

Full SAP Calculation Printout



Property Reference	1408_01 1 HBL		Issued on Date	21/03/2024	
Assessment Reference	1408_01	Prop Type Ref			
Property	Adj. 1, Higher Broad Lane Cottages, Illogan, TR15 3JW				
SAP Rating	81 B	DER	4.60	TER	13.51
Environmental	96 A	% DER < TER			65.95
CO ₂ Emissions (t/year)	0.34	DFEE	41.30	TFEE	46.26
Compliance Check	See BREL	% DFEE < TFEE			10.74
% DPER < TPER	31.62	DPER	48.60	TPER	71.07
Assessor Details	Mr. Martin Richards			Assessor ID	B046-0001
Client	MRD, MRD				

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	40.7200 (1b)	x 2.3500 (2b)	= 95.6920 (1b) - (3b)
First floor	40.7200 (1c)	x 2.5800 (2c)	= 105.0576 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 200.7496 (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) = 0.1494 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3494 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3494 (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	0.4455	0.4368	0.4281	0.3844	0.3756	0.3320	0.3320	0.3232	0.3494	0.3756	0.3931	0.4106 (22b)
Effective ac	0.5993	0.5954	0.5916	0.5739	0.5706	0.5551	0.5551	0.5522	0.5611	0.5706	0.5773	0.5843 (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
WIND 1.4 (Uw = 1.40)			9.6800	1.3258	12.8333		(27)
HG DOOR			2.1000	1.0000	2.1000		(26a)
Heatloss Floor 1			40.7200	0.1400	5.7008	110.0000	4479.2000 (28a)
Rendered walls	136.0680	11.7800	124.2880	0.1500	18.6432	190.0000	23614.7200 (29a)
Plane roof	40.7200		40.7200	0.1000	4.0720	9.0000	366.4800 (30)
Total net area of external elements Aum(A, m ²)			217.5080				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.3493		(33)
G Floor walls			16.3400			9.0000	147.0600 (32c)
F Floor walls			21.6000			9.0000	194.4000 (32c)
Internal Floor 1			40.7200			18.0000	732.9600 (32d)
Internal Ceiling 1			40.7200			9.0000	366.4800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	29901.3000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							367.1574 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E12 Gable (insulation at ceiling level)				12.7000	0.0570	0.7239	
E10 Eaves (insulation at ceiling level)				14.9000	0.1130	1.6837	
E2 Other lintels (including other steel lintels)				8.1000	0.0240	0.1944	

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E3 Sill	7.1000	0.0150	0.1065	
E4 Jamb	22.3000	0.0100	0.2230	
E5 Ground floor (normal)	27.6000	0.0750	2.0700	
E6 Intermediate floor within a dwelling	27.6000	0.0000	0.0000	
E16 Corner (normal)	24.6500	0.0620	1.5283	
E17 Corner (inverted - internal area greater than external area)	4.9300	0.0620	0.3057	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				6.8355 (36)
Point Thermal bridges				0.0000
Total fabric heat loss			(33) + (36) + (36a) =	50.1848 (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	39.6988	39.4435	39.1932	38.0177	37.7978	36.7740	36.7740	36.5844	37.1684	37.7978	38.2427	38.7079 (38)
Average = Sum(39)m / 12 =	89.8836	89.6283	89.3780	88.2025	87.9826	86.9588	86.9588	86.7692	87.3532	87.9826	88.4275	88.8927 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1037	1.1005	1.0975	1.0830	1.0803	1.0678	1.0678	1.0654	1.0726	1.0803	1.0858	1.0915 (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													2.4896 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	28.4892	28.0661	27.4703	26.3717	25.5491	24.6370	24.1443	24.7359	25.3801	26.3561	27.4773	28.3929	(42b)
Hot water usage for other uses	40.1262	38.6670	37.2079	35.7488	34.2896	32.8305	32.8305	34.2896	35.7488	37.2079	38.6670	40.1262	(42c)
Average daily hot water use (litres/day)													62.8923 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	68.6154	66.7331	64.6782	62.1205	59.8387	57.4674	56.9747	59.0255	61.1289	63.5640	66.1444	68.5191 (44)	
Energy content (annual)	108.6700	95.0271	99.4079	85.0398	80.5544	70.6629	68.9060	73.0859	75.3780	86.2558	94.2348	107.2843 (45)	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)	
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)	
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month	92.3695	80.7730	84.4968	72.2838	68.4713	60.0635	58.5701	62.1231	64.0713	73.3174	80.0996	91.1916 (62)	
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)	
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
Output from w/h	92.3695	80.7730	84.4968	72.2838	68.4713	60.0635	58.5701	62.1231	64.0713	73.3174	80.0996	91.1916 (64)	
12Total per year (kWh/year)													887.8309 (64)
Electric shower(s)	52.8249	47.0674	51.3958	49.0464	49.9667	47.6634	49.2522	49.9667	49.0464	51.3958	50.4294	52.8249	(64a)
Heat gains from water heating, kWh/month	36.2986	31.9601	33.9731	30.3326	29.6095	26.9317	26.9556	28.0224	28.2794	31.1783	32.6322	36.0041 (65)	

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

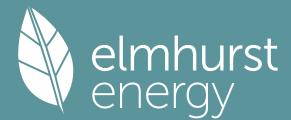
Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	124.4808	124.4808	124.4808	124.4808	124.4808	124.4808	124.4808	124.4808	124.4808	124.4808	124.4808	124.4808 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	130.6669	144.6669	130.6669	135.0224	130.6669	135.0224	130.6669	130.6669	135.0224	130.6669	135.0224	130.6669 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	222.4238	224.7318	218.9156	206.5335	190.9033	176.2132	166.3992	164.0912	169.9074	182.2895	197.9197	212.6098 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.4481	35.4481	35.4481	35.4481	35.4481	35.4481	35.4481	35.4481	35.4481	35.4481	35.4481	35.4481 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846 (71)
Water heating gains (Table 5)	48.7884	47.5597	45.6628	42.1285	39.7977	37.4052	36.2306	37.6646	39.2770	41.9063	45.3225	48.3926 (72)
Total internal gains	462.2233	477.3026	455.5895	444.0287	421.7121	408.9850	393.6410	392.7669	404.5511	415.2069	438.6089	452.0136 (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		0.6300	10.6334	0.6300	0.7000	0.5400	1.4358 (74)					
East		3.6000	19.6403	0.6300	0.7000	0.5400	15.1539 (76)					
West		5.4500	19.6403	0.6300	0.7000	0.5400	22.9413 (80)					
Solar gains	39.5310	77.2662	127.3902	186.4802	229.4488	235.3544	223.8681	191.6378	148.3432	91.6933	49.2715	32.5246 (83)
Total gains	501.7543	554.5689	582.9797	630.5089	651.1610	644.3394	617.5090	584.4046	552.8943	506.9002	487.8804	484.5382 (84)

