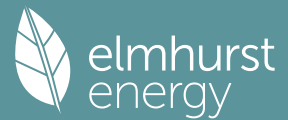


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Plot Reference	73a Keith Road				Issued on Date	02/07/2026	
Assessment Reference	Be Lean			Plot Type Ref			
Plot Address	73a, Keith Road, Hayes, UB3 4HP				SAP Version	10.2	
SAP Rating	82 B	DER	11.63	TER	12.32		
Environmental	91 B	% DER < TER				5.60	
CO ₂ Emissions (t/year)	0.7	DFEE	36.58	TFEE	39.80		
Compliance Check	See BREL	% DFEE < TFEE				8.11	
% DPER < TPER	-13.11	DPER	72.96	TPER	64.50		
Assessor Details	Mr. Benjamin Leech				Assessor ID	AW86-0001	
Client	Faluck Patel, Faluck Patel						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	37.2600 (1b)	x 2.5500 (2b)	= 95.0130 (1b) - (3b)
First floor	35.8200 (1c)	x 2.4200 (2c)	= 86.6844 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.0800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.6974 (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) = 0.1651 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4151 (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) = 0.3840 (21)

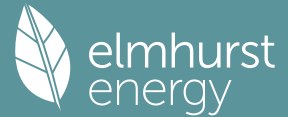
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4896	0.4800	0.4704	0.4224	0.4128	0.3648	0.3648	0.3552	0.3840	0.4128	0.4320	0.4512 (22b)
Effective ac	0.6198	0.6152	0.6106	0.5892	0.5852	0.5665	0.5665	0.5631	0.5737	0.5852	0.5933	0.6018 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Solid Door			1.7900	1.0000	1.7900		(26)
Window			11.1900	1.1450	12.8130		(27)
Ground Floor			37.2600	0.1300	4.8438	135.0000	5030.1000 (28a)
External Walls	86.2600	12.9800	73.2800	0.1800	13.1904	55.5000	4067.0400 (29a)
Pitched Roof, Flat Ceiling	35.8200		35.8200	0.1100	3.9402	8.8000	315.2160 (30)
Flat Roof	1.4400		1.4400	0.1100	0.1584	8.8000	12.6720 (31)
Total net area of external elements Aum(A, m ²)			160.7800				(32)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	36.7358	(33)
Main dwelling							
Party Wall			50.4700	0.0000	0.0000	55.5000	2801.0850 (32)
Internal Walls			94.1700			8.8000	828.6960 (32c)
Internal Floor			35.8200			17.6000	630.4320 (32d)
Internal Ceiling			35.8200			8.8000	315.2160 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	14000.4570 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							191.5771 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				7.9500	0.2140	1.7013	

6. Solar gains												
[Jan]					Area	Solar flux	g		FF	Access		Gains
					m2	Table 6a	Specific data		Specific data	factor		W
						W/m2	or Table 6b		or Table 6c	Table 6d		
North					7.8600	10.6334	0.4500		0.0000	0.7700		28.9599 (74)
South					3.3300	46.7521	0.4500		0.0000	0.7700		53.9446 (78)
Solar gains	82.9046	143.6913	206.5818	278.2504	336.0309	345.3944	328.0099	282.3889	230.6302	161.1707	99.6686	70.7556 (83)
Total gains	505.5763	578.7042	622.7129	683.4917	721.1100	715.3931	684.5144	638.2465	597.0692	540.7810	500.3083	484.1005 (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	48.3037	48.4717	48.6375	49.4316	49.5831	50.3006	50.3006	50.4358	50.0218	49.5831	49.2776	48.9623
alpha	4.2202	4.2314	4.2425	4.2954	4.3055	4.3534	4.3534	4.3624	4.3348	4.3055	4.2852	4.2642
util living area	0.9899	0.9813	0.9655	0.9178	0.8161	0.6419	0.4848	0.5359	0.7667	0.9353	0.9809	0.9915 (86)
MIT	19.4647	19.6822	19.9831	20.4062	20.7421	20.9346	20.9847	20.9767	20.8556	20.4326	19.8919	19.4407 (87)
Th 2	19.9995	20.0026	20.0056	20.0200	20.0227	20.0353	20.0353	20.0377	20.0305	20.0227	20.0173	20.0116 (88)
util rest of house	0.9873	0.9766	0.9566	0.8961	0.7691	0.5620	0.3841	0.4326	0.6956	0.9136	0.9753	0.9894 (89)
MIT 2	18.2144	18.4922	18.8736	19.4042	19.7920	19.9925	20.0291	20.0273	19.9227	19.4472	18.7707	18.1922 (90)
Living area fraction									fLA = Living area / (4) =			0.4298 (91)
MIT	18.7518	19.0037	19.3504	19.8348	20.2004	20.3974	20.4398	20.4353	20.3237	19.8708	19.2526	18.7288 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.6018	18.8537	19.2004	19.6848	20.0504	20.2474	20.2898	20.2853	20.1737	19.7208	19.1026	18.5788 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9824	0.9694	0.9474	0.8873	0.7705	0.5805	0.4113	0.4600	0.7071	0.9054	0.9683	0.9850 (94)
Useful gains	496.6625	561.0113	589.9434	606.4904	555.6481	415.2848	281.5586	293.6194	422.1818	489.6194	484.4521	476.8446 (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	1151.4635	1119.5430	1015.5185	848.4937	654.9548	436.6332	285.2770	299.5900	472.2061	715.3798	947.2492	1142.0908 (97)
Space heating kWh	487.1719	375.3333	316.6279	174.2423	73.8842	0.0000	0.0000	0.0000	0.0000	167.9657	333.2140	494.9431 (98a)
Space heating requirement - total per year (kWh/year)												2423.3823
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	487.1719	375.3333	316.6279	174.2423	73.8842	0.0000	0.0000	0.0000	0.0000	167.9657	333.2140	494.9431 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2423.3823
Space heating per m2										(98c) / (4) =		33.1607 (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 %)												89.1000 (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	487.1719	375.3333	316.6279	174.2423	73.8842	0.0000	0.0000	0.0000	0.0000	167.9657	333.2140	494.9431 (98)
Space heating efficiency (main heating system 1)	89.1000	89.1000	89.1000	89.1000	89.1000	0.0000	0.0000	0.0000	0.0000	89.1000	89.1000	89.1000 (210)
Space heating fuel (main heating system)	546.7698	421.2495	355.3624	195.5582	82.9228	0.0000	0.0000	0.0000	0.0000	188.5137	373.9775	555.4917 (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	60.9149	52.7738	54.8067	46.8973	44.2316	38.6788	38.0433	40.6836	42.2433	48.3890	52.7996	60.2227 (64)
Efficiency of water heater (217)m	88.6249	88.5733	88.4703	88.1978	87.5191	85.0000	85.0000	85.0000	85.0000	88.1490	88.5160	85.0000 (216)
Fuel for water heating, kWh/month	68.7334	59.5820	61.9492	53.1728	50.5393	45.5045	44.7569	47.8630	49.6980	54.8946	59.6498	67.9436 (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	20.9784	16.8296	15.1532	11.1019	8.5754	7.0062	7.8228	10.1684	13.2077	17.3292	19.5733	21.5614 (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												2719.8455 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												85.0000
Water heating fuel used												664.2872 (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)												169.3075 (232)

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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	4377.5853 (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	2719.8455	0.2100	571.1676 (261)
Total CO2 associated with community systems			0.0000 (273)
Water heating (other fuel)	664.2872	0.2100	139.5003 (264)
Energy for instantaneous electric shower(s)	738.1451	0.1391	102.6923 (264a)
Space and water heating			710.6679 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	169.3075	0.1443	24.4363 (268)
Total CO2, kg/year			849.7257 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.6300 (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	2719.8455	1.1300	3073.4254 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	664.2872	1.1300	750.6446 (278)
Energy for instantaneous electric shower(s)	738.1451	1.5143	1117.7983 (278a)
Space and water heating			3824.0700 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	169.3075	1.5338	259.6895 (282)
Total Primary energy kWh/year			5331.6585 (286)
Dwelling Primary energy Rate (DPER)			72.9600 (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)
Main dwelling			
Ground floor	37.2600 (1b)	x 2.5500 (2b)	= 95.0130 (1b) - (3b)
First floor	35.8200 (1c)	x 2.4200 (2c)	= 86.6844 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.0800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	181.6974 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1651 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4151 (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) = 0.3840 (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	0.4896	0.4800	0.4704	0.4224	0.4128	0.3648	0.3648	0.3552	0.3840	0.4128	0.4320	0.4512 (22b)
Effective ac	0.6198	0.6152	0.6106	0.5892	0.5852	0.5665	0.5665	0.5631	0.5737	0.5852	0.5933	0.6018 (25)

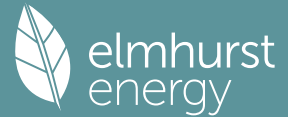
3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K
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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	115.9260	115.9260	115.9260	115.9260	115.9260	115.9260	115.9260	115.9260	115.9260	115.9260	115.9260	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	108.5047	120.1302	108.5047	112.1215	108.5047	112.1215	108.5047	108.5047	112.1215	108.5047	112.1215	108.5047 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	204.3762	206.4970	201.3527	189.7753	175.4134	161.9152	152.8976	150.7768	156.1211	167.4985	181.8604	195.3586 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5926	34.5926	34.5926	34.5926	34.5926	34.5926	34.5926	34.5926	34.5926	34.5926	34.5926	34.5926 (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)	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408 (71)
Water heating gains (Table 5)	101.6373	99.4120	95.1680	85.9251	80.2519	74.3283	70.5698	73.7376	77.2773	83.8512	92.7150	100.4597 (72)
Total internal gains	475.2960	486.8170	465.6032	448.5987	424.9478	406.1427	389.7498	390.7968	403.2977	420.6322	447.4747	465.1007 (73)

