88)
util rest of house	0.9416	0.9122	0.8687	0.7827	0.6552	0.4859	0.3395	0.3789	0.5947	0.8117	0.9125	0.9477 (89)
MIT 2	17.0805	17.5227	18.1257	18.8923	19.4813	19.8480	19.9617	19.9486	19.7178	18.9650	17.9249	17.0265 (90)
Living area fraction	fLA = Living area / (4) = 0.2971 (91)											
MIT	17.5079	17.9232	18.4902	19.2132	19.7759	20.1322	20.2491	20.2336	20.0011	19.2777	18.2973	17.4557 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.5079	17.9232	18.4902	19.2132	19.7759	20.1322	20.2491	20.2336	20.0011	19.2777	18.2973	17.4557 (93)

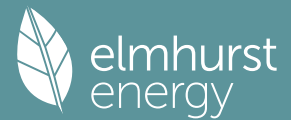
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9174	0.8843	0.8394	0.7585	0.6449	0.4951	0.3616	0.3999	0.5949	0.7871	0.8855	0.9250 (94)	
Useful gains	737.9958	836.0592	879.3348	881.9269	794.5976	603.1228	422.0521	436.3232	603.5585	705.3749	710.9899	708.4759 (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	1663.0284	1634.6433	1500.3647	1271.8365	993.1973	671.6444	443.0235	464.3071	720.0179	1067.2047	1384.7533	1648.8090 (97)	
Space heating kWh	688.2243	536.6485	462.0462	280.7349	147.7582	0.0000	0.0000	0.0000	0.0000	269.2013	485.1096	699.6078 (98a)	
Space heating requirement - total per year (kWh/year)												3569.3309	
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	688.2243	536.6485	462.0462	280.7349	147.7582	0.0000	0.0000	0.0000	0.0000	269.2013	485.1096	699.6078 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												3569.3309	
Space heating per m2										(98c) / (4) =		32.2958 (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	688.2243	536.6485	462.0462	280.7349	147.7582	0.0000	0.0000	0.0000	0.0000	269.2013	485.1096	699.6078 (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)	745.6384	581.4177	500.5918	304.1549	160.0847	0.0000	0.0000	0.0000	0.0000	291.6591	525.5792	757.9717 (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	247.5007	218.7819	232.4788	204.8625	198.8225	179.4386	177.4460	184.4317	186.3565	207.4304	220.0512	244.8895 (64)	
Efficiency of water heater (217)m	86.2277	85.9913	85.5696	84.7668	83.4038	79.8000	79.8000	79.8000	79.8000	84.6454	85.7810	79.8000 (216)	
Fuel for water heating, kWh/month	287.0315	254.4235	271.6839	241.6778	238.3854	224.8604	222.3634	231.1175	233.5294	245.0581	256.5268	283.8407 (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	29.1762	23.4062	21.0747	15.4402	11.9265	9.7440	10.8797	14.1419	18.3689	24.1010	27.2220	29.9871 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-20.5001	-30.7927	-47.1136	-56.4824	-64.0016	-60.8521	-60.0872	-55.1674	-47.0751	-36.6970	-23.1915	-17.5085 (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	-6.4704	-13.9872	-28.5261	-43.9440	-59.2161	-59.9340	-59.2539	-49.6752	-35.7520	-20.3806	-8.7554	-5.0907 (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													3867.0974 (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													2990.4983 (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)													235.4686 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-910.4547 (233)

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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	6268.6097 (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	3867.0974	0.2100	812.0905 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2990.4983	0.2100	628.0047 (264)
Space and water heating			1440.0951 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	235.4686	0.1443	33.9854 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-519.4691	0.1333	-69.2424
PV Unit electricity exported	-390.9855	0.1252	-48.9321
Total			-118.1744 (269)
Total CO2, kg/year			1367.8354 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.3800 (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	3867.0974	1.1300	4369.8201 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2990.4983	1.1300	3379.2631 (278)
Space and water heating			7749.0832 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	235.4686	1.5338	361.1695 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-519.4691	1.4926	-775.3389
PV Unit electricity exported	-390.9855	0.4594	-179.5997
Total			-954.9386 (283)
Total Primary energy kWh/year			7285.4149 (286)
Target Primary Energy Rate (TPER)			65.9200 (287)