7. Mean internal temperature (heating season)

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Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	92.4075	92.6707	92.9302	94.1687	94.4041	95.5155	95.5155	95.7242	95.0843	94.4041	93.9291	93.4376
alpha	7.1605	7.1780	7.1953	7.2779	7.2936	7.3677	7.3677	7.3816	7.3390	7.2936	7.2619	7.2292
util living area	0.9997	0.9994	0.9982	0.9910	0.9546	0.8071	0.6126	0.6695	0.9145	0.9940	0.9993	0.9998 (86)
Living	20.0341	20.1407	20.3094	20.5713	20.8094	20.9646	20.9958	20.9923	20.9057	20.6014	20.2816	20.0234
Non living	18.8701	19.0087	19.2266	19.5681	19.8552	20.0101	20.0263	20.0273	19.9634	19.6099	19.1989	18.8641
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.5059	20.1407	20.3094	20.5713	20.8094	20.9646	20.9958	20.9923	20.9057	20.6014	20.2816	20.1600 (87)
Th 2	19.9978	20.0004	20.0029	20.0147	20.0169	20.0272	20.0272	20.0292	20.0233	20.0169	20.0124	20.0078 (88)
util rest of house	0.9996	0.9990	0.9972	0.9852	0.9242	0.7111	0.4815	0.5362	0.8489	0.9890	0.9988	0.9997 (89)
MIT 2	19.5482	19.0087	19.2266	19.5681	19.8552	20.0101	20.0263	20.0273	19.9634	19.6099	19.1989	19.0701 (90)
Living area fraction									fLA = Living area / (4) =			0.3966 (91)
MIT	19.9281	19.4576	19.6560	19.9660	20.2337	20.3887	20.4108	20.4100	20.3372	20.0031	19.6283	19.5024 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9281	19.4576	19.6560	19.9660	20.2337	20.3887	20.4108	20.4100	20.3372	20.0031	19.6283	19.5024 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9996	0.9988	0.9968	0.9849	0.9322	0.7495	0.5341	0.5901	0.8735	0.9889	0.9985	0.9996 (94)
Useful gains	501.5514	553.8821	581.0865	620.9735	607.0214	482.9230	329.8109	344.8422	482.9649	501.2923	487.1720	484.3590 (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	1404.7063	1304.7765	1175.8614	976.0475	750.8133	503.3750	331.3851	347.9458	544.8364	827.3133	1107.8442	1360.2696 (97)
Space heating kWh	671.9472	504.6010	442.5126	255.6533	106.9812	0.0000	0.0000	0.0000	0.0000	242.5596	446.8839	651.6775 (98a)
Space heating requirement - total per year (kWh/year)												3322.8163
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	671.9472	504.6010	442.5126	255.6533	106.9812	0.0000	0.0000	0.0000	0.0000	242.5596	446.8839	651.6775 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3322.8163
Space heating per m2												(98c) / (4) = 40.8008 (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 %)												384.7972 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	671.9472	504.6010	442.5126	255.6533	106.9812	0.0000	0.0000	0.0000	0.0000	242.5596	446.8839	651.6775 (98)
Space heating efficiency (main heating system 1)	384.7972	384.7972	384.7972	384.7972	384.7972	0.0000	0.0000	0.0000	0.0000	384.7972	384.7972	384.7972 (210)
Space heating fuel (main heating system)	174.6237	131.1343	114.9989	66.4384	27.8020	0.0000	0.0000	0.0000	0.0000	63.0357	116.1349	169.3561 (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	92.3695	80.7730	84.4968	72.2838	68.4713	60.0635	58.5701	62.1231	64.0713	73.3174	80.0996	91.1916 (64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	92.3695	80.7730	84.4968	72.2838	68.4713	60.0635	58.5701	62.1231	64.0713	73.3174	80.0996	91.1916 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	27.1500	21.7807	19.6111	14.3680	11.0982	9.0673	10.1242	13.1598	17.0933	22.4273	25.3316	27.9046 (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												863.5240 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												100.0000
Water heating fuel used												887.8309 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												219.1160 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)

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Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	2571.3508 (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	863.5240	0.1551	133.9248 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	887.8309	0.1416	125.6965 (264)
Energy for instantaneous electric shower(s)	600.8799	0.1391	83.5957 (264a)
Space and water heating			259.6213 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	219.1160	0.1443	31.6252 (268)
Total CO2, kg/year			374.8422 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.6000 (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	863.5240	1.5742	1359.3457 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	887.8309	1.5235	1352.6397 (278)
Energy for instantaneous electric shower(s)	600.8799	1.5143	909.9330 (278a)
Space and water heating			2711.9854 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	219.1160	1.5338	336.0874 (282)
Total Primary energy kWh/year			3958.0058 (286)
Dwelling Primary energy Rate (DPER)			48.6000 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	40.7200 (1b)	x 2.3500 (2b)	= 95.6920 (1b) - (3b)
First floor	40.7200 (1c)	x 2.5800 (2c)	= 105.0576 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.4400		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 200.7496 (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) = 0.1494 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3994 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3994 (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	0.5093	0.4993	0.4893	0.4394	0.4294	0.3795	0.3795	0.3695	0.3994	0.4294	0.4494	0.4693 (22b)
Effective ac	0.6297	0.6247	0.6197	0.5965	0.5922	0.5720	0.5720	0.5683	0.5798	0.5922	0.6010	0.6101 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Semi-glazed door			2.1000	1.0000	2.1000		(26a)

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TER Opening Type (Uw = 1.20)			9.6800	1.1450	11.0840	(27)
Heatloss Floor 1			40.7200	0.1300	5.2936	(28a)
Rendered walls	136.0680	11.7800	124.2880	0.1800	22.3718	(29a)
Plane roof	40.7200		40.7200	0.1100	4.4792	(30)
Total net area of external elements Aum(A, m ²)			217.5080			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	45.3286		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 367.1574 (35)

List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E12 Gable (insulation at ceiling level)	12.7000	0.0600	0.7620
E10 Eaves (insulation at ceiling level)	14.9000	0.0600	0.8940
E2 Other lintels (including other steel lintels)	8.1000	0.0500	0.4050
E3 Sill	7.1000	0.0500	0.3550
E4 Jamb	22.3000	0.0500	1.1150
E5 Ground floor (normal)	27.6000	0.1600	4.4160
E6 Intermediate floor within a dwelling	27.6000	0.0000	0.0000
E16 Corner (normal)	24.6500	0.0900	2.2185
E17 Corner (inverted - internal area greater than external area)	4.9300	-0.0900	-0.4437

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.7218 (36)

Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	55.0504 (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	41.7150	41.3814	41.0544	39.5185	39.2311	37.8934	37.8934	37.6456	38.4086	39.2311	39.8125	40.4202 (38)
Average = Sum(39)m / 12 =	96.7655	96.4318	96.1048	94.5689	94.2815	92.9438	92.9438	92.6960	93.4591	94.2815	94.8629	95.4706 (39)
												94.5675

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1882	1.1841	1.1801	1.1612	1.1577	1.1413	1.1413	1.1382	1.1476	1.1577	1.1648	1.1723 (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													2.4896 (42)
Hot water usage for mixer showers													
Hot water usage for baths	65.9624	64.9711	63.5266	60.7628	58.7232	56.4487	55.1558	56.5894	58.1608	60.6030	63.4262	65.7097 (42a)	
Hot water usage for other uses	28.4892	28.0661	27.4703	26.3717	25.5491	24.6370	24.1443	24.7359	25.3801	26.3561	27.4773	28.3929 (42b)	
Average daily hot water use (litres/day)	40.1262	38.6670	37.2079	35.7488	34.2896	32.8305	32.8305	34.2896	35.7488	37.2079	38.6670	40.1262 (42c)	
													123.7074 (43)
Daily hot water use	134.5778	131.7042	128.2048	122.8833	118.5619	113.9161	112.1306	115.6149	119.2897	124.1670	129.5705	134.2287 (44)	
Energy conte	213.1383	187.5451	197.0460	168.2211	159.6071	140.0731	135.6122	143.1554	147.0961	168.4935	184.5970	210.1697 (45)	
Energy content (annual)													Total = Sum(45)m = 2054.7545
Distribution loss (46)m = 0.15 x (45)m	31.9707	28.1318	29.5569	25.2332	23.9411	21.0110	20.3418	21.4733	22.0644	25.2740	27.6895	31.5255 (46)	
Water storage loss:													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.3938 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)	
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month	259.7332	229.6308	243.6409	213.3129	206.2020	185.1650	182.2071	189.7503	192.1880	215.0884	229.6888	256.7646 (62)	
WWHRS	-30.1553	-26.6696	-27.9268	-23.1245	-21.5512	-18.4415	-17.2860	-18.3819	-19.0803	-22.4936	-25.4825	-29.5968 (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	229.5779	202.9612	215.7141	190.1884	184.6508	166.7235	164.9211	171.3684	173.1077	192.5948	204.2063	227.1678 (64)	
													Total per year (kWh/year) = Sum(64)m = 2323.1820 (64)
12Total per year (kWh/year)													2323 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
													Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month	108.1444	96.0273	102.7937	92.0070	90.3453	82.6478	82.3670	84.8751	84.9829	93.3000	97.4520	107.1574 (65)	

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	124.4808	124.4808	124.4808	124.4808	124.4808	124.4808	124.4808	124.4808	124.4808	124.4808	124.4808	124.4808 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	130.6669	144.6669	130.6669	135.0224	130.6669	135.0224	130.6669	130.6669	135.0224	130.6669	135.0224	130.6669 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	222.4238	224.7318	218.9156	206.5335	190.9033	176.2132	166.3992	164.0912	169.9074	182.2895	197.9197	212.6098 (68)
Pumps, fans	35.4481	35.4481	35.4481	35.4481	35.4481	35.4481	35.4481	35.4481	35.4481	35.4481	35.4481	35.4481 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846 (71)
Total internal gains	145.3554	142.8978	138.1636	127.7875	121.4319	114.7886	110.7083	114.0794	118.0319	125.4032	135.3499	144.0287 (72)
	561.7902	575.6407	551.0903	532.6876	506.3463	486.3684	468.1186	469.1817	483.3059	501.7038	531.6363	550.6496 (73)

6. Solar gains

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[Jan]		Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North		0.6300	10.6334	0.6300	0.7000	0.5400	1.4358 (74)
East		3.6000	19.6403	0.6300	0.7000	0.5400	15.1539 (76)
West		5.4500	19.6403	0.6300	0.7000	0.5400	22.9413 (80)