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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	7.8600				10.6334	0.6300	0.7000	0.7700	25.5427 (74)			
South	3.3300				46.7521	0.6300	0.7000	0.7700	47.5792 (78)			
Solar gains	73.1218	126.7358	182.2051	245.4168	296.3793	304.6379	289.3048	249.0670	203.4158	142.1525	87.9077	62.4064 (83)
Total gains	548.4178	613.5527	647.8083	694.0166	721.3271	710.7806	679.0546	639.8638	606.7135	562.7847	535.3824	527.5072 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	46.3746	46.5294	46.6822	47.4133	47.5526	48.2122	48.2122	48.3363	47.9560	47.5526	47.2716	46.9813
util living area	4.0916	4.1020	4.1121	4.1609	4.1702	4.2141	4.2141	4.2224	4.1971	4.1702	4.1514	4.1321
util living area	0.9868	0.9779	0.9627	0.9194	0.8273	0.6626	0.5059	0.5528	0.7736	0.9314	0.9768	0.9886 (86)
MIT	19.4530	19.6565	19.9463	20.3584	20.7032	20.9177	20.9793	20.9702	20.8362	20.4087	19.8773	19.4301 (87)
Th 2	19.9622	19.9653	19.9683	19.9826	19.9853	19.9977	19.9977	20.0001	19.9929	19.9853	19.9799	19.9742 (88)
util rest of house	0.9835	0.9724	0.9530	0.8976	0.7806	0.5800	0.3983	0.4438	0.7013	0.9085	0.9700	0.9858 (89)
MIT 2	18.1740	18.4335	18.8006	19.3180	19.7189	19.9437	19.9893	19.9868	19.8708	19.3894	18.7257	18.1531 (90)
Living area fraction	18.7237	18.9591	19.2930	19.7652	20.1420	20.3623	20.4148	20.4095	20.2857	19.8275	19.2206	18.7019 (92)
MIT	18.7237	18.9591	19.2930	19.7652	20.1420	20.3623	20.4148	20.4095	20.2857	19.8275	19.2206	18.7019 (93)
Temperature adjustment	18.7237	18.9591	19.2930	19.7652	20.1420	20.3623	20.4148	20.4095	20.2857	19.8275	19.2206	18.7019 (93)
adjusted MIT	18.7237	18.9591	19.2930	19.7652	20.1420	20.3623	20.4148	20.4095	20.2857	19.8275	19.2206	18.7019 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9781	0.9655	0.9451	0.8922	0.7885	0.6115	0.4442	0.4899	0.7241	0.9042	0.9635	0.9810 (94)
Ext temp.	536.4225	592.3898	612.2208	619.1835	568.7826	434.6622	301.6330	313.4619	439.3450	508.8493	515.8378	517.4686 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Space heating kWh	1209.5878	1175.0883	1065.7648	891.2024	690.4154	464.8140	307.7211	322.5908	501.6349	754.6600	997.1615	1200.4409 (97)
Space heating requirement - total per year (kWh/year)	500.8350	391.5734	337.4368	195.8536	90.4947	0.0000	0.0000	0.0000	0.0000	182.8831	346.5531	508.1314 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	500.8350	391.5734	337.4368	195.8536	90.4947	0.0000	0.0000	0.0000	0.0000	182.8831	346.5531	508.1314 (98c)
Space heating requirement after solar 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 (98d)
Space heating per m2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (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)											
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating efficiency (main heating system 1)	500.8350	391.5734	337.4368	195.8536	90.4947	0.0000	0.0000	0.0000	0.0000	182.8831	346.5531	508.1314 (98)
Space heating fuel (main heating system)	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 efficiency (main heating system 2)	542.0292	423.7807	365.1913	211.9628	97.9380	0.0000	0.0000	0.0000	0.0000	197.9255	375.0575	549.9258 (211)
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 (212)
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 (213)
Water heating requirement	203.0230	179.5752	191.2849	169.8925	165.7408	150.5332	149.2085	155.0577	156.1343	172.6369	181.6986	201.0739 (64)
Efficiency of water heater (217)m	86.2360	86.0040	85.5839	84.6870	83.1405	80.3000	80.3000	80.3000	80.3000	84.5052	85.7415	80.3000 (216)
Fuel for water heating, kWh/month	235.4272	208.7987	223.5057	200.6123	199.3503	187.4635	185.8139	193.0980	194.4388	204.2914	211.9145	86.2801 (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	22.5451	18.0865	16.2849	11.9310	9.2159	7.5294	8.4070	10.9278	14.1941	18.6234	21.0351	23.1717 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-34.7776	-48.9838	-70.3476	-79.0311	-85.1752	-79.4967	-78.5260	-74.1632	-66.4418	-55.9954	-38.2226	-30.0737 (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	-19.7784	-41.5969	-82.6565	-124.1115	-164.0698	-164.8295	-162.8774	-137.9126	-101.1009	-59.4612	-26.3996	-15.6399 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

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Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (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												2763.8107	(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												2477.7618	(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)												181.9521	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1841.6689	(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												3667.8558	(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	2763.8107	0.2100	580.4002	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2477.7618	0.2100	520.3300	(264)
Space and water heating			1100.7302	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	181.9521	0.1443	26.2613	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-741.2347	0.1346	-99.7711	
PV Unit electricity exported	-1100.4341	0.1259	-138.5508	
Total			-238.3219	(269)
Total CO2, kg/year			900.5989	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.3200	(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	2763.8107	1.1300	3123.1061	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2477.7618	1.1300	2799.8709	(278)
Space and water heating			5922.9769	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	181.9521	1.5338	279.0842	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-741.2347	1.4975	-1109.9723	
PV Unit electricity exported	-1100.4341	0.4622	-508.5773	
Total			-1618.5496	(283)
Total Primary energy kWh/year			4713.6123	(286)
Target Primary Energy Rate (TPER)			64.5000	(287)

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

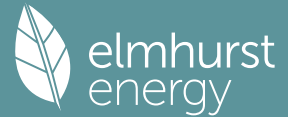
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	37.2600 (1b)	x 2.5500 (2b)	= 95.0130 (1b) - (3b)	
First floor	35.8200 (1c)	x 2.4200 (2c)	= 86.6844 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	73.0800			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n)	= 181.6974 (5)	

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1651 (8)
Pressure test		Yes
Pressure Test Method		Blower Door

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Measured/design AP50 5.0000 (17)
Infiltration rate 0.4151 (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) = 0.3840 (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	0.4896	0.4800	0.4704	0.4224	0.4128	0.3648	0.3648	0.3552	0.3840	0.4128	0.4320	0.4512 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.6198	0.6152	0.6106	0.5892	0.5852	0.5665	0.5665	0.5631	0.5737	0.5852	0.5933	0.6018 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
Solid Door			1.7900	1.0000	1.7900		(26)
Window			11.1900	1.1450	12.8130		(27)
Ground Floor			37.2600	0.1300	4.8438	135.0000	5030.1000 (28a)
External Walls	86.2600	12.9800	73.2800	0.1800	13.1904	55.5000	4067.0400 (29a)
Pitched Roof, Flat Ceiling	35.8200		35.8200	0.1100	3.9402	8.8000	315.2160 (30)
Flat Roof	1.4400		1.4400	0.1100	0.1584	8.8000	12.6720 (30)
Total net area of external elements Aum(A, m2)			160.7800				(31)
Fabric heat loss, W/K = Sum (A x U)					36.7358		(33)
Main dwelling							
Party Wall			50.4700	0.0000	0.0000	55.5000	2801.0850 (32)
Internal Walls			94.1700			8.8000	828.6960 (32c)
Internal Floor			35.8200			17.6000	630.4320 (32d)
Internal Ceiling			35.8200			8.8000	315.2160 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 14000.4570 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 191.5771 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	7.9500	0.2140	1.7013
E3 Sill	4.2000	0.0200	0.0840
E4 Jamb	15.7200	0.0150	0.2358
E5 Ground floor (normal)	17.5500	0.0510	0.8951
P1 Party wall - Ground floor	10.3500	0.0360	0.3726
E6 Intermediate floor within a dwelling	13.5500	0.0010	0.0136
E24 Eaves (insulation at ceiling level - inverted)	3.6000	0.1500	0.5400
P2 Party wall - Intermediate floor within a dwelling	9.9500	0.0000	0.0000
E14 Flat roof	4.4000	0.1600	0.7040
E10 Eaves (insulation at ceiling level)	17.1500	0.0560	0.9604
P4 Party wall - Roof (insulation at ceiling level)	9.9500	0.0330	0.3283
E16 Corner (normal)	9.9400	0.0380	0.3777
E18 Party wall between dwellings	9.9400	0.0400	0.3976

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.6104 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 43.3461 (37)

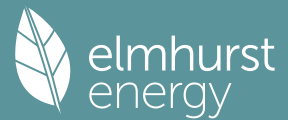
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	37.1657	36.8866	36.6131	35.3285	35.0882	33.9693	33.9693	33.7621	34.4003	35.0882	35.5744	36.0827 (38)
Average = Sum(39)m / 12 =	80.5118	80.2328	79.9593	78.6747	78.4343	77.3154	77.3154	77.1083	77.7464	78.4343	78.9205	79.4289 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1017	1.0979	1.0941	1.0766	1.0733	1.0580	1.0580	1.0551	1.0639	1.0733	1.0799	1.0869 (40)
HLP (average)												1.0765
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3185 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths												27.2555
Hot water usage for other uses												38.3740 (42c)
Average daily hot water use (litres/day)												60.1556 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	65.6295	63.8293	61.8639	59.4174	57.2350	54.9670	54.4956	56.4571	58.4688	60.7980	63.2660	65.5374 (44)
Energy content (annual)	103.9411	90.8921	95.0824	81.3395	77.0493	67.5883	65.9077	69.9056	72.0979	82.5022	90.1341	102.6157 (45)
Distribution loss (46)m = 0.15 x (45)m												999.0559
Water storage loss (or HIU loss):												0.0000 (46)
Total storage loss												0.0000 (56)
If cylinder contains dedicated solar storage												0.0000 (57)
Primary loss												0.0000 (59)
Combi loss												0.0000 (61)
Total heat required for water heating calculated for each month	88.3499	77.2583	80.8201	69.1386	65.4919	57.4501	56.0216	59.4198	61.2832	70.1269	76.6139	87.2233 (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	88.3499	77.2583	80.8201	69.1386	65.4919	57.4501	56.0216	59.4198	61.2832	70.1269	76.6139	87.2233 (64)
12Total per year (kWh/year)												849.1975 (64)
Electric shower(s)												849 (64)

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	50.5275	45.0204	49.1605	46.9133	47.7936	45.5905	47.1101	47.7936	46.9133	49.1605	48.2361	50.5275 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											574.7470 (64a)
Heat gains from water heating, kWh/month	34.7193	30.5697	32.4952	29.0130	28.3214	25.7601	25.7829	26.8033	27.0491	29.8219	31.2125	34.4377 (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	115.9260	115.9260	115.9260	115.9260	115.9260	115.9260	115.9260	115.9260	115.9260	115.9260	115.9260	115.9260 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	108.5047	120.1302	108.5047	112.1215	108.5047	112.1215	108.5047	108.5047	112.1215	108.5047	112.1215	108.5047 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	204.3762	206.4970	201.1527	189.7753	175.4134	161.9152	152.8976	150.7768	156.1211	167.4985	181.8604	195.3586 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5926	34.5926	34.5926	34.5926	34.5926	34.5926	34.5926	34.5926	34.5926	34.5926	34.5926	34.5926 (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)	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408 (71)
Water heating gains (Table 5)	46.6658	45.4906	43.6763	40.2958	38.0664	35.7780	34.6545	36.0260	37.5682	40.0831	43.3507	46.2872 (72)
Total internal gains	417.3245	429.8956	411.1115	399.9704	379.7622	367.5924	353.8345	353.0853	363.5886	373.8641	395.1104	407.9283 (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					7.8600	10.6334	0.4500	0.0000			0.7700	28.9599 (74)
South					3.3300	46.7521	0.4500	0.0000			0.7700	53.9446 (78)
Solar gains	82.9046	143.6913	206.5818	278.2504	336.0309	345.3944	328.0099	282.3889	230.6302	161.1707	99.6686	70.7556 (83)
Total gains	500.2291	573.5869	617.6932	678.2207	715.7932	712.9869	681.8444	635.4741	594.2188	535.0348	494.7790	478.6839 (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	48.3037	48.4717	48.6375	49.4316	49.5831	50.3006	50.3006	50.4358	50.0218	49.5831	49.2776	48.9623
alpha	4.2202	4.2314	4.2425	4.2954	4.3055	4.3534	4.3534	4.3624	4.3348	4.3055	4.2852	4.2642
util living area	0.9903	0.9818	0.9665	0.9196	0.8191	0.6436	0.4865	0.5379	0.7688	0.9373	0.9816	0.9919 (86)
MIT	19.4554	19.6737	19.9752	20.3995	20.7380	20.9339	20.9844	20.9763	20.8540	20.4248	19.8826	19.4312 (87)
Th 2	19.9995	20.0026	20.0056	20.0200	20.0227	20.0353	20.0353	20.0377	20.0305	20.0227	20.0173	20.0116 (88)
util rest of house	0.9878	0.9773	0.9577	0.8983	0.7724	0.5637	0.3856	0.4343	0.6979	0.9162	0.9762	0.9898 (89)
MIT 2	18.5992	18.8172	19.1159	19.5341	19.8398	20.0016	20.0304	20.0294	19.9454	19.5672	19.0368	18.5843 (90)
Living area fraction	18.9672	19.1853	19.4853	19.9061	20.2258	20.4023	20.4404	20.4364	20.3359	19.9358	19.4003	18.9483 (92)
MIT	18.9672	19.1853	19.4853	19.9061	20.2258	20.4023	20.4404	20.4364	20.3359	19.9358	19.4003	18.9483 (93)
Temperature adjustment												0.0000
adjusted MIT	18.9672	19.1853	19.4853	19.9061	20.2258	20.4023	20.4404	20.4364	20.3359	19.9358	19.4003	18.9483 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9845	0.9726	0.9521	0.8954	0.7829	0.5953	0.4288	0.4784	0.7220	0.9140	0.9719	0.9869 (94)
Useful gains	492.4575	557.8542	588.1162	607.2940	560.4148	424.4529	292.3783	304.0280	429.0263	489.0066	480.8751	472.3963 (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	1180.8831	1146.1494	1038.2922	865.8999	668.7172	448.6088	296.9250	311.2400	484.8175	732.2445	970.7478	1171.4401 (97)
Space heating kWh	512.1886	395.3344	334.9309	186.1962	80.5770	0.0000	0.0000	0.0000	0.0000	180.9689	352.7084	520.0886 (98a)
Space heating requirement - total per year (kWh/year)												2562.9929
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	512.1886	395.3344	334.9309	186.1962	80.5770	0.0000	0.0000	0.0000	0.0000	180.9689	352.7084	520.0886 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2562.9929
Space heating per m2										(98c) / (4) =		35.0711 (99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	726.7652	572.1343	586.0227	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8446	0.9061	0.8789	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	613.8617	518.3896	515.0403	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	788.2439	754.1064	702.0650	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	125.5552	175.3732	139.1464	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	31.3888	43.8433	34.7866	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												110.0187 (107)
Energy for space heating												35.0711 (99)

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Energy for space cooling 1.5055 (108)
 Total 36.5765 (109)
 Fabric Energy Efficiency (DFEE) 36.6 (109)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	37.2600 (1b)	x 2.5500 (2b)	= 95.0130 (1b) - (3b)
First floor	35.8200 (1c)	x 2.4200 (2c)	= 86.6844 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.0800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.6974 (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) = 0.1651 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4151 (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) = 0.3840 (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	0.4896	0.4800	0.4704	0.4224	0.4128	0.3648	0.3648	0.3552	0.3840	0.4128	0.4320	0.4512 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.6198	0.6152	0.6106	0.5892	0.5852	0.5665	0.5665	0.5631	0.5737	0.5852	0.5933	0.6018 (25)

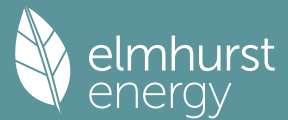
3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
TER Opaque door			1.7900	1.0000	1.7900		(26)
TER Opening Type			11.1900	1.1450	12.8130		(27)
Ground Floor			37.2600	0.1300	4.8438		(28a)
External Walls	86.2600	12.9800	73.2800	0.1800	13.1904		(29a)
Pitched Roof, Flat Ceiling	35.8200		35.8200	0.1100	3.9402		(30)
Flat Roof	1.4400		1.4400	0.1100	0.1584		(30)
Total net area of external elements Aum(A, m ²)			160.7800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.7358		(33)
Main dwelling							
Party Wall			50.4700	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							191.5771 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	7.9500	0.0500	0.3975
E2 Other lintels (including other steel lintels)	4.2000	0.0500	0.2100
E3 Sill	15.7200	0.0500	0.7860
E4 Jamb	17.5500	0.1600	2.8080
E5 Ground floor (normal)	10.3500	0.0800	0.8280
P1 Party wall - Ground floor	13.5500	0.0000	0.0000
E6 Intermediate floor within a dwelling	3.6000	0.2400	0.8640
E24 Eaves (insulation at ceiling level - inverted)	9.9500	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	4.4000	0.0800	0.3520
E14 Flat roof	17.1500	0.0600	1.0290
E10 Eaves (insulation at ceiling level)	9.9500	0.1200	1.1940
P4 Party wall - Roof (insulation at ceiling level)	9.9400	0.0900	0.8946
E16 Corner (normal)	9.9400	0.0600	0.5964
E18 Party wall between dwellings			9.9595 (36)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			0.0000
Point Thermal Bridges			(36a) =
Total fabric heat loss			(33) + (36) + (36a) = 46.6953 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	37.1657	36.8866	36.6131	35.3285	35.0882	33.9693	33.9693	33.7621	34.4003	35.0882	35.5744	36.0827 (38)
Heat transfer coeff	83.8609	83.5819	83.3084	82.0238	81.7834	80.6646	80.6646	80.4574	81.0955	81.7834	82.2697	82.7780 (39)
Average = Sum(39)m / 12 =												82.0226

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HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1475	1.1437	1.1400	1.1224	1.1191	1.1038	1.1038	1.1009	1.1097	1.1191	1.1257	1.1327 (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												2.3185 (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	27.2555	26.8508	26.2807	25.2297	24.4427	23.5701	23.0987	23.6648	24.2811	25.2148	26.2875	27.1634 (42b)
Hot water usage for other uses	38.3740	36.9785	35.5831	34.1877	32.7923	31.3969	31.3969	32.7923	34.1877	35.5831	36.9785	38.3740 (42c)
Average daily hot water use (litres/day)												60.1556 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	65.6295	63.8293	61.8639	59.4174	57.2350	54.9670	54.4956	56.4571	58.4688	60.7980	63.2660	65.5374 (44)
Energy content (annual)	103.9411	90.8921	95.0824	81.3395	77.0493	67.5883	65.9077	69.9056	72.0979	82.5022	90.1341	102.6157 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		999.0559
Water storage loss (or HIU loss):	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	88.3499	77.2583	80.8201	69.1386	65.4919	57.4501	56.0216	59.4198	61.2832	70.1269	76.6139	87.2233 (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	88.3499	77.2583	80.8201	69.1386	65.4919	57.4501	56.0216	59.4198	61.2832	70.1269	76.6139	87.2233 (64)
12Total per year (kWh/year)									Total per year (kWh/year) = Sum(64)m =			849.1975 (64)
Electric shower(s)	50.5275	45.0204	49.1605	46.9133	47.7936	45.5905	47.1101	47.7936	46.9133	49.1605	48.2361	50.5275 (64a)
Heat gains from water heating, kWh/month	34.7193	30.5697	32.4952	29.0130	28.3214	25.7601	25.7829	26.8033	27.0491	29.8219	31.2125	34.4377 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												574.7470 (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	115.9260	115.9260	115.9260	115.9260	115.9260	115.9260	115.9260	115.9260	115.9260	115.9260	115.9260	115.9260 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	108.5047	120.1302	108.5047	112.1215	108.5047	112.1215	108.5047	108.5047	112.1215	108.5047	112.1215	108.5047 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	204.3762	206.4970	201.1527	189.7753	175.4134	161.9152	152.8976	150.7768	156.1211	167.4985	181.8604	195.3586 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5926	34.5926	34.5926	34.5926	34.5926	34.5926	34.5926	34.5926	34.5926	34.5926	34.5926	34.5926 (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)	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408 (71)
Water heating gains (Table 5)	46.6658	45.4906	43.6763	40.2958	38.0664	35.7780	34.6545	36.0260	37.5682	40.0831	43.3507	46.2872 (72)
Total internal gains	417.3245	429.8956	411.1115	399.9704	379.7622	367.5924	353.8345	353.0853	363.5886	373.8641	395.1104	407.9283 (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				7.8600	10.6334	0.6300	0.7000	0.7700	25.5427 (74)			
South				3.3300	46.7521	0.6300	0.7000	0.7700	47.5792 (78)			
Solar gains	73.1218	126.7358	182.2051	245.4168	296.3793	304.6379	289.3048	249.0670	203.4158	142.1525	87.9077	62.4064 (83)
Total gains	490.4463	556.6313	593.3166	645.3872	676.1415	672.2303	643.1393	602.1522	567.0044	516.0167	483.0181	470.3347 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	46.3746	46.5294	46.6822	47.4133	47.5526	48.2122	48.2122	48.3363	47.9560	47.5526	47.2716	46.9813
alpha	4.0916	4.1020	4.1121	4.1609	4.1702	4.2141	4.2141	4.2224	4.1971	4.1702	4.1514	4.1321
util living area	0.9911	0.9841	0.9719	0.9345	0.8509	0.6896	0.5307	0.5817	0.8022	0.9471	0.9837	0.9925 (86)
MIT	19.3539	19.5624	19.8616	20.2951	20.6644	20.9042	20.9753	20.9639	20.8099	20.3444	19.7908	19.3313 (87)
Th 2	19.9622	19.9653	19.9683	19.9826	19.9853	19.9977	19.9977	20.0001	19.9929	19.9853	19.9799	19.9742 (88)
util rest of house	0.9888	0.9801	0.9643	0.9159	0.8074	0.6069	0.4194	0.4694	0.7331	0.9282	0.9788	0.9905 (89)
MIT 2	18.4707	18.6795	18.9767	19.4070	19.7468	19.9478	19.9898	19.9873	19.8799	19.4624	18.9182	18.4572 (90)
Living area fraction	18.8503	19.0590	19.3570	19.7887	20.1411	20.3589	20.4134	20.4071	20.2796	19.8415	19.2933	18.8329 (91)
MIT	18.8503	19.0590	19.3570	19.7887	20.1411	20.3589	20.4134	20.4071	20.2796	19.8415	19.2933	18.8329 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8503	19.0590	19.3570	19.7887	20.1411	20.3589	20.4134	20.4071	20.2796	19.8415	19.2933	18.8329 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9855	0.9755	0.9587	0.9117	0.8149	0.6384	0.4669	0.5169	0.7547	0.9250	0.9745	0.9876	(94)
Useful gains	483.3356	542.9790	568.7990	588.4064	550.9701	429.1472	300.2752	311.2608	427.9405	477.2997	470.6804	464.5173	(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	1220.2012	1183.4339	1071.0995	893.1354	690.3457	464.5395	307.6027	322.3992	501.1409	755.8026	1003.1348	1211.2811	(97)
Space heating kWh	548.2280	430.3857	373.7116	219.4049	103.6954	0.0000	0.0000	0.0000	0.0000	207.2062	383.3672	555.5922	(98a)
Space heating requirement - total per year (kWh/year)												2821.5911	
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	548.2280	430.3857	373.7116	219.4049	103.6954	0.0000	0.0000	0.0000	0.0000	207.2062	383.3672	555.5922	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2821.5911	
Space heating per m2										(98c) / (4) =		38.6096	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	758.2470	596.9179	611.4761	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7986	0.8707	0.8398	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	605.5234	519.7327	513.5160	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	740.6064	708.8665	663.1174	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	97.2597	140.7156	111.3034	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fc = cooled area / (4) =				1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	24.3149	35.1789	27.8259	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement													87.3197 (107)
Energy for space heating													38.6096 (99)
Energy for space cooling													1.1949 (108)
Total													39.8045 (109)
Fabric Energy Efficiency (TFEE)													39.8 (109)