Solar gains	39.5310	77.2662	127.3902	186.4802	229.4488	235.3544	223.8681	191.6378	148.3432	91.6933	49.2715	32.5246 (83)
Total gains	601.3213	652.9070	678.4805	719.1678	735.7951	721.7228	691.9867	660.8195	631.6492	593.3971	580.9078	583.1743 (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	85.8356	86.1325	86.4256	87.8293	88.0970	89.3650	89.3650	89.6038	88.8723	88.0970	87.5571	86.9997
alpha	6.7224	6.7422	6.7617	6.8553	6.8731	6.9577	6.9577	6.9736	6.9248	6.8731	6.8371	6.8000
util living area	0.9992	0.9983	0.9960	0.9842	0.9356	0.7761	0.5847	0.6341	0.8827	0.9872	0.9979	0.9993 (86)
MIT	20.0299	20.1398	20.3134	20.5814	20.8192	20.9666	20.9958	20.9929	20.9161	20.6213	20.2917	20.0222 (87)
Th 2	19.9295	19.9328	19.9360	19.9512	19.9540	19.9673	19.9673	19.9697	19.9622	19.9540	19.9482	19.9422 (88)
util rest of house	0.9988	0.9975	0.9938	0.9746	0.8961	0.6739	0.4513	0.4987	0.8039	0.9775	0.9967	0.9990 (89)
MIT 2	18.8114	18.9532	19.1786	19.5276	19.8076	19.9519	19.9664	19.9681	19.9127	19.5824	19.1612	18.8114 (90)
Living area fraction									FLA = Living area / (4) = 0.3966 (91)			
MIT	19.2947	19.4234	19.6287	19.9455	20.2089	20.3544	20.3747	20.3746	20.3107	19.9944	19.6096	19.2916 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2947	19.4234	19.6287	19.9455	20.2089	20.3544	20.3747	20.3746	20.3107	19.9944	19.6096	19.2916 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9984	0.9969	0.9930	0.9745	0.9074	0.7148	0.5048	0.5533	0.8340	0.9780	0.9961	0.9987 (94)
Useful gains	600.3761	650.8708	673.7144	700.8526	667.6579	515.8727	349.2943	365.6273	526.7792	580.3572	578.6557	582.4333 (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	1450.9664	1400.5209	1261.7312	1044.5649	802.2276	534.8329	350.8340	368.4259	580.4427	885.7205	1186.6970	1440.8021 (97)
Space heating kWh	632.8392	503.7648	437.4845	247.4729	100.1199	0.0000	0.0000	0.0000	0.0000	227.1903	437.7898	638.6264 (98a)
Space heating requirement - total per year (kWh/year)												3225.2878
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	632.8392	503.7648	437.4845	247.4729	100.1199	0.0000	0.0000	0.0000	0.0000	227.1903	437.7898	638.6264 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3225.2878
Space heating per m2												(98c) / (4) = 39.6032 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
 Fraction of space heat from main system(s) 1.0000 (202)
 Efficiency of main space heating system 1 (in %) 92.3000 (206)
 Efficiency of main space heating system 2 (in %) 0.0000 (207)
 Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	632.8392	503.7648	437.4845	247.4729	100.1199	0.0000	0.0000	0.0000	0.0000	227.1903	437.7898	638.6264 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	685.6330	545.7907	473.9810	268.1179	108.4722	0.0000	0.0000	0.0000	0.0000	246.1434	474.3118	691.9029 (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	229.5779	202.9612	215.7141	190.1884	184.6508	166.7235	164.9211	171.3684	173.1077	192.5948	204.2063	227.1678 (64)
Efficiency of water heater (217)m	86.2117	86.0141	85.6114	84.6512	82.7486	79.8000	79.8000	79.8000	79.8000	84.4312	85.7247	79.8000 (216)
Fuel for water heating, kWh/month	266.2956	235.9629	251.9689	224.6729	223.1468	208.9266	206.6680	214.7474	216.9269	228.1085	238.2116	263.3898 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	27.1500	21.7807	19.6111	14.3680	11.0982	9.0673	10.1242	13.1598	17.0933	22.4273	25.3316	27.9046 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-37.9955	-53.4939	-76.7662	-86.1448	-92.7292	-86.4852	-85.4368	-80.7710	-72.4595	-61.1369	-41.7566	-32.8595 (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	-21.6266	-45.4982	-90.4460	-135.8619	-179.6609	-180.5294	-178.3836	-150.9983	-110.6414	-65.0412	-28.8664	-17.0990 (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												3494.3530 (211)

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Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2779.0260	(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)	219.1160	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2012.6880	(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	4565.8070	(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	3494.3530	0.2100	733.8141 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2779.0260	0.2100	583.5955 (264)
Space and water heating			1317.4096 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	219.1160	0.1443	31.6252 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-808.0352	0.1346	-108.7806
PV Unit electricity exported	-1204.6528	0.1259	-151.6580
Total			-260.4386 (269)
Total CO2, kg/year			1100.5254 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.5100 (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	3494.3530	1.1300	3948.6189 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2779.0260	1.1300	3140.2994 (278)
Space and water heating			7088.9182 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	219.1160	1.5338	336.0874 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-808.0352	1.4975	-1210.0716
PV Unit electricity exported	-1204.6528	0.4621	-556.6892
Total			-1766.7608 (283)
Total Primary energy kWh/year			5788.3456 (286)
Target Primary Energy Rate (TPER)			71.0700 (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)
Ground floor	40.7200 (1b)	x 2.3500 (2b)	= 95.6920 (1b) - (3b)
First floor	40.7200 (1c)	x 2.5800 (2c)	= 105.0576 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 200.7496 (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)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1494 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3494 (18)
Number of sides sheltered	0 (19)

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Shelter factor (20) = 1 - [0.075 x (19)] = 1.0000 (20)
 Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3494 (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	0.4455	0.4368	0.4281	0.3844	0.3756	0.3320	0.3320	0.3232	0.3494	0.3756	0.3931	0.4106 (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	0.5993	0.5954	0.5916	0.5739	0.5706	0.5551	0.5551	0.5522	0.5611	0.5706	0.5773	0.5843 (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
WIND 1.4 (Uw = 1.40)			9.6800	1.3258	12.8333		(27)
HG DOOR			2.1000	1.0000	2.1000		(26a)
Heatloss Floor 1			40.7200	0.1400	5.7008	110.0000	4479.2000 (28a)
Rendered walls	136.0680	11.7800	124.2880	0.1500	18.6432	190.0000	23614.7200 (29a)
Plane roof	40.7200		40.7200	0.1000	4.0720	9.0000	366.4800 (30)
Total net area of external elements Aum(A, m2)			217.5080				(31)
Fabric heat loss, W/K = Sum (A x U)					43.3493		(32)
G Floor walls			16.3400			9.0000	147.0600 (32c)
F Floor walls			21.6000			9.0000	194.4000 (32c)
Internal Floor 1			40.7200			18.0000	732.9600 (32d)
Internal Ceiling 1			40.7200			9.0000	366.4800 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 29901.3000 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 367.1574 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E12 Gable (insulation at ceiling level)	12.7000	0.0570	0.7239
E10 Eaves (insulation at ceiling level)	14.9000	0.1130	1.6837
E2 Other lintels (including other steel lintels)	8.1000	0.0240	0.1944
E3 Sill	7.1000	0.0150	0.1065
E4 Jamb	22.3000	0.0100	0.2230
E5 Ground floor (normal)	27.6000	0.0750	2.0700
E6 Intermediate floor within a dwelling	27.6000	0.0000	0.0000
E16 Corner (normal)	24.6500	0.0620	1.5283
E17 Corner (inverted - internal area greater than external area)	4.9300	0.0620	0.3057

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.8355 (36)
 Point Thermal bridges 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 50.1848 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	39.6988	39.4435	39.1932	38.0177	37.7978	36.7740	36.7740	36.5844	37.1684	37.7978	38.2427	38.7079 (38)
Heat transfer coeff	89.8836	89.6283	89.3780	88.2025	87.9826	86.9588	86.9588	86.7692	87.3532	87.9826	88.4275	88.8927 (39)
Average = Sum(39)m / 12 =												88.2015

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1037	1.1005	1.0975	1.0830	1.0803	1.0678	1.0678	1.0654	1.0726	1.0803	1.0858	1.0915 (40)
HLP (average)												1.0830
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	28.4892	28.0661	27.4703	26.3717	25.5491	24.6370	24.1443	24.7359	25.3801	26.3561	27.4773	28.3929 (42b)
Hot water usage for other uses	40.1262	38.6670	37.2079	35.7488	34.2896	32.8305	32.8305	34.2896	35.7488	37.2079	38.6670	40.1262 (42c)
Average daily hot water use (litres/day)												62.8923 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	68.6154	66.7331	64.6782	62.1205	59.8387	57.4674	56.9747	59.0255	61.1289	63.5640	66.1444	68.5191 (44)
Energy conte	108.6700	95.0271	99.4079	85.0398	80.5544	70.6629	68.9060	73.0859	75.3780	86.2558	94.2348	107.2843 (45)
Energy content (annual)										Total = Sum(45)m =		1044.5069
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)