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

1. Overall dwelling characteristics

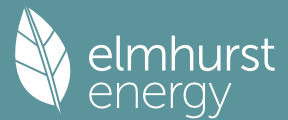
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	37.2600 (1b)	x 2.5500 (2b)	= 95.0130 (1b) - (3b)
First floor	35.8200 (1c)	x 2.4200 (2c)	= 86.6844 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.0800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	181.6974 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1651 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4151 (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) = 0.3840 (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	0.4896	0.4800	0.4704	0.4224	0.4128	0.3648	0.3648	0.3552	0.3840	0.4128	0.4320	0.4512	(22b)
Effective ac	0.6198	0.6152	0.6106	0.5892	0.5852	0.5665	0.5665	0.5631	0.5737	0.5852	0.5933	0.6018	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Solid Door			1.7900	1.0000	1.7900			(26)
Window			11.1900	1.1450	12.8130			(27)
Ground Floor			37.2600	0.1300	4.8438	135.0000	5030.1000	(28a)
External Walls	86.2600	12.9800	73.2800	0.1800	13.1904	55.5000	4067.0400	(29a)
Pitched Roof, Flat Ceiling	35.8200		35.8200	0.1100	3.9402	8.8000	315.2160	(30)
Flat Roof	1.4400		1.4400	0.1100	0.1584	8.8000	12.6720	(31)
Total net area of external elements Aum(A, m2)			160.7800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.7358			(33)
Main dwelling								
Party Wall			50.4700	0.0000	0.0000	55.5000	2801.0850	(32)
Internal Walls			94.1700			8.8000	828.6960	(32c)
Internal Floor			35.8200			17.6000	630.4320	(32d)
Internal Ceiling			35.8200			8.8000	315.2160	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 14000.4570 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 191.5771 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	7.9500	0.2140	1.7013
E3 Sill	4.2000	0.0200	0.0840
E4 Jamb	15.7200	0.0150	0.2358
E5 Ground floor (normal)	17.5500	0.0510	0.8951
P1 Party wall - Ground floor	10.3500	0.0360	0.3726
E6 Intermediate floor within a dwelling	13.5500	0.0010	0.0136
E24 Eaves (insulation at ceiling level - inverted)	3.6000	0.1500	0.5400
P2 Party wall - Intermediate floor within a dwelling	9.9500	0.0000	0.0000
E14 Flat roof	4.4000	0.1600	0.7040
E10 Eaves (insulation at ceiling level)	17.1500	0.0560	0.9604
P4 Party wall - Roof (insulation at ceiling level)	9.9500	0.0330	0.3283
E16 Corner (normal)	9.9400	0.0380	0.3777
E18 Party wall between dwellings	9.9400	0.0400	0.3976

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.6104 (36)
 Point Thermal bridges 0.0000 (36a) =
 Total fabric heat loss (33) + (36) + (36a) = 43.3461 (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	37.1657	36.8866	36.6131	35.3285	35.0882	33.9693	33.9693	33.7621	34.4003	35.0882	35.5744	36.0827
Average = Sum(39)m / 12 =	80.5118	80.2328	79.9593	78.6747	78.4343	77.3154	77.3154	77.1083	77.7464	78.4343	78.9205	79.4289

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1017	1.0979	1.0941	1.0766	1.0733	1.0580	1.0580	1.0551	1.0639	1.0733	1.0799	1.0869
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

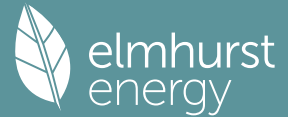
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3185 (42)
Hot water usage for mixer showers													0.0000 (42a)
Hot water usage for baths													0.0000 (42b)
Hot water usage for other uses													38.3740 (42c)
Average daily hot water use (litres/day)													34.8854 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	38.3740	36.9785	35.5831	34.1877	32.7923	31.3969	31.3969	32.7923	34.1877	35.5831	36.9785	38.3740	(44)
Energy content (annual)	60.7750	52.6569	54.6899	46.8013	44.1447	38.6061	37.9718	40.6037	42.1569	48.2860	52.6827	60.0843	(45)
Distribution loss (46)m = 0.15 x (45)m													579.4593
Water storage loss (or HIU loss):													
Total storage loss	9.1162	7.8985	8.2035	7.0202	6.6217	5.7909	5.6958	6.0906	6.3235	7.2429	7.9024	9.0127	(46)
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	(56)
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	0.1399	0.1168	0.1168	0.0960	0.0869	0.0727	0.0715	0.0799	0.0865	0.1031	0.1169	0.1383	(61)
Total heat required for water heating calculated for each month													
WWHRS	60.9149	52.7738	54.8067	46.8973	44.2316	38.6788	38.0433	40.6836	42.2433	48.3890	52.7996	60.2227	(62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
Output from w/h	60.9149	52.7738	54.8067	46.8973	44.2316	38.6788	38.0433	40.6836	42.2433	48.3890	52.7996	60.2227	(64)
Electric shower(s)													
Heat gains from water heating, kWh/month	64.8922	57.8195	63.1367	60.2505	61.3811	58.5516	60.5034	61.3811	60.2505	63.1367	61.9495	64.8922	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													738.1451 (64a)
Heat gains from water heating, kWh/month	36.4657	31.9925	33.9978	30.6481	30.0451	27.4926	27.7693	28.8660	29.1014	31.8650	33.0336	36.2357	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	139.1111	139.1111	139.1111	139.1111	139.1111	139.1111	139.1111	139.1111	139.1111	139.1111	139.1111	139.1111	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	23.9672	21.2875	17.3121	13.1064	9.7972	8.2712	8.9373	11.6171	15.5924	19.7981	23.1074	24.6333	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	305.0392	308.2045	300.2279	283.2467	261.8110	241.6645	228.2053	225.0400	233.0165	249.9978	271.4335	291.5800	(68)
	51.2296	51.2296	51.2296	51.2296	51.2296	51.2296	51.2296	51.2296	51.2296	51.2296	51.2296	51.2296	(69)

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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)	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408 (71)
Water heating gains (Table 5)	49.0130	47.6079	45.6959	42.5667	40.3832	38.1842	37.3244	38.7984	40.4186	42.8293	45.8800	48.7039 (72)
Total internal gains	478.6195	477.6999	463.8360	439.5199	412.5914	385.7199	372.0670	373.0554	386.6276	413.2252	441.0208	465.5173 (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				7.8600	10.6334	0.4500	0.0000			0.7700			28.9599 (74)
South				3.3300	46.7521	0.4500	0.0000			0.7700			53.9446 (78)
Solar gains	82.9046	143.6913	206.5818	278.2504	336.0309	345.3944	328.0099	282.3889	230.6302	161.1707	99.6686	70.7556 (83)	
Total gains	561.5240	621.3913	670.4178	717.7703	748.6224	731.1143	700.0770	655.4443	617.2578	574.3959	540.6894	536.2728 (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	48.3037	48.4717	48.6375	49.4316	49.5831	50.3006	50.3006	50.4358	50.0218	49.5831	49.2776	48.9623
alpha	4.2202	4.2314	4.2425	4.2954	4.3055	4.3534	4.3534	4.3624	4.3348	4.3055	4.2852	4.2642
util living area	0.9852	0.9760	0.9562	0.9057	0.8008	0.6312	0.4749	0.5235	0.7516	0.9226	0.9749	0.9876 (86)
MIT	19.5607	19.7525	20.0556	20.4478	20.7622	20.9387	20.9858	20.9787	20.8669	20.4769	19.9584	19.5313 (87)
Th 2	19.9995	20.0026	20.0056	20.0200	20.0227	20.0353	20.0353	20.0377	20.0305	20.0227	20.0173	20.0116 (88)
util rest of house	0.9816	0.9702	0.9453	0.8818	0.7522	0.5517	0.3759	0.4218	0.6793	0.8979	0.9679	0.9846 (89)
MIT 2	18.3359	18.5804	18.9626	19.4522	19.8120	19.9955	20.0296	20.0282	19.9322	19.4982	18.8536	18.3070 (90)
Living area fraction	18.8623	19.0842	19.4324	19.8801	20.2204	20.4009	20.4406	20.4367	20.3339	19.9188	19.3284	18.8332 (92)
MIT	18.8623	19.0842	19.4324	19.8801	20.2204	20.4009	20.4406	20.4367	20.3339	19.9188	19.3284	18.8332 (92)
Temperature adjustment	18.7123	18.9342	19.2824	19.7301	20.0704	20.2509	20.2906	20.2867	20.1839	19.7688	19.1784	-0.1500
adjusted MIT	18.7123	18.9342	19.2824	19.7301	20.0704	20.2509	20.2906	20.2867	20.1839	19.7688	19.1784	18.6832 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9753	0.9621	0.9354	0.8736	0.7548	0.5703	0.4027	0.4490	0.6918	0.8902	0.9599	0.9790 (94)
Useful gains	547.6662	597.8325	627.1209	627.0249	565.0390	416.9410	281.9129	294.2622	427.0231	511.3243	519.0006	525.0193 (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	1160.3598	1125.9999	1022.0696	852.0554	656.5263	436.8998	285.3380	299.6986	473.0043	719.1515	953.2375	1150.3872 (97)
Space heating kWh	455.8440	354.9285	293.8418	162.0220	68.0666	0.0000	0.0000	0.0000	0.0000	154.6234	312.6506	465.2738 (98a)
Space heating requirement - total per year (kWh/year)												2267.2506
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	455.8440	354.9285	293.8418	162.0220	68.0666	0.0000	0.0000	0.0000	0.0000	154.6234	312.6506	465.2738 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2267.2506
Space heating per m2										(98c) / (4) =		31.0242 (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 %)	89.1000 (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	455.8440	354.9285	293.8418	162.0220	68.0666	0.0000	0.0000	0.0000	0.0000	154.6234	312.6506	465.2738 (98)
Space heating efficiency (main heating system 1)	89.1000	89.1000	89.1000	89.1000	89.1000	0.0000	0.0000	0.0000	0.0000	89.1000	89.1000	89.1000 (210)
Space heating fuel (main heating system)	511.6095	398.3485	329.7888	181.8428	76.3935	0.0000	0.0000	0.0000	0.0000	173.5391	350.8985	522.1928 (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	60.9149	52.7738	54.8067	46.8973	44.2316	38.6788	38.0433	40.6836	42.2433	48.3890	52.7996	60.2227 (64)
Efficiency of water heater (217)m	88.5962	88.5471	88.4295	88.1456	87.4388	85.0000	85.0000	85.0000	85.0000	88.0872	88.4834	85.0000 (216)
Fuel for water heating, kWh/month	68.7556	59.5996	61.9778	53.2043	50.5858	45.5045	44.7569	47.8630	49.6980	54.9331	59.6718	67.9636 (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	20.9784	16.8296	15.1532	11.1019	8.5754	7.0062	7.8228	10.1684	13.2077	17.3292	19.5733	21.5614 (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)												