Water storage loss:	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	92.3695	80.7730	84.4968	72.2838	68.4713	60.0635	58.5701	62.1231	64.0713	73.3174	80.0996	91.1916 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	92.3695	80.7730	84.4968	72.2838	68.4713	60.0635	58.5701	62.1231	64.0713	73.3174	80.0996	91.1916 (64)

12Total per year (kWh/year) Total per year (kWh/year) = Sum(64)m = 887.8309 (64)
 Electric shower(s) 888 (64)

Heat gains from water heating, kWh/month 36.2986 (65)
 31.9601 (65)
 33.9731 (65)
 30.3326 (65)
 29.6095 (65)
 26.9317 (65)
 26.9556 (65)
 28.0224 (65)
 28.2794 (65)
 31.1783 (65)
 32.6322 (65)
 36.0041 (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	124.4808	124.4808	124.4808	124.4808	124.4808	124.4808	124.4808	124.4808	124.4808	124.4808	124.4808	124.4808 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	130.6669	144.6669	130.6669	135.0224	130.6669	135.0224	130.6669	130.6669	135.0224	130.6669	135.0224	130.6669 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	222.4238	224.7318	218.9156	206.5335	190.9033	176.2132	166.3992	164.0912	169.9074	182.2895	197.9197	212.6098 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.4481	35.4481	35.4481	35.4481	35.4481	35.4481	35.4481	35.4481	35.4481	35.4481	35.4481	35.4481 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846 (71)
Water heating gains (Table 5)	48.7884	47.5597	45.6628	42.1285	39.7977	37.4052	36.2306	37.6646	39.2770	41.9063	45.3225	48.3926 (72)
Total internal gains	462.2233	477.3026	455.5895	444.0287	421.7121	408.9850	393.6410	392.7669	404.5511	415.2069	438.6089	452.0136 (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	0.6300	10.6334	0.6300	0.7000	0.5400	1.4358 (74)						
East	3.6000	19.6403	0.6300	0.7000	0.5400	15.1539 (76)						
West	5.4500	19.6403	0.6300	0.7000	0.5400	22.9413 (80)						
Solar gains	39.5310	77.2662	127.3902	186.4802	229.3544	235.3544	223.8681	191.6378	148.3432	91.6933	49.2715	32.5246 (83)
Total gains	501.7543	554.5689	582.9797	630.5089	651.1610	644.3394	617.5090	584.4046	552.8943	506.9002	487.8804	484.5382 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nil,m (see Table 9a)												21.0000 (85)
tau	92.4075	92.6707	92.9302	94.1687	94.4041	95.5155	95.5155	95.7242	95.0843	94.4041	93.9291	93.4376
alpha	7.1605	7.1780	7.1953	7.2779	7.2936	7.3677	7.3677	7.3816	7.3390	7.2936	7.2619	7.2292
util living area	0.9997	0.9994	0.9982	0.9910	0.9546	0.8071	0.6126	0.6695	0.9145	0.9940	0.9993	0.9998 (86)
MIT	20.0341	20.1407	20.3094	20.5713	20.8094	20.9646	20.9958	20.9923	20.9057	20.6014	20.2816	20.0234 (87)
Th 2	19.9978	20.0004	20.0029	20.0147	20.0169	20.0272	20.0272	20.0292	20.0233	20.0169	20.0124	20.0078 (88)
util rest of house	0.9996	0.9990	0.9972	0.9852	0.9242	0.7111	0.4815	0.5362	0.8489	0.9890	0.9988	0.9997 (89)
MIT 2	19.1190	19.2275	19.3979	19.6667	19.8909	20.0139	20.0265	20.0277	19.9766	19.6997	19.3784	19.1165 (90)
Living area fraction												0.3966 (91)
MIT	19.4819	19.5897	19.7594	20.0254	20.2552	20.3909	20.4109	20.4103	20.3451	20.0573	19.7366	19.4761 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4819	19.5897	19.7594	20.0254	20.2552	20.3909	20.4109	20.4103	20.3451	20.0573	19.7366	19.4761 (93)

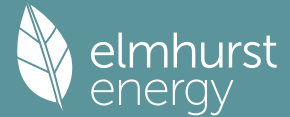
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9995	0.9988	0.9969	0.9853	0.9330	0.7497	0.5341	0.5901	0.8741	0.9893	0.9986	0.9996 (94)
Useful gains	501.5087	553.9210	581.1768	621.2599	607.5124	483.0729	329.8210	344.8628	483.2845	501.4782	487.2105	484.3569 (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	1364.6071	1316.6128	1185.1007	981.2928	752.7075	503.5735	331.3955	347.9677	545.5322	832.0817	1117.4244	1357.9370 (97)
Space heating kWh	642.1452	512.5289	449.3194	259.2237	108.0252	0.0000	0.0000	0.0000	0.0000	245.9690	453.7540	649.9436 (98a)
Space heating requirement - total per year (kWh/year)												3320.9089
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	642.1452	512.5289	449.3194	259.2237	108.0252	0.0000	0.0000	0.0000	0.0000	245.9690	453.7540	649.9436 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3320.9089
Space heating per m2										(98c) / (4) =		40.7774 (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	817.4127	643.4951	659.4459	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8172	0.9085	0.8737	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	667.9803	584.6264	576.1800	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	719.1513	689.3603	649.2734	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	36.8431	77.9220	54.3815	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												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	9.2108	19.4805	13.5954	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												42.2867 (107)
Energy for space heating												40.7774 (99)
Energy for space cooling												0.5192 (108)
Total												41.2966 (109)
Fabric Energy Efficiency (DFEE)												41.3 (109)

Full SAP Calculation Printout



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)
Ground floor	40.7200 (1b)	x 2.3500 (2b)	= 95.6920 (1b) - (3b)
First floor	40.7200 (1c)	x 2.5800 (2c)	= 105.0576 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	200.7496 (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) =	0.1494 (8)
Pressure test												Yes	
Pressure Test Method												Blower Door	
Measured/design AP50												5.0000 (17)	
Infiltration rate												0.3994 (18)	
Number of sides sheltered												0 (19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =											1.0000 (20)	
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =											0.3994 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infiltr rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
	0.5093	0.4993	0.4893	0.4394	0.4294	0.3795	0.3795	0.3695	0.3994	0.4294	0.4494	0.4693	(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	0.6297	0.6247	0.6197	0.5965	0.5922	0.5720	0.5720	0.5683	0.5798	0.5922	0.6010	0.6101	(25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Semi-glazed door			2.1000	1.0000	2.1000		(26a)
TER Opening Type (Uw = 1.20)			9.6800	1.1450	11.0840		(27)
Heatloss Floor 1			40.7200	0.1300	5.2936		(28a)
Rendered walls	136.0680	11.7800	124.2880	0.1800	22.3718		(29a)
Plane roof	40.7200		40.7200	0.1100	4.4792		(30)
Total net area of external elements Aum(A, m ²)			217.5080				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	45.3286	(33)

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

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	12.7000	0.0600	0.7620
E12 Gable (insulation at ceiling level)	14.9000	0.0600	0.8940
E10 Eaves (insulation at ceiling level)	8.1000	0.0500	0.4050
E2 Other lintels (including other steel lintels)	7.1000	0.0500	0.3550
E3 Sill	22.3000	0.0500	1.1150
E4 Jamb	27.6000	0.1600	4.4160
E5 Ground floor (normal)	27.6000	0.0000	0.0000
E6 Intermediate floor within a dwelling	24.6500	0.0900	2.2185
E16 Corner (normal)	4.9300	-0.0900	-0.4437
E17 Corner (inverted - internal area greater than external area)			

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

Point Thermal bridges	(36a) =	9.7218 (36)
Total fabric heat loss	(33) + (36) + (36a) =	55.0504 (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
	41.7150	41.3814	41.0544	39.5185	39.2311	37.8934	37.8934	37.6456	38.4086	39.2311	39.8125	40.4202 (38)
Heat transfer coeff	96.7655	96.4318	96.1048	94.5689	94.2815	92.9438	92.9438	92.6960	93.4591	94.2815	94.8629	95.4706 (39)
Average = Sum(39)m / 12 =	94.5675											

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1882	1.1841	1.1801	1.1612	1.1577	1.1413	1.1413	1.1382	1.1476	1.1577	1.1648	1.1723 (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	2.4896 (42)											
Hot water usage for mixer showers	0.0000 (42a)											
Hot water usage for baths	0.0000 (42a)											

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Hot water usage for other uses	28.4892	28.0661	27.4703	26.3717	25.5491	24.6370	24.1443	24.7359	25.3801	26.3561	27.4773	28.3929 (42b)
Average daily hot water use (litres/day)	40.1262	38.6670	37.2079	35.7488	34.2896	32.8305	32.8305	34.2896	35.7488	37.2079	38.6670	40.1262 (42c) 62.8923 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	68.6154	66.7331	64.6782	62.1205	59.8387	57.4674	56.9747	59.0255	61.1289	63.5640	66.1444	68.5191 (44)
Distribution loss (46)m = 0.15 x (45)m	108.6700	95.0271	99.4079	85.0398	80.5544	70.6629	68.9060	73.0859	75.3780	86.2558	94.2348	107.2843 (45)
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	92.3695	80.7730	84.4968	72.2838	68.4713	60.0635	58.5701	62.1231	64.0713	73.3174	80.0996	91.1916 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	92.3695	80.7730	84.4968	72.2838	68.4713	60.0635	58.5701	62.1231	64.0713	73.3174	80.0996	91.1916 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											887.8309 (64)
Electric shower(s)	52.8249	47.0674	51.3958	49.0464	49.9667	47.6634	49.2522	49.9667	49.0464	51.3958	50.4294	52.8249 (64a)
Heat gains from water heating, kWh/month	36.2986	31.9601	33.9731	30.3326	29.6095	26.9317	26.9556	28.0224	28.2794	31.1783	32.6322	36.0041 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	124.4808	124.4808	124.4808	124.4808	124.4808	124.4808	124.4808	124.4808	124.4808	124.4808	124.4808	124.4808 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	130.6669	144.6669	130.6669	135.0224	130.6669	135.0224	130.6669	130.6669	135.0224	130.6669	135.0224	130.6669 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	222.4238	224.7318	218.9156	206.5335	190.9033	176.2132	166.3992	164.0912	169.9074	182.2895	197.9197	212.6098 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.4481	35.4481	35.4481	35.4481	35.4481	35.4481	35.4481	35.4481	35.4481	35.4481	35.4481	35.4481 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846 (71)
Water heating gains (Table 5)	48.7884	47.5597	45.6628	42.1285	39.7977	37.4052	36.2306	37.6646	39.2770	41.9063	45.3225	48.3926 (72)
Total internal gains	462.2233	477.3026	455.5895	444.0287	421.7121	408.9850	393.6410	392.7669	404.5511	415.2069	438.6089	452.0136 (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		0.6300	10.6334	0.6300	0.7000	0.5400	1.4358 (74)					
East		3.6000	19.6403	0.6300	0.7000	0.5400	15.1539 (76)					
West		5.4500	19.6403	0.6300	0.7000	0.5400	22.9413 (80)					
Solar gains	39.5310	77.2662	127.3902	186.4802	229.4488	235.3544	223.8681	191.6378	148.3432	91.6933	49.2715	32.5246 (83)
Total gains	501.7543	554.5689	582.9797	630.5089	651.1610	644.3394	617.5090	584.4046	552.8943	506.9002	487.8804	484.5382 (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	85.8356	86.1325	86.4256	87.8293	88.0970	89.3650	89.3650	89.6038	88.8723	88.0970	87.5571	86.9997
alpha	6.7224	6.7422	6.7617	6.8553	6.8731	6.9577	6.9577	6.9736	6.9248	6.8731	6.8371	6.8000
util living area	0.9997	0.9994	0.9984	0.9924	0.9632	0.8368	0.6490	0.7058	0.9303	0.9948	0.9993	0.9998 (86)
MIT	19.9351	20.0455	20.2237	20.5027	20.7605	20.9465	20.9922	20.9866	20.8746	20.5430	20.2034	19.9280 (87)
Th 2	19.9295	19.9328	19.9360	19.9512	19.9540	19.9673	19.9673	19.9697	19.9622	19.9540	19.9482	19.9422 (88)
util rest of house	0.9996	0.9991	0.9975	0.9873	0.9364	0.7403	0.5046	0.5615	0.8698	0.9904	0.9989	0.9997 (89)
MIT 2	18.9635	19.0765	19.2570	19.5459	19.7924	19.9463	19.9660	19.9671	19.8978	19.5895	19.2471	18.9669 (90)
Living area fraction	19.3489	19.4608	19.6404	19.9254	20.1763	20.3430	20.3730	20.3714	20.2852	19.9677	19.6263	19.3481 (92)
Temperature adjustment	19.3489	19.4608	19.6404	19.9254	20.1763	20.3430	20.3730	20.3714	20.2852	19.9677	19.6263	19.3481 (93)
adjusted MIT	19.3489	19.4608	19.6404	19.9254	20.1763	20.3430	20.3730	20.3714	20.2852	19.9677	19.6263	19.3481 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	501.4993	553.9292	581.2897	622.4273	614.9376	501.9376	347.6842	362.5695	493.3973	502.0857	487.2260	484.3481 (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	1456.2093	1404.1230	1262.8568	1042.6571	799.1624	533.7732	350.6734	368.1376	578.0647	883.2013	1188.2850	1446.1950 (97)
Space heating kWh	710.3042	571.3302	507.0860	302.5655	137.5371	0.0000	0.0000	0.0000	0.0000	283.5500	504.7625	715.6141 (98a)

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Space heating requirement - total per year (kWh/year)													3732.7495
Solar heating kWh													0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Space heating kWh	710.3042	571.3302	507.0860	302.5655	137.5371	0.0000	0.0000	0.0000	0.0000	283.5500	504.7625	715.6141	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3732.7495	
Space heating per m2												(98c) / (4) =	45.8344 (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													
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	873.6714	687.7839	704.4899	0.0000	0.0000	0.0000	0.0000	(100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.7754	0.8753	0.8362	0.0000	0.0000	0.0000	0.0000	(101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	677.4558	602.0403	589.0646	0.0000	0.0000	0.0000	0.0000	(102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	719.1513	689.3603	649.2734	0.0000	0.0000	0.0000	0.0000	(103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	30.0208	64.9661	44.7954	0.0000	0.0000	0.0000	0.0000	(104)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	fc = cooled area / (4) =				1.0000 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	7.5052	16.2415	11.1988	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement													34.9456 (107)
Energy for space heating													45.8344 (99)
Energy for space cooling													0.4291 (108)
Total													46.2634 (109)
Fabric Energy Efficiency (TFEE)													46.3 (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)	
Ground floor	40.7200 (1b)	x 2.3500 (2b)	= 95.6920 (1b) - (3b)	
First floor	40.7200 (1c)	x 2.5800 (2c)	= 105.0576 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.4400		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	200.7496 (5)	

2. Ventilation rate

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	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) =	0.1494 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	(17)
Infiltration rate	0.3494	(18)
Number of sides sheltered	0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3494 (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	0.4455	0.4368	0.4281	0.3844	0.3756	0.3320	0.3320	0.3232	0.3494	0.3756	0.3931	0.4106	(22b)
Effective ac	0.5993	0.5954	0.5916	0.5739	0.5706	0.5551	0.5551	0.5522	0.5611	0.5706	0.5773	0.5843	(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	
WIND 1.4 (Uw = 1.40)			9.6800	1.3258	12.8333			(27)
HG DOOR			2.1000	1.0000	2.1000			(26a)
Heatloss Floor 1			40.7200	0.1400	5.7008	110.0000	4479.2000	(28a)
Rendered walls	136.0680	11.7800	124.2880	0.1500	18.6432	190.0000	23614.7200	(29a)
Plane roof	40.7200		40.7200	0.1000	4.0720	9.0000	366.4800	(30)
Total net area of external elements Aum(A, m2)			217.5080					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.3493			(33)
G floor walls			16.3400			9.0000	147.0600	(32c)

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F Floor walls	21.6000	9.0000	194.4000 (32c)
Internal Floor 1	40.7200	18.0000	732.9600 (32d)
Internal Ceiling 1	40.7200	9.0000	366.4800 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 29901.3000 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 367.1574 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E12 Gable (insulation at ceiling level)	12.7000	0.0570	0.7239
E10 Eaves (insulation at ceiling level)	14.9000	0.1130	1.6837
E2 Other lintels (including other steel lintels)	8.1000	0.0240	0.1944
E3 Sill	7.1000	0.0150	0.1065
E4 Jamb	22.3000	0.0100	0.2230
E5 Ground floor (normal)	27.6000	0.0750	2.0700
E6 Intermediate floor within a dwelling	27.6000	0.0000	0.0000
E16 Corner (normal)	24.6500	0.0620	1.5283
E17 Corner (inverted - internal area greater than external area)	4.9300	0.0620	0.3057