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(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)
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												2544.6135	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												85.0000	
Water heating fuel used												664.5141	(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)												169.3075	(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												4202.5801	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2544.6135	3.6400	92.6239	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	664.5141	3.6400	24.1883	(247)
Energy for instantaneous electric shower(s)	738.1451	16.4900	121.7201	(247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814	(249)
Energy for lighting	169.3075	16.4900	27.9188	(250)
Additional standing charges			92.0000	(251)
Total energy cost			372.6326	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.1361	(257)
SAP value		81.5842	
SAP rating (Section 12)		82	(258)
SAP band		B	

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	2544.6135	0.2100	534.3688	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	664.5141	0.2100	139.5480	(264)
Energy for instantaneous electric shower(s)	738.1451	0.1391	102.6923	(264a)
Space and water heating			673.9168	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	169.3075	0.1443	24.4363	(268)
Total CO2, kg/year			812.9747	(272)
CO2 emissions per m2			11.1200	(273)
EI value			90.7742	
EI rating			91	(274)
EI band			B	

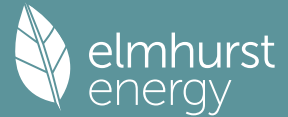
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	37.2600 (1b)	x 2.5500 (2b)	= 95.0130 (1b) - (3b)	
First floor	35.8200 (1c)	x 2.4200 (2c)	= 86.6844 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.0800			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	181.6974	(5)

2. Ventilation rate

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											m3 per hour	
Number of open chimneys											0 * 80 =	0.0000 (6a)
Number of open flues											0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire											0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler											0 * 20 =	0.0000 (6d)
Number of flues attached to other heater											0 * 35 =	0.0000 (6e)
Number of blocked chimneys											0 * 20 =	0.0000 (6f)
Number of intermittent extract fans											3 * 10 =	30.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
											Air changes per hour	
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =										30.0000 / (5) =	0.1651 (8)
Pressure test											Yes	
Pressure Test Method											Blower Door	
Measured/design AP50											5.0000 (17)	
Infiltration rate											0.4151 (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) =	0.3840 (21)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.8000	3.5000	3.6000	3.4000	3.4000	3.7000	3.5000	4.0000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9500	0.8750	0.9000	0.8500	0.8500	0.9250	0.8750	1.0000 (22a)
Adj infilt rate	0.4032	0.3840	0.3840	0.3552	0.3648	0.3360	0.3456	0.3264	0.3264	0.3552	0.3360	0.3840 (22b)
Effective ac	0.5813	0.5737	0.5737	0.5631	0.5665	0.5564	0.5597	0.5533	0.5533	0.5631	0.5564	0.5737 (25)

3. Heat losses and heat loss parameter

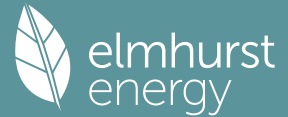
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
Solid Door			1.7900	1.0000	1.7900		(26)
Window			11.1900	1.1450	12.8130		(27)
Ground Floor			37.2600	0.1300	4.8438	135.0000	5030.1000 (28a)
External Walls	86.2600	12.9800	73.2800	0.1800	13.1904	55.5000	4067.0400 (29a)
Pitched Roof, Flat Ceiling	35.8200		35.8200	0.1100	3.9402	8.8000	315.2160 (30)
Flat Roof	1.4400		1.4400	0.1100	0.1584	8.8000	12.6720 (30)
Total net area of external elements Aum(A, m2)			160.7800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 36.7358		(33)
Main dwelling							
Party Wall			50.4700	0.0000	0.0000	55.5000	2801.0850 (32)
Internal Walls			94.1700			8.8000	828.6960 (32c)
Internal Floor			35.8200			17.6000	630.4320 (32d)
Internal Ceiling			35.8200			8.8000	315.2160 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) = 14000.4570	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							191.5771 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				7.9500	0.2140	1.7013	
E3 Sill				4.2000	0.0200	0.0840	
E4 Jamb				15.7200	0.0150	0.2358	
E5 Ground floor (normal)				17.5500	0.0510	0.8951	
P1 Party wall - Ground floor				10.3500	0.0360	0.3726	
E6 Intermediate floor within a dwelling				13.5500	0.0010	0.0136	
E24 Eaves (insulation at ceiling level - inverted)				3.6000	0.1500	0.5400	
P2 Party wall - Intermediate floor within a dwelling				9.9500	0.0000	0.0000	
E14 Flat roof				4.4000	0.1600	0.7040	
E10 Eaves (insulation at ceiling level)				17.1500	0.0560	0.9604	
P4 Party wall - Roof (insulation at ceiling level)				9.9500	0.0330	0.3283	
E16 Corner (normal)				9.9400	0.0380	0.3777	
E18 Party wall between dwellings				9.9400	0.0400	0.3976	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.6104 (36)
Point Thermal bridges						(36a) = 0.0000	
Total fabric heat loss						(33) + (36) + (36a) = 43.3461	(37)

List of Thermal Bridges												
K1 Element										Length	Psi-value	Total
E2 Other lintels (including other steel lintels)										7.9500	0.2140	1.7013
E3 Sill										4.2000	0.0200	0.0840
E4 Jamb										15.7200	0.0150	0.2358
E5 Ground floor (normal)										17.5500	0.0510	0.8951
P1 Party wall - Ground floor										10.3500	0.0360	0.3726
E6 Intermediate floor within a dwelling										13.5500	0.0010	0.0136
E24 Eaves (insulation at ceiling level - inverted)										3.6000	0.1500	0.5400
P2 Party wall - Intermediate floor within a dwelling										9.9500	0.0000	0.0000
E14 Flat roof										4.4000	0.1600	0.7040
E10 Eaves (insulation at ceiling level)										17.1500	0.0560	0.9604
P4 Party wall - Roof (insulation at ceiling level)										9.9500	0.0330	0.3283
E16 Corner (normal)										9.9400	0.0380	0.3777
E18 Party wall between dwellings										9.9400	0.0400	0.3976
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												6.6104 (36)
Point Thermal bridges												0.0000
Total fabric heat loss												(33) + (36) + (36a) = 43.3461 (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	34.8533	34.4003	34.4003	33.7621	33.9693	33.3643	33.5604	33.1737	33.1737	33.7621	33.3643	34.4003 (38)
Heat transfer coeff	78.1995	77.7464	77.7464	77.1083	77.3154	76.7104	76.9066	76.5198	76.5198	77.1083	76.7104	77.7464 (39)
Average = Sum(39)m / 12 =												77.1948
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0701	1.0639	1.0639	1.0551	1.0580	1.0497	1.0524	1.0471	1.0471	1.0551	1.0497	1.0639 (40)
HLP (average)												1.0563
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3185 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses	38.3740	36.9785	35.5831	34.1877	32.7923	31.3969	31.3969	32.7923	34.1877	35.5831	36.9785	38.3740 (42c)
Average daily hot water use (litres/day)												34.8854 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	38.3740	36.9785	35.5831	34.1877	32.7923	31.3969	31.3969	32.7923	34.1877	35.5831	36.9785	38.3740 (44)
Energy content (annual)	60.7750	52.6569	54.6899	46.8013	44.1447	38.6061	37.9718	40.6037	42.1569	48.2860	52.6827	60.0843 (45)
Distribution loss (46)m = 0.15 x (45)m	9.1162	7.8985	8.2035	7.0202	6.6217	5.7909	5.6958	6.0906	6.3235	7.2429	7.9024	9.0127 (46)
Water storage loss (or HIU loss):												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

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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 (57)
Combi loss	0.1399	0.1168	0.1168	0.0960	0.0869	0.0727	0.0715	0.0799	0.0865	0.1031	0.1169 0.1383 (61)
Total heat required for water heating calculated for each month											
WWHRS	60.9149	52.7738	54.8067	46.8973	44.2316	38.6788	38.0433	40.6836	42.2433	48.3890	52.7996 60.2227 (62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (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 (63b)
FGHRS	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	60.9149	52.7738	54.8067	46.8973	44.2316	38.6788	38.0433	40.6836	42.2433	48.3890	52.7996 60.2227 (64)
Total per year (kWh/year) = Sum(64)m =											580.6846 (64)
Electric shower(s)											
	64.8922	57.8195	63.1367	60.2505	61.3811	58.5516	60.5034	61.3811	60.2505	63.1367	61.9495 64.8922 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											738.1451 (64a)
Heat gains from water heating, kWh/month											
	36.4657	31.9925	33.9978	30.6481	30.0451	27.4926	27.7693	28.8660	29.1014	31.8650	33.0336 36.2357 (65)

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

Metabolic gains (Table 5), Watts											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov Dec
(66)m	139.1111	139.1111	139.1111	139.1111	139.1111	139.1111	139.1111	139.1111	139.1111	139.1111	139.1111 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5											
	23.9672	21.2875	17.3121	13.1064	9.7972	8.2712	8.9373	11.6171	15.5924	19.7981	23.1074 24.6333 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5											
	305.0392	308.2045	300.2279	283.2467	261.8110	241.6645	228.2053	225.0400	233.0165	249.9978	271.4335 291.5800 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5											
	51.2296	51.2296	51.2296	51.2296	51.2296	51.2296	51.2296	51.2296	51.2296	51.2296	51.2296 (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 (70)
Losses e.g. evaporation (negative values) (Table 5)											
	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408 (71)
Water heating gains (Table 5)											
	49.0130	47.6079	45.6959	42.5667	40.3832	38.1842	37.3244	38.7984	40.4186	42.8293	45.8800 48.7039 (72)
Total internal gains	478.6195	477.6999	463.8360	439.5199	412.5914	385.7199	372.0670	373.0554	386.6276	413.2252	441.0208 465.5173 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	Specific data or Table 6c	FF Access factor Table 6d	Gains W
North	7.8600	12.3661	0.4500	0.0000	0.7700	33.6790 (74)
South	3.3300	52.5273	0.4500	0.0000	0.7700	60.6083 (78)
Solar gains	94.2874	142.7777	206.3998	288.1599	340.5754	375.0773 352.2246 307.3419 250.1734 173.7590 109.5831 77.0761 (83)
Total gains	572.9068	620.4776	670.2358	727.6798	753.1668	760.7971 724.2917 680.3973 636.8010 586.9843 550.6039 542.5934 (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	49.7320	50.0218	50.0218	50.4358	50.3006	50.6974	50.5681	50.8236	50.8236	50.4358	50.6974 50.0218
alpha	4.3155	4.3348	4.3348	4.3624	4.3534	4.3798	4.3712	4.3882	4.3882	4.3624	4.3798 4.3348
util living area	0.9802	0.9699	0.9418	0.8639	0.7073	0.4551	0.2754	0.3135	0.6201	0.8782	0.9645 0.9836 (86)
MIT	19.7653	19.9361	20.2467	20.6248	20.8850	20.9878	20.9990	20.9983	20.9522	20.6577	20.1561 19.7256 (87)
Th 2	20.0254	20.0305	20.0305	20.0377	20.0353	20.0421	20.0399	20.0443	20.0443	20.0377	20.0421 20.0305 (88)
util rest of house	0.9753	0.9625	0.9269	0.8300	0.6417	0.3643	0.1741	0.2073	0.5279	0.8396	0.9541 0.9795 (89)
MIT 2	18.6135	18.8319	19.2179	19.6730	19.9471	20.0369	20.0398	20.0440	20.0170	19.7200	19.1193 18.5673 (90)
Living area fraction	19.1085	19.3065	19.6601	20.0821	20.3502	20.4456	20.4521	20.4542	20.4190	20.1231	19.5649 19.0651 (92)
MIT	18.9585	19.1565	19.5101	19.9321	20.2002	20.2956	20.3021	20.3042	20.2690	19.9731	19.4149 18.9151 (93)
Temperature adjustment											-0.1500
adjusted MIT											

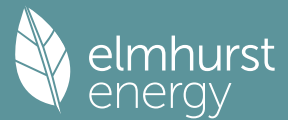
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9681	0.9539	0.9172	0.8258	0.6537	0.3888	0.2018	0.2363	0.5507	0.8366	0.9455	0.9730 (94)
Useful gains	554.6139	591.8501	614.7423	600.9297	492.3162	295.7845	146.1759	160.7908	350.6751	491.0688	520.5844	527.9441 (95)
Ext temp.	5.2000	5.8000	7.6000	10.2000	13.3000	16.4000	18.4000	18.2000	15.5000	11.9000	8.1000	5.2000 (96)
Heat loss rate W	1075.9113	1038.4173	925.9661	750.4266	533.4937	298.8332	146.2832	161.0112	364.9195	622.4997	867.9727	1066.2997 (97)
Space heating kWh	387.8453	300.0932	231.5505	107.6378	30.6361	0.0000	0.0000	0.0000	0.0000	97.7845	250.1195	400.5366 (98a)
Space heating requirement - total per year (kWh/year)												1806.2035
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	387.8453	300.0932	231.5505	107.6378	30.6361	0.0000	0.0000	0.0000	0.0000	97.7845	250.1195	400.5366 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1806.2035
Space heating per m ²												(98c) / (4) = 24.7154 (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 %)	89.1000 (206)

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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	387.8453	300.0932	231.5505	107.6378	30.6361	0.0000	0.0000	0.0000	0.0000	97.7845	250.1195	400.5366 (98)
Space heating efficiency (main heating system 1)	89.1000	89.1000	89.1000	89.1000	89.1000	0.0000	0.0000	0.0000	0.0000	89.1000	89.1000	89.1000 (210)
Space heating fuel (main heating system)	435.2921	336.8049	259.8771	120.8056	34.3839	0.0000	0.0000	0.0000	0.0000	109.7470	280.7178	449.5360 (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	60.9149	52.7738	54.8067	46.8973	44.2316	38.6788	38.0433	40.6836	42.2433	48.3890	52.7996	60.2227 (64)
Efficiency of water heater	88.5204	88.4618	88.2850	87.8146	86.6312	85.0000	85.0000	85.0000	85.0000	87.6996	88.3571	85.0000 (216)
(217)m	88.5204	88.4618	88.2850	87.8146	86.6312	85.0000	85.0000	85.0000	85.0000	87.6996	88.3571	88.5418 (217)
Fuel for water heating, kWh/month	68.8145	59.6571	62.0793	53.4049	51.0573	45.5045	44.7569	47.8630	49.6980	55.1759	59.7570	68.0161 (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	20.9784	16.8296	15.1532	11.1019	8.5754	7.0062	7.8228	10.1684	13.2077	17.3292	19.5733	21.5614 (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												2027.1645 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												85.0000
Water heating fuel used												665.7846 (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)												169.3075 (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												3686.4016 (238)

10a. Fuel costs - using BEDF prices (596)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2027.1645	7.3200	148.3884 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	665.7846	7.3200	48.7354 (247)
Energy for instantaneous electric shower(s)	738.1451	27.6700	204.2447 (247a)
Pumps, fans and electric keep-hot	86.0000	27.6700	23.7962 (249)
Energy for lighting	169.3075	27.6700	46.8474 (250)
Additional standing charges			108.0000 (251)
Total energy cost			580.0122 (255)

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	2027.1645	0.2100	425.7045 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	665.7846	0.2100	139.8148 (264)
Energy for instantaneous electric shower(s)	738.1451	0.1391	102.6923 (264a)
Space and water heating			565.5193 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	169.3075	0.1443	24.4363 (268)
Total CO2, kg/year			704.5772 (272)

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	2027.1645	1.1300	2290.6959 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	665.7846	1.1300	752.3366 (278)
Energy for instantaneous electric shower(s)	738.1451	1.5143	1117.7983 (278a)

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Space and water heating			3043.0324 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	169.3075	1.5338	259.6895 (282)
Total Primary energy kWh/year			4550.6210 (286)

SAP 10 EPC IMPROVEMENTS

Be Lean

Current energy efficiency rating: B 82
Current environmental impact rating: B 91

N Solar water heating			SAP increase too small
U Solar photovoltaic panels			Recommended
V2 Wind turbine			Not applicable
Recommended measures:	SAP change	Cost change	CO2 change
U Solar photovoltaic panels	+ 6.4	-£ 226	-110 kg (15.6%)
Measures omitted - SAP change or cost saving too small:			
N Solar water heating	+ 0.0	-£ 8	-74 kg (10.5%)

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
Solar photovoltaic panels	£226	1.50 kg/m²	B 88 A 92
Total Savings	£226	1.50 kg/m²	

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 92

Fuel prices for cost data on this page from database revision number 596 TEST (30 Jun 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£275	£275	£0
Mains gas	£305	£305	£0
Space heating	£280	£280	£0
Water heating	£253	£253	£0
Lighting	£47	£47	£0
Generated (PV)	-£0	-£226	£226
Total cost of fuels	£580	£354	£226
Total cost of uses	£580	£354	£226
Delivered energy	50 kWh/m²	39 kWh/m²	11 kWh/m²
Carbon dioxide emissions	0.7 tonnes	0.6 tonnes	0.1 tonnes
CO2 emissions per m²	10 kg/m²	8 kg/m²	1 kg/m²
Primary energy	62 kWh/m²	46 kWh/m²	17 kWh/m²

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

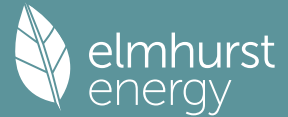
1. Overall dwelling characteristics

	Area (m²)	Storey height (m)	Volume (m³)
Main dwelling			
Ground floor	37.2600 (1b)	x 2.5500 (2b)	= 95.0130 (1b) - (3b)
First floor	35.8200 (1c)	x 2.4200 (2c)	= 86.6844 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.0800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	181.6974 (5)

2. Ventilation rate

	m³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1651 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4151 (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) = 0.3840 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4896	0.4800	0.4704	0.4224	0.4128	0.3648	0.3648	0.3552	0.3840	0.4128	0.4320	0.4512 (22b)
Effective ac	0.6198	0.6152	0.6106	0.5892	0.5852	0.5665	0.5665	0.5631	0.5737	0.5852	0.5933	0.6018 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Solid Door			1.7900	1.0000	1.7900		(26)
Window			11.1900	1.1450	12.8130		(27)
Ground Floor			37.2600	0.1300	4.8438	135.0000	5030.1000 (28a)
External Walls	86.2600	12.9800	73.2800	0.1800	13.1904	55.5000	4067.0400 (29a)
Pitched Roof, Flat Ceiling	35.8200		35.8200	0.1100	3.9402	8.8000	315.2160 (30)
Flat Roof	1.4400		1.4400	0.1100	0.1584	8.8000	12.6720 (30)
Total net area of external elements Aum(A, m ²)			160.7800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	36.7358	(33)
Main dwelling							
Party Wall			50.4700	0.0000	0.0000	55.5000	2801.0850 (32)
Internal Walls			94.1700			8.8000	828.6960 (32c)
Internal Floor			35.8200			17.6000	630.4320 (32d)
Internal Ceiling			35.8200			8.8000	315.2160 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 14000.4570 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 191.5771 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	7.9500	0.2140	1.7013
E3 Sill	4.2000	0.0200	0.0840
E4 Jamb	15.7200	0.0150	0.2358
E5 Ground floor (normal)	17.5500	0.0510	0.8951
P1 Party wall - Ground floor	10.3500	0.0360	0.3726
E6 Intermediate floor within a dwelling	13.5500	0.0010	0.0136
E24 Eaves (insulation at ceiling level - inverted)	3.6000	0.1500	0.5400
P2 Party wall - Intermediate floor within a dwelling	9.9500	0.0000	0.0000
E14 Flat roof	4.4000	0.1600	0.7040
E10 Eaves (insulation at ceiling level)	17.1500	0.0560	0.9604
P4 Party wall - Roof (insulation at ceiling level)	9.9500	0.0330	0.3283
E16 Corner (normal)	9.9400	0.0380	0.3777
E18 Party wall between dwellings	9.9400	0.0400	0.3976

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.6104 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 43.3461 (37)

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

(38)m	Jan 37.1657	Feb 36.8866	Mar 36.6131	Apr 35.3285	May 35.0882	Jun 33.9693	Jul 33.9693	Aug 33.7621	Sep 34.4003	Oct 35.0882	Nov 35.5744	Dec 36.0827 (38)
Heat transfer coeff	80.5118	80.2328	79.9593	78.6747	78.4343	77.3154	77.3154	77.1083	77.7464	78.4343	78.9205	79.4289 (39)
Average = Sum(39)m / 12 =												78.6735