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.8355 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 50.1848 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	39.6988	39.4435	39.1932	38.0177	37.7978	36.7740	36.7740	36.5844	37.1684	37.7978	38.2427	38.7079 (38)
Heat transfer coeff	89.8836	89.6283	89.3780	88.2025	87.9826	86.9588	86.9588	86.7692	87.3532	87.9826	88.4275	88.8927 (39)
Average = Sum(39)m / 12 =												88.2015

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1037	1.1005	1.0975	1.0830	1.0803	1.0678	1.0678	1.0654	1.0726	1.0803	1.0858	1.0915 (40)
HLP (average)												1.0830
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4896 (42)

Hot water usage for mixer showers 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (42a)

Hot water usage for baths 28.4892 28.0661 27.4703 26.3717 25.5491 24.6370 24.1443 24.7359 25.3801 26.3561 27.4773 28.3929 (42b)

Hot water usage for other uses 40.1262 38.6670 37.2079 35.7488 34.2896 32.8305 32.8305 34.2896 35.7488 37.2079 38.6670 40.1262 (42c)

Average daily hot water use (litres/day) 62.8923 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	68.6154	66.7331	64.6782	62.1205	59.8387	57.4674	56.9747	59.0255	61.1289	63.5640	66.1444	68.5191 (44)
Energy conte	108.6700	95.0271	99.4079	85.0398	80.5544	70.6629	68.9060	73.0859	75.3780	86.2558	94.2348	107.2843 (45)
Energy content (annual)												Total = Sum(45)m = 1044.5069
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Total heat required for water heating calculated for each month												
WWHRS	92.3695	80.7730	84.4968	72.2838	68.4713	60.0635	58.5701	62.1231	64.0713	73.3174	80.0996	91.1916 (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	92.3695	80.7730	84.4968	72.2838	68.4713	60.0635	58.5701	62.1231	64.0713	73.3174	80.0996	91.1916 (64)
												Total per year (kWh/year) = Sum(64)m = 887.8309 (64)
Electric shower(s)	52.8249	47.0674	51.3958	49.0464	49.9667	47.6634	49.2522	49.9667	49.0464	51.3958	50.4294	52.8249 (64a)
												Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 600.8799 (64a)
Heat gains from water heating, kWh/month	36.2986	31.9601	33.9731	30.3326	29.6095	26.9317	26.9556	28.0224	28.2794	31.1783	32.6322	36.0041 (65)

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

Metabolic gains (Table 5), Watts

(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	149.3770	149.3770	149.3770	149.3770	149.3770	149.3770	149.3770	149.3770	149.3770	149.3770	149.3770	149.3770 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	31.0181	27.5500	22.4052	16.9622	12.6794	10.7045	11.5666	15.0347	20.1795	25.6226	29.9053	31.8802 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	331.9758	335.4206	326.7397	308.2589	284.9303	263.0047	248.3571	244.9122	253.5932	272.0739	295.4025	317.3281 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.4273	52.4273	52.4273	52.4273	52.4273	52.4273	52.4273	52.4273	52.4273	52.4273	52.4273	52.4273 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846 (71)
Water heating gains (Table 5)	48.7884	47.5597	45.6628	42.1285	39.7977	37.4052	36.2306	37.6646	39.2770	41.9063	45.3225	48.3926 (72)
Total internal gains	514.0020	512.7500	497.0273	469.5693	439.6271	413.3340	398.3739	399.8311	415.2693	441.8224	472.8500	499.8206 (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	0.6300	10.6334	0.6300	0.7000	0.5400	1.4358 (74)
East	3.6000	19.6403	0.6300	0.7000	0.5400	15.1539 (76)
West	5.4500	19.6403	0.6300	0.7000	0.5400	22.9413 (80)

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Solar gains	39.5310	77.2662	127.3902	186.4802	229.4488	235.3544	223.8681	191.6378	148.3432	91.6933	49.2715	32.5246 (83)
Total gains	553.5330	590.0162	624.4175	656.0495	669.0759	648.6884	622.2420	591.4689	563.6125	533.5157	522.1215	532.3452 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	92.4075	92.6707	92.9302	94.1687	94.4041	95.5155	95.5155	95.7242	95.0843	94.4041	93.9291	93.4376
alpha	7.1605	7.1780	7.1953	7.2779	7.2936	7.3677	7.3677	7.3816	7.3390	7.2936	7.2619	7.2292
util living area	0.9995	0.9990	0.9973	0.9886	0.9482	0.8034	0.6082	0.6623	0.9075	0.9918	0.9989	0.9996 (86)
Living	20.0840	20.1748	20.3488	20.5943	20.8218	20.9656	20.9960	20.9928	20.9114	20.6259	20.3145	20.0695
Non living	18.9340	19.0522	19.2767	19.5964	19.8682	20.0107	20.0264	20.0274	19.9680	19.6402	19.2409	18.9232
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.5314	20.1748	20.3488	20.5943	20.8218	20.9656	20.9960	20.9928	20.9114	20.6259	20.3145	20.1997 (87)
Th 2	19.9978	20.0004	20.0029	20.0147	20.0169	20.0272	20.0272	20.0292	20.0233	20.0169	20.0124	20.0078 (88)
util rest of house	0.9993	0.9985	0.9958	0.9816	0.9150	0.7071	0.4779	0.5300	0.8393	0.9853	0.9981	0.9994 (89)
MIT 2	19.5737	19.0522	19.2767	19.5964	19.8682	20.0107	20.0264	20.0274	19.9680	19.6402	19.2409	19.1187 (90)
Living area fraction	FLA = Living area / (4) =											
MIT	19.9536	19.4974	19.7019	19.9922	20.2464	20.3894	20.4109	20.4103	20.3422	20.0311	19.6667	19.5474 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.9536	19.4974	19.7019	19.9922	20.2464	20.3894	20.4109	20.4103	20.3422	20.0311	19.6667	19.5474 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9992	0.9982	0.9951	0.9813	0.9242	0.7456	0.5302	0.5834	0.8650	0.9854	0.9978	0.9993 (94)
Useful gains	553.1111	588.9483	621.3840	643.8108	618.3498	483.6549	329.8929	345.0823	487.5389	525.7149	520.9712	531.9847 (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	1406.9987	1308.3444	1179.9635	978.3578	751.9353	503.4432	331.3938	347.9702	545.2717	829.7738	1111.2448	1364.2726 (97)
Space heating kWh	635.2924	483.4341	415.5832	240.8738	99.3876	0.0000	0.0000	0.0000	0.0000	226.2198	424.9970	619.2222 (98a)
Space heating requirement - total per year (kWh/year)	3145.0101											
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	635.2924	483.4341	415.5832	240.8738	99.3876	0.0000	0.0000	0.0000	0.0000	226.2198	424.9970	619.2222 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	3145.0101											
Space heating per m2	(98c) / (4) = 38.6175 (99)											

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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 %)	384.7972 (206)											
Efficiency of main space heating system 2 (in %)	0.0000 (207)											
Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
Space heating requirement	635.2924	483.4341	415.5832	240.8738	99.3876	0.0000	0.0000	0.0000	0.0000	226.2198	424.9970	619.2222 (98)
Space heating efficiency (main heating system 1)	384.7972	384.7972	384.7972	384.7972	384.7972	0.0000	0.0000	0.0000	0.0000	384.7972	384.7972	384.7972 (210)
Space heating fuel (main heating system)	165.0980	125.6335	108.0006	62.5976	25.8286	0.0000	0.0000	0.0000	0.0000	58.7894	110.4470	160.9217 (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	92.3695	80.7730	84.4968	72.2838	68.4713	60.0635	58.5701	62.1231	64.0713	73.3174	80.0996	91.1916 (64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	92.3695	80.7730	84.4968	72.2838	68.4713	60.0635	58.5701	62.1231	64.0713	73.3174	80.0996	91.1916 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	27.1500	21.7807	19.6111	14.3680	11.0982	9.0673	10.1242	13.1598	17.0933	22.4273	25.3316	27.9046 (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	817.3162 (211)											
Space heating fuel - main system 2	0.0000 (213)											
Space heating fuel - secondary	0.0000 (215)											

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Efficiency of water heater	100.0000	
Water heating fuel used	887.8309	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	0.0000	(231)
Electricity for lighting (calculated in Appendix L)	219.1160	(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	2525.1430	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	817.3162	16.4900	134.7754	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	887.8309	16.4900	146.4033	(247)
Energy for instantaneous electric shower(s)	600.8799	16.4900	99.0851	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	219.1160	16.4900	36.1322	(250)
Additional standing charges			0.0000	(251)
Total energy cost			416.3961	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.1856	(257)
SAP value		80.7820	
SAP rating (Section 12)		81	(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	817.3162	0.1551	126.8003	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	887.8309	0.1416	125.6965	(264)
Energy for instantaneous electric shower(s)	600.8799	0.1391	83.5957	(264a)
Space and water heating			252.4968	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	219.1160	0.1443	31.6252	(268)
Total CO2, kg/year			367.7177	(272)
CO2 emissions per m2			4.5200	(273)
EI value			96.1030	
EI rating			96	(274)
EI band			A	

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	40.7200 (1b)	x 2.3500 (2b)	= 95.6920	(1b) - (3b)
First floor	40.7200 (1c)	x 2.5800 (2c)	= 105.0576	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.4400			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	200.7496	(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)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1494	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	

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Measured/design AP50 4.0000 (17)
 Infiltration rate 0.3494 (18)
 Number of sides sheltered 0 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 1.0000 (20)
 Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3494 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	6.3000	6.0000	6.0000	5.4000	5.2000	4.7000	4.5000	4.4000	4.9000	5.6000	5.8000	6.1000 (22)
Wind factor	1.5750	1.5000	1.5000	1.3500	1.3000	1.1750	1.1250	1.1000	1.2250	1.4000	1.4500	1.5250 (22a)
Adj infilt rate												
Effective ac	0.5504	0.5242	0.5242	0.4717	0.4543	0.4106	0.3931	0.3844	0.4281	0.4892	0.5067	0.5329 (22b)
	0.6515	0.6374	0.6374	0.6113	0.6032	0.5843	0.5773	0.5739	0.5916	0.6197	0.6284	0.6420 (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
WIND 1.4 (Uw = 1.40)			9.6800	1.3258	12.8333		(27)
HG DOOR			2.1000	1.0000	2.1000		(26a)
Heatloss Floor 1			40.7200	0.1400	5.7008	110.0000	(28a)
Rendered walls	136.0680	11.7800	124.2880	0.1500	18.6432	190.0000	(29a)
Plane roof	40.7200		40.7200	0.1000	4.0720	9.0000	(30)
Total net area of external elements Aum(A, m2)			217.5080				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 43.3493		(33)
G Floor walls			16.3400			9.0000	(32c)
F Floor walls			21.6000			9.0000	(32c)
Internal Floor 1			40.7200			18.0000	(32d)
Internal Ceiling 1			40.7200			9.0000	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 29901.3000 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 367.1574 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E12 Gable (insulation at ceiling level)	12.7000	0.0570	0.7239
E10 Eaves (insulation at ceiling level)	14.9000	0.1130	1.6837
E2 Other lintels (including other steel lintels)	8.1000	0.0240	0.1944
E3 Sill	7.1000	0.0150	0.1065
E4 Jamb	22.3000	0.0100	0.2230
E5 Ground floor (normal)	27.6000	0.0750	2.0700
E6 Intermediate floor within a dwelling	27.6000	0.0000	0.0000
E16 Corner (normal)	24.6500	0.0620	1.5283
E17 Corner (inverted - internal area greater than external area)	4.9300	0.0620	0.3057

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.8355 (36)

Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 50.1848 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	43.1570	42.2242	42.2242	40.4951	39.9592	38.7079	38.2427	38.0177	39.1932	41.0512	41.6276	42.5301 (38)
Heat transfer coeff	93.3418	92.4090	92.4090	90.6799	90.1440	88.8927	88.4275	88.2025	89.3780	91.2360	91.8124	92.7149 (39)
Average = Sum(39)m / 12 =												90.8040

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1461	1.1347	1.1347	1.1135	1.1069	1.0915	1.0858	1.0830	1.0975	1.1203	1.1274	1.1384 (40)
HLP (average)												1.1150
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4896 (42)

Hot water usage for mixer showers 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (42a)

Hot water usage for baths 28.4892 28.0661 27.4703 26.3717 25.5491 24.6370 24.1443 24.7359 25.3801 26.3561 27.4773 28.3929 (42b)

Hot water usage for other uses 40.1262 38.6670 37.2079 35.7488 34.2896 32.8305 32.8305 34.2896 35.7488 37.2079 38.6670 40.1262 (42c)

Average daily hot water use (litres/day) 62.8923 (43)

Daily hot water use 68.6154 66.7331 64.6782 62.1205 59.8387 57.4674 56.9747 59.0255 61.1289 63.5640 66.1444 68.5191 (44)

Energy conte 108.6700 95.0271 99.4079 85.0398 80.5544 70.6629 68.9060 73.0859 75.3780 86.2558 94.2348 107.2843 (45)

Energy content (annual) Total = Sum(45)m = 1044.5069

Distribution loss (46)m = 0.15 x (45)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (46)

Water storage loss: Total storage loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (56)

If cylinder contains dedicated solar storage 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (57)

Primary loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (59)

Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)

Total heat required for water heating calculated for each month 92.3695 80.7730 84.4968 72.2838 68.4713 60.0635 58.5701 62.1231 64.0713 73.3174 80.0996 91.1916 (62)

WWHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63a)

PV diverter 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63b)

Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63c)

FGHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63d)

Output from w/h 92.3695 80.7730 84.4968 72.2838 68.4713 60.0635 58.5701 62.1231 64.0713 73.3174 80.0996 91.1916 (64)

Electric shower(s) 52.8249 47.0674 51.3958 49.0464 49.9667 47.6634 49.2522 49.9667 49.0464 51.3958 50.4294 52.8249 (64a)

Heat gains from water heating, kWh/month 36.2986 31.9601 33.9731 30.3326 29.6095 26.9317 26.9556 28.0224 28.2794 31.1783 32.6322 36.0041 (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	149.3770	149.3770	149.3770	149.3770	149.3770	149.3770	149.3770	149.3770	149.3770	149.3770	149.3770	149.3770 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	31.0181	27.5500	22.4052	16.9622	12.6794	10.7045	11.5666	15.0347	20.1795	25.6226	29.9053	31.8802 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	331.9758	335.4206	326.7397	308.2589	284.9303	263.0047	248.3571	244.9122	253.5932	272.0739	295.4025	317.3281 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	52.4273	52.4273	52.4273	52.4273	52.4273	52.4273	52.4273	52.4273	52.4273	52.4273	52.4273	52.4273 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846 (71)
Water heating gains (Table 5)												
	48.7884	47.5597	45.6628	42.1285	39.7977	37.4052	36.2306	37.6646	39.2770	41.9063	45.3225	48.3926 (72)
Total internal gains												
	514.0020	512.7500	497.0273	469.5693	439.6271	413.3340	398.3739	399.8311	415.2693	441.8224	472.8500	499.8206 (73)

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	0.6300	14.1491	0.6300	0.7000	0.5400	1.9105 (74)						
East	3.6000	26.5119	0.6300	0.7000	0.5400	20.4559 (76)						
West	5.4500	26.5119	0.6300	0.7000	0.5400	30.9679 (80)						