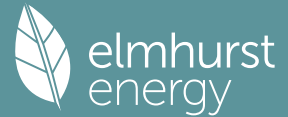
HLP	Jan 1.1017	Feb 1.0979	Mar 1.0941	Apr 1.0766	May 1.0733	Jun 1.0580	Jul 1.0580	Aug 1.0551	Sep 1.0639	Oct 1.0733	Nov 1.0799	Dec 1.0869 (40)
HLP (average)												1.0765
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3185 (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												
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 (42b)
Hot water usage for other uses												
38.3740	36.9785	35.5831	34.1877	32.7923	31.3969	31.3969	32.7923	34.1877	35.5831	36.9785	38.3740	38.3740 (42c)
Average daily hot water use (litres/day)												34.8854 (43)
Daily hot water use	Jan 38.3740	Feb 36.9785	Mar 35.5831	Apr 34.1877	May 32.7923	Jun 31.3969	Jul 31.3969	Aug 32.7923	Sep 34.1877	Oct 35.5831	Nov 36.9785	Dec 38.3740 (44)
Energy conte	60.7750	52.6569	54.6899	46.8013	44.1447	38.6061	37.9718	40.6037	42.1569	48.2860	52.6827	60.0843 (45)
Energy content (annual)										Total = Sum(45)m =		579.4593
Distribution loss (46)m = 0.15 x (45)m	9.1162	7.8985	8.2035	7.0202	6.6217	5.7909	5.6958	6.0906	6.3235	7.2429	7.9024	9.0127 (46)
Water storage loss (or HIU loss):												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.1399	0.1168	0.1168	0.0960	0.0869	0.0727	0.0715	0.0799	0.0865	0.1031	0.1169	0.1383 (61)
Total heat required for water heating calculated for each month	60.9149	52.7738	54.8067	46.8973	44.2316	38.6788	38.0433	40.6836	42.2433	48.3890	52.7996	60.2227 (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	60.9149	52.7738	54.8067	46.8973	44.2316	38.6788	38.0433	40.6836	42.2433	48.3890	52.7996	60.2227 (64)
Electric shower(s)	64.8922	57.8195	63.1367	60.2505	61.3811	58.5516	60.5034	61.3811	60.2505	63.1367	61.9495	64.8922 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												738.1451 (64a)
Heat gains from water heating, kWh/month	36.4657	31.9925	33.9978	30.6481	30.0451	27.4926	27.7693	28.8660	29.1014	31.8650	33.0336	36.2357 (65)

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

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Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	139.1111	139.1111	139.1111	139.1111	139.1111	139.1111	139.1111	139.1111	139.1111	139.1111	139.1111	139.1111
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.9672	21.2875	17.3121	13.1064	9.7972	8.2712	8.9373	11.6171	15.5924	19.7981	23.1074	24.6333
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	305.0392	308.2045	300.2279	283.2467	261.8110	241.6645	228.2053	225.0400	233.0165	249.9978	271.4335	291.5800
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.2296	51.2296	51.2296	51.2296	51.2296	51.2296	51.2296	51.2296	51.2296	51.2296	51.2296	51.2296
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
Losses e.g. evaporation (negative values) (Table 5)	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408
Water heating gains (Table 5)	49.0130	47.6079	45.6959	42.5667	40.3832	38.1842	37.3244	38.7984	40.4186	42.8293	45.8800	48.7039
Total internal gains	478.6195	477.6999	463.8360	439.5199	412.5914	385.7199	372.0670	373.0554	386.6276	413.2252	441.0208	465.5173

6. Solar gains

[Jan]	Area m ²		Solar flux Table 6a W/m ²		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North	7.8600		10.6334		0.4500		0.0000		0.7700		28.9599	(74)
South	3.3300		46.7521		0.4500		0.0000		0.7700		53.9446	(78)
Solar gains	82.9046	143.6913	206.5818	278.2504	336.0309	345.3944	328.0099	282.3889	230.6302	161.1707	99.6686	70.7556
Total gains	561.5240	621.3913	670.4178	717.7703	748.6224	731.1143	700.0770	655.4443	617.2578	574.3959	540.6894	536.2728

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	48.3037	48.4717	48.6375	49.4316	49.5831	50.3006	50.3006	50.4358	50.0218	49.5831	49.2776	48.9623
alpha	4.2202	4.2314	4.2425	4.2954	4.3055	4.3534	4.3534	4.3624	4.3348	4.3055	4.2852	4.2642
util living area	0.9852	0.9760	0.9562	0.9057	0.8008	0.6312	0.4749	0.5235	0.7516	0.9226	0.9749	0.9876
MIT	19.5607	19.7525	20.0556	20.4478	20.7622	20.9387	20.9858	20.9787	20.8669	20.4769	19.9584	19.5313
Th 2	19.9995	20.0026	20.0056	20.0200	20.0227	20.0353	20.0353	20.0377	20.0305	20.0227	20.0173	20.0116
util rest of house	0.9816	0.9702	0.9453	0.8818	0.7522	0.5517	0.3759	0.4218	0.6793	0.8979	0.9679	0.9846
MIT 2	18.3359	18.5804	18.9626	19.4522	19.8120	19.9955	20.0296	20.0282	19.9322	19.4982	18.8536	18.3070
Living area fraction	18.8623	19.0842	19.4324	19.8801	20.2204	20.4009	20.4406	20.4367	20.3339	19.9188	19.3284	18.8332
MIT	18.7123	18.9342	19.2824	19.7301	20.0704	20.2509	20.2906	20.2867	20.1839	19.7688	19.1784	18.6832
Temperature adjustment												-0.1500
adjusted MIT												18.6832

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9753	0.9621	0.9354	0.8736	0.7548	0.5703	0.4027	0.4490	0.6918	0.8902	0.9599	0.9790
Useful gains	547.6662	597.8325	627.1209	627.0249	565.0390	416.9410	281.9129	294.2622	427.0231	511.3243	519.0006	525.0193
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	1160.3598	1125.9999	1022.0696	852.0554	656.5263	436.8998	285.3380	299.6986	473.0043	719.1515	953.2375	1150.3872
Space heating kWh	455.8440	354.9285	293.8418	162.0220	68.0666	0.0000	0.0000	0.0000	0.0000	154.6234	312.6506	465.2738
Space heating requirement - total per year (kWh/year)												2267.2506
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
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	455.8440	354.9285	293.8418	162.0220	68.0666	0.0000	0.0000	0.0000	0.0000	154.6234	312.6506	465.2738
Space heating requirement after solar contribution - total per year (kWh/year)												2267.2506
Space heating per m ²										(98c) / (4) =		31.0242

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 %)												89.1000 (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	455.8440	354.9285	293.8418	162.0220	68.0666	0.0000	0.0000	0.0000	0.0000	154.6234	312.6506	465.2738
Space heating efficiency (main heating system 1)	89.1000	89.1000	89.1000	89.1000	89.1000	0.0000	0.0000	0.0000	0.0000	89.1000	89.1000	89.1000
Space heating fuel (main heating system)	511.6095	398.3485	329.7888	181.8428	76.3935	0.0000	0.0000	0.0000	0.0000	173.5391	350.8985	522.1928
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
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
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
Water heating												
Water heating requirement	60.9149	52.7738	54.8067	46.8973	44.2316	38.6788	38.0433	40.6836	42.2433	48.3890	52.7996	60.2227
Efficiency of water heater	88.5962	88.5471	88.4295	88.1456	87.4388	85.0000	85.0000	85.0000	85.0000	88.0872	88.4834	85.0000
Fuel for water heating, kWh/month												88.6102

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Space cooling fuel requirement	68.7556	59.5996	61.9778	53.2043	50.5858	45.5045	44.7569	47.8630	49.6980	54.9331	59.6718	67.9636	(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	20.9784	16.8296	15.1532	11.1019	8.5754	7.0062	7.8228	10.1684	13.2077	17.3292	19.5733	21.5614	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.9939	-49.1432	-72.6661	-84.3262	-93.4495	-88.5225	-87.8172	-81.9038	-71.3834	-57.7311	-37.9382	-29.2712	(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												2544.6135	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												85.0000	
Water heating fuel used												664.5141	(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)												169.3075	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-788.1463	(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												3414.4338	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2544.6135	3.6400	92.6239 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	664.5141	3.6400	24.1883 (247)
Energy for instantaneous electric shower(s)	738.1451	16.4900	121.7201 (247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814 (249)
Energy for lighting	169.3075	16.4900	27.9188 (250)
Additional standing charges			92.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-788.1463	16.4900	-129.9653
PV Unit electricity exported	0.0000	5.5900	0.0000
Total			-129.9653 (252)
Total energy cost			242.6672 (255)

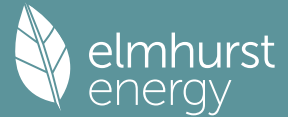
11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)		0.7398 (257)
SAP value		88.0072
SAP rating (Section 12)		88 (258)
SAP band		B

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	2544.6135	0.2100	534.3688 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	664.5141	0.2100	139.5480 (264)
Energy for instantaneous electric shower(s)	738.1451	0.1391	102.6923 (264a)
Space and water heating			673.9168 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	169.3075	0.1443	24.4363 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-788.1463	0.1339	-105.5195
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-105.5195 (269)
Total CO2, kg/year			707.4551 (272)
CO2 emissions per m2			9.6800 (273)
EI value			91.9716
EI rating			92 (274)
EI band			A

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1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	37.2600 (1b)	x 2.5500 (2b)	= 95.0130 (1b) - (3b)
First floor	35.8200 (1c)	x 2.4200 (2c)	= 86.6844 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.0800		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	181.6974 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1651 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4151 (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) = 0.3840 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.8000	3.5000	3.6000	3.4000	3.4000	3.7000	3.5000	4.0000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9500	0.8750	0.9000	0.8500	0.8500	0.9250	0.8750	1.0000 (22a)
Adj infilt rate	0.4032	0.3840	0.3840	0.3552	0.3648	0.3360	0.3456	0.3264	0.3264	0.3552	0.3360	0.3840 (22b)
Effective ac	0.5813	0.5737	0.5737	0.5631	0.5665	0.5564	0.5597	0.5533	0.5533	0.5631	0.5564	0.5737 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
Solid Door			1.7900	1.0000	1.7900		(26)
Window			11.1900	1.1450	12.8130		(27)
Ground Floor			37.2600	0.1300	4.8438	135.0000	5030.1000 (28a)
External Walls	86.2600	12.9800	73.2800	0.1800	13.1904	55.5000	4067.0400 (29a)
Pitched Roof, Flat Ceiling	35.8200		35.8200	0.1100	3.9402	8.8000	315.2160 (30)
Flat Roof	1.4400		1.4400	0.1100	0.1584	8.8000	12.6720 (30)
Total net area of external elements Aum(A, m2)			160.7800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.7358		(33)
Main dwelling							
Party Wall			50.4700	0.0000	0.0000	55.5000	2801.0850 (32)
Internal Walls			94.1700			8.8000	828.6960 (32c)
Internal Floor			35.8200			17.6000	630.4320 (32d)
Internal Ceiling			35.8200			8.8000	315.2160 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	14000.4570 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		191.5771 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	7.9500	0.2140	1.7013
E3 Sill	4.2000	0.0200	0.0840
E4 Jamb	15.7200	0.0150	0.2358
E5 Ground floor (normal)	17.5500	0.0510	0.8951
P1 Party wall - Ground floor	10.3500	0.0360	0.3726
E6 Intermediate floor within a dwelling	13.5500	0.0010	0.0136
E24 Eaves (insulation at ceiling level - inverted)	3.6000	0.1500	0.5400
P2 Party wall - Intermediate floor within a dwelling	9.9500	0.0000	0.0000
E14 Flat roof	4.4000	0.1600	0.7040
E10 Eaves (insulation at ceiling level)	17.1500	0.0560	0.9604
P4 Party wall - Roof (insulation at ceiling level)	9.9500	0.0330	0.3283
E16 Corner (normal)	9.9400	0.0380	0.3777
E18 Party wall between dwellings	9.9400	0.0400	0.3976

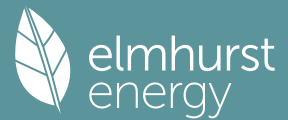
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.6104 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	43.3461 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)		
(38)m	Jan 34.8533	Feb 34.4003
Heat transfer coeff	78.1995	77.7464
Average = Sum(39)m / 12 =		

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0701	1.0639	1.0639	1.0551	1.0580	1.0497	1.0524	1.0471	1.0471	1.0551	1.0497	1.0639 (40)
HLP (average)												1.0563
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

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Assumed occupancy												2.3185 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	38.3740	36.9785	35.5831	34.1877	32.7923	31.3969	31.3969	32.7923	34.1877	35.5831	36.9785	(42c)
Average daily hot water use (litres/day)												34.8854 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	38.3740	36.9785	35.5831	34.1877	32.7923	31.3969	31.3969	32.7923	34.1877	35.5831	36.9785	38.3740 (44)
Distribution loss (46)m = 0.15 x (45)m	60.7750	52.6569	54.6899	46.8013	44.1447	38.6061	37.9718	40.6037	42.1569	48.2860	52.6827	60.0843 (45)
Water storage loss (or HIU loss):	9.1162	7.8985	8.2035	7.0202	6.6217	5.7909	5.6958	6.0906	6.3235	7.2429	7.9024	9.0127 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.1399	0.1168	0.1168	0.0960	0.0869	0.0727	0.0715	0.0799	0.0865	0.1031	0.1169	0.1383 (61)
Total heat required for water heating calculated for each month	60.9149	52.7738	54.8067	46.8973	44.2316	38.6788	38.0433	40.6836	42.2433	48.3890	52.7996	60.2227 (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	60.9149	52.7738	54.8067	46.8973	44.2316	38.6788	38.0433	40.6836	42.2433	48.3890	52.7996	60.2227 (64)
Electric shower(s)	64.8922	57.8195	63.1367	60.2505	61.3811	58.5516	60.5034	61.3811	60.2505	63.1367	61.9495	64.8922 (64a)
Heat gains from water heating, kWh/month	36.4657	31.9925	33.9978	30.6481	30.0451	27.4926	27.7693	28.8660	29.1014	31.8650	33.0336	36.2357 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	139.1111	139.1111	139.1111	139.1111	139.1111	139.1111	139.1111	139.1111	139.1111	139.1111	139.1111	139.1111 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.9672	21.2875	17.3121	13.1064	9.7972	8.2712	8.9373	11.6171	15.5924	19.7981	23.1074	24.6333 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	305.0392	308.2045	300.2279	283.2467	261.8110	241.6645	228.2053	225.0400	233.0165	249.9978	271.4335	291.5800 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.2296	51.2296	51.2296	51.2296	51.2296	51.2296	51.2296	51.2296	51.2296	51.2296	51.2296	51.2296 (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)	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408	-92.7408 (71)
Water heating gains (Table 5)	49.0130	47.6079	45.6959	42.5667	40.3832	38.1842	37.3244	38.7984	40.4186	42.8293	45.8800	48.7039 (72)
Total internal gains	478.6195	477.6999	463.8360	439.5199	412.5914	385.7199	372.0670	373.0554	386.6276	413.2252	441.0208	465.5173 (73)

6. Solar gains

[Jan]														
	Area				Solar flux		g		FF		Access		Gains	
	m2				Table 6a		Specific data		Specific data		factor		W	
					W/m2		or Table 6b		or Table 6c		Table 6d			
North	7.8600				12.3661		0.4500		0.0000		0.7700		33.6790 (74)	
South	3.3300				52.5273		0.4500		0.0000		0.7700		60.6083 (78)	
Solar gains	94.2874	142.7777	206.3998	288.1599	340.5754	375.0773	352.2246	307.3419	250.1734	173.7590	109.5831	77.0761	(83)	
Total gains	572.9068	620.4776	670.2358	727.6798	753.1668	760.7971	724.2917	680.3973	636.8010	586.9843	550.6039	542.5934	(84)	

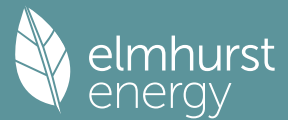
7. Mean internal temperature (heating season)

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	49.7320	50.0218	50.0218	50.4358	50.3006	50.6974	50.5681	50.8236	50.8236	50.4358	50.6974	50.0218
alpha	4.3155	4.3348	4.3348	4.3624	4.3534	4.3798	4.3712	4.3882	4.3882	4.3624	4.3798	4.3348
util living area	0.9802	0.9699	0.9418	0.8639	0.7073	0.4551	0.2754	0.3135	0.6201	0.8782	0.9645	0.9836 (86)
MIT	19.7653	19.9361	20.2467	20.6248	20.8850	20.9878	20.9990	20.9983	20.9522	20.6577	20.1561	19.7256 (87)
Th 2	20.0254	20.0305	20.0305	20.0377	20.0353	20.0421	20.0399	20.0443	20.0443	20.0377	20.0421	20.0305 (88)
util rest of house	0.9753	0.9625	0.9269	0.8300	0.6417	0.3643	0.1741	0.2073	0.5279	0.8396	0.9541	0.9795 (89)
MIT 2	18.6135	18.8319	19.2179	19.6730	19.9471	20.0369	20.0398	20.0440	20.0170	19.7200	19.1193	18.5673 (90)
Living area fraction	19.1085	19.3065	19.6601	20.0821	20.3502	20.4456	20.4521	20.4542	20.4190	20.1231	19.5649	19.0651 (92)
Temperature adjustment	18.9585	19.1565	19.5101	19.9321	20.2002	20.2956	20.3021	20.3042	20.2690	19.9731	19.4149	-0.1500
adjusted MIT												18.9151 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9681	0.9539	0.9172	0.8258	0.6537	0.3888	0.2018	0.2363	0.5507	0.8366	0.9455	0.9730 (94)
Ext temp.	5.2000	5.8000	7.6000	10.2000	13.3000	16.4000	18.4000	18.2000	15.5000	11.9000	8.1000	5.2000 (96)
Heat loss rate W												

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Space heating	1075.9113	1038.4173	925.9661	750.4266	533.4937	298.8332	146.2832	161.0112	364.9195	622.4997	867.9727	1066.2997	(97)
Space heating kWh	387.8453	300.0932	231.5505	107.6378	30.6361	0.0000	0.0000	0.0000	0.0000	97.7845	250.1195	400.5366	(98a)
Space heating requirement - total per year (kWh/year)												1806.2035	
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	387.8453	300.0932	231.5505	107.6378	30.6361	0.0000	0.0000	0.0000	0.0000	97.7845	250.1195	400.5366	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1806.2035	
Space heating per m2										(98c) / (4) =		24.7154	(99)

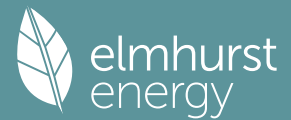
9a. Energy requirements - Individual heating systems, including micro-CHP

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 %)													89.1000	(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	387.8453	300.0932	231.5505	107.6378	30.6361	0.0000	0.0000	0.0000	0.0000	97.7845	250.1195	400.5366	(98)	
Space heating efficiency (main heating system 1)	89.1000	89.1000	89.1000	89.1000	89.1000	0.0000	0.0000	0.0000	0.0000	89.1000	89.1000	89.1000	(210)	
Space heating fuel (main heating system)	435.2921	336.8049	259.8771	120.8056	34.3839	0.0000	0.0000	0.0000	0.0000	109.7470	280.7178	449.5360	(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	60.9149	52.7738	54.8067	46.8973	44.2316	38.6788	38.0433	40.6836	42.2433	48.3890	52.7996	60.2227	(64)	
Efficiency of water heater	88.5204	88.4618	88.2850	87.8146	86.6312	85.0000	85.0000	85.0000	85.0000	87.6996	88.3571	88.5418	(216)	
Fuel for water heating, kWh/month	68.8145	59.6571	62.0793	53.4049	51.0573	45.5045	44.7569	47.8630	49.6980	55.1759	59.7570	68.0161	(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)	
(221)m	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	(231)	
Pumps and Fa	20.9784	16.8296	15.1532	11.1019	8.5754	7.0062	7.8228	10.1684	13.2077	17.3292	19.5733	21.5614	(232)	
Lighting	-38.1591	-49.4388	-73.0207	-86.0464	-93.8636	-91.9460	-90.7512	-85.5797	-75.1083	-61.2762	-41.3040	-31.8153	(233a)	
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	(234a)	
(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	(235a)	
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)	
(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	(235c)	
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)	
(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	(235e)	
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	(235f)	
(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	(235g)	
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	(235h)	
(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	(235i)	
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	(235j)	
(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	(235k)	
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	(235l)	
(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	(235m)	
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	(235n)	
(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	(235o)	
Annual totals kWh/year														
Space heating fuel - main system 1												2027.1645	(211)	
Space heating fuel - main system 2												0.0000	(213)	
Space heating fuel - secondary												0.0000	(215)	
Efficiency of water heater												85.0000		
Water heating fuel used												665.7846	(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)												169.3075	(232)	
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation												-818.3093	(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												2868.0923	(238)	

10a. Fuel costs - using BEDF prices (596)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2027.1645	7.3200	148.3884	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	665.7846	7.3200	48.7354	(247)
Energy for instantaneous electric shower(s)	738.1451	27.6700	204.2447	(247a)
Pumps, fans and electric keep-hot	86.0000	27.6700	23.7962	(249)
Energy for lighting	169.3075	27.6700	46.8474	(250)
Additional standing charges			108.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-818.3093	27.6700	-226.4262	
PV Unit electricity exported	0.0000	5.8100	0.0000	
Total			-226.4262	(252)
Total energy cost			353.5860	(255)

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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	2027.1645	0.2100	425.7045 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	665.7846	0.2100	139.8148 (264)
Energy for instantaneous electric shower(s)	738.1451	0.1391	102.6923 (264a)
Space and water heating			565.5193 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	169.3075	0.1443	24.4363 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-818.3093	0.1339	-109.6083
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-109.6083 (269)
Total CO2, kg/year			594.9688 (272)

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	2027.1645	1.1300	2290.6959 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	665.7846	1.1300	752.3366 (278)
Energy for instantaneous electric shower(s)	738.1451	1.5143	1117.7983 (278a)
Space and water heating			3043.0324 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	169.3075	1.5338	259.6895 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-818.3093	1.4950	-1223.3617
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-1223.3617 (283)
Total Primary energy kWh/year			3327.2593 (286)