Solar gains	53.3343	89.4167	145.6587	216.6342	250.3217	279.5226	243.6598	225.0689	178.5734	110.0223	64.0488	42.2354 (83)
Total gains	567.3363	602.1667	642.6860	686.2035	689.9488	692.8566	642.0337	624.9000	593.8427	551.8447	536.8988	542.0560 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	88.9839	89.8821	89.8821	91.5960	92.1406	93.4376	93.9291	94.1687	92.9302	91.0377	90.4662	89.5856
alpha	6.9323	6.9921	6.9921	7.1064	7.1427	7.2292	7.2619	7.2779	7.1953	7.0692	7.0311	6.9724
util living area	0.9986	0.9978	0.9948	0.9850	0.9473	0.8264	0.6970	0.6883	0.8681	0.9794	0.9962	0.9987 (86)
Living	20.2438	20.3065	20.4325	20.6109	20.8128	20.9519	20.9880	20.9895	20.9367	20.7294	20.4804	20.2721
Non living	19.1118	19.1989	19.3592	19.5961	19.8386	19.9815	20.0087	20.0116	19.9686	19.7398	19.4259	19.1530
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.6132	20.3065	20.4325	20.6109	20.8128	20.9519	20.9880	20.9895	20.9367	20.7294	20.4804	20.3740 (87)
Th 2	19.9633	19.9726	19.9726	19.9899	19.9952	20.0078	20.0124	20.0147	20.0029	19.9843	19.9785	19.9696 (88)
util rest of house	0.9978	0.9965	0.9917	0.9758	0.9137	0.7403	0.5755	0.5627	0.7816	0.9619	0.9934	0.9979 (89)
MIT 2	19.6238	19.1989	19.3592	19.5961	19.8386	19.9815	20.0087	20.0116	19.9686	19.7398	19.4259	19.3001 (90)
Living area fraction	20.0162	19.6382	19.7849	19.9986	20.2250	20.3664	20.3971	20.3994	20.3525	20.1323	19.8441	19.7260 (92)
MIT	20.0162	19.6382	19.7849	19.9986	20.2250	20.3664	20.3971	20.3994	20.3525	20.1323	19.8441	19.7260 (93)
Temperature adjustment												0.0000
adjusted MIT	20.0162	19.6382	19.7849	19.9986	20.2250	20.3664	20.3971	20.3994	20.3525	20.1323	19.8441	19.7260 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9978	0.9959	0.9910	0.9759	0.9229	0.7741	0.6246	0.6135	0.8157	0.9652	0.9929	0.9976 (94)
Useful gains	566.1085	599.6861	636.8872	669.6454	636.7330	536.3184	400.9869	383.3646	484.3900	532.6393	533.0760	540.7602 (95)
Ext temp.	6.5000	6.7000	7.7000	9.1000	11.6000	14.0000	15.8000	16.0000	14.5000	12.0000	9.3000	7.0000 (96)
Heat loss rate W	1261.6278	1195.6059	1116.7507	988.2839	777.4919	565.9268	406.5105	388.0421	523.0884	741.9547	968.0816	1179.8904 (97)
Space heating kWh	517.4663	400.4581	357.0185	229.4197	104.7246	0.0000	0.0000	0.0000	0.0000	155.7306	313.2041	475.5129 (98a)
Space heating requirement - total per year (kWh/year)												2553.5348
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	517.4663	400.4581	357.0185	229.4197	104.7246	0.0000	0.0000	0.0000	0.0000	155.7306	313.2041	475.5129 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2553.5348
Space heating per m ²										(98c) / (4) =		31.3548 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												
Efficiency of main space heating system 1 (in %)												
Efficiency of main space heating system 2 (in %)												
Efficiency of secondary/supplementary heating system, %												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	517.4663	400.4581	357.0185	229.4197	104.7246	0.0000	0.0000	0.0000	0.0000	155.7306	313.2041	475.5129 (98)
Space heating efficiency (main heating system 1)	382.2877	382.2877	382.2877	382.2877	382.2877	0.0000	0.0000	0.0000	0.0000	382.2877	382.2877	382.2877 (210)
Space heating fuel (main heating system)	135.3604	104.7531	93.3900	60.0123	27.3942	0.0000	0.0000	0.0000	0.0000	40.7365	81.9289	124.3861 (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)

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Water heating												
Water heating requirement												
	92.3695	80.7730	84.4968	72.2838	68.4713	60.0635	58.5701	62.1231	64.0713	73.3174	80.0996	91.1916 (64)
Efficiency of water heater												100.0000 (216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (217)
Fuel for water heating, kWh/month												
	92.3695	80.7730	84.4968	72.2838	68.4713	60.0635	58.5701	62.1231	64.0713	73.3174	80.0996	91.1916 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting												
	27.1500	21.7807	19.6111	14.3680	11.0982	9.0673	10.1242	13.1598	17.0933	22.4273	25.3316	27.9046 (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												667.9615 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												100.0000
Water heating fuel used												887.8309 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												219.1160 (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												2375.7884 (238)

10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	667.9615	25.1600	168.0591 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	887.8309	25.1600	223.3783 (247)
Energy for instantaneous electric shower(s)	600.8799	25.1600	151.1814 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	219.1160	25.1600	55.1296 (250)
Additional standing charges			0.0000 (251)
Total energy cost			597.7484 (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	667.9615	0.1549	103.4971 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	887.8309	0.1416	125.6965 (264)
Energy for instantaneous electric shower(s)	600.8799	0.1391	83.5957 (264a)
Space and water heating			229.1936 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	219.1160	0.1443	31.6252 (268)
Total CO2, kg/year			344.4145 (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	667.9615	1.5736	1051.1368 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	887.8309	1.5235	1352.6397 (278)
Energy for instantaneous electric shower(s)	600.8799	1.5143	909.9330 (278a)
Space and water heating			2403.7765 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	219.1160	1.5338	336.0874 (282)
Total Primary energy kWh/year			3649.7970 (286)

SAP 10 EPC IMPROVEMENTS

1408_01

Current energy efficiency rating: B 81
 Current environmental impact rating: A 96

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 2.5	-£ 100	-52 kg (15.1%)
U Solar photovoltaic panels	+ 8.7	-£ 294	-257 kg (87.9%)

Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
Solar water heating	£100	0.64 kg/m ²	B 83	A 97
Solar photovoltaic panels	£294	3.16 kg/m ²	A 92	A 99
Total Savings	£394	3.79 kg/m²		

Potential energy efficiency rating: A 92
 Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 538 TEST (29 Feb 2024)
 Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£598	£497	£100
Space heating	£168	£188	-£20
Water heating	£375	£254	£121
Lighting	£55	£55	£0
Generated (PV)	-£0	-£294	£294
Total cost of fuels	£598	£203	£394
Total cost of uses	£598	£203	£395
Delivered energy	29 kWh/m ²	-0 kWh/m ²	29 kWh/m ²
Carbon dioxide emissions	0.3 tonnes	0.0 tonnes	0.3 tonnes
CO2 emissions per m ²	4 kg/m ²	0 kg/m ²	4 kg/m ²
Primary energy	45 kWh/m ²	15 kWh/m ²	30 kWh/m ²

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	40.7200 (1b)	x 2.3500 (2b)	= 95.6920 (1b) - (3b)
First floor	40.7200 (1c)	x 2.5800 (2c)	= 105.0576 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	200.7496 (5)

2. Ventilation rate

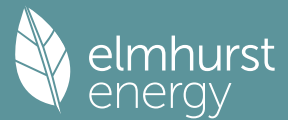
		m ³ per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
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) =	0.1494 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		4.0000 (17)
Infiltration rate		0.3494 (18)
Number of sides sheltered		0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3494 (21)

Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4455	0.4368	0.4281	0.3844	0.3756	0.3320	0.3320	0.3232	0.3494	0.3756	0.3931	0.4106 (22b)
Effective ac	0.5993	0.5954	0.5916	0.5739	0.5706	0.5551	0.5551	0.5522	0.5611	0.5706	0.5773	0.5843 (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
WIND 1.4 (Uw = 1.40)			9.6800	1.3258	12.8333		(27)
HG DOOR			2.1000	1.0000	2.1000		(26a)
Heatloss Floor 1			40.7200	0.1400	5.7008	110.0000	4479.2000 (28a)
Rendered walls	136.0680	11.7800	124.2880	0.1500	18.6432	190.0000	23614.7200 (29a)

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Plane roof	40.7200	40.7200	0.1000	4.0720	9.0000	366.4800	(30)
Total net area of external elements Aum(A, m ²)		217.5080					(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =	43.3493				(33)
G floor walls		16.3400			9.0000	147.0600	(32c)
F Floor walls		21.6000			9.0000	194.4000	(32c)
Internal Floor 1		40.7200			18.0000	732.9600	(32d)
Internal Ceiling 1		40.7200			9.0000	366.4800	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 29901.3000 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 367.1574 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E12 Gable (insulation at ceiling level)	12.7000	0.0570	0.7239
E10 Eaves (insulation at ceiling level)	14.9000	0.1130	1.6837
E2 Other lintels (including other steel lintels)	8.1000	0.0240	0.1944
E3 Sill	7.1000	0.0150	0.1065
E4 Jamb	22.3000	0.0100	0.2230
E5 Ground floor (normal)	27.6000	0.0750	2.0700
E6 Intermediate floor within a dwelling	27.6000	0.0000	0.0000
E16 Corner (normal)	24.6500	0.0620	1.5283
E17 Corner (inverted - internal area greater than external area)	4.9300	0.0620	0.3057

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.8355 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 50.1848 (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	39.6988	39.4435	39.1932	38.0177	37.7978	36.7740	36.7740	36.5844	37.1684	37.7978	38.2427	38.7079
Average = Sum(39)m / 12 =	89.8836	89.6283	89.3780	88.2025	87.9826	86.9588	86.9588	86.7692	87.3532	87.9826	88.4275	88.8927
												88.2015

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1037	1.1005	1.0975	1.0830	1.0803	1.0678	1.0678	1.0654	1.0726	1.0803	1.0858	1.0915
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4896	(42)
Hot water usage for mixer showers													
Hot water usage for baths													
Hot water usage for other uses													
Average daily hot water use (litres/day)													
Daily hot water use													
Energy conte													
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
Water storage loss:													
Total storage loss													
If cylinder contains dedicated solar storage													
Primary loss													
Combi loss													
Total heat required for water heating calculated for each month													
WWHRS													
PV diverter													
Aperture area of solar collector													
Zero-loss collector efficiency													
Collector linear heat loss coefficient													
Collector 2nd order heat loss coefficient													
Collector loop efficiency													
Incidence angle modifier													
Overshading factor													
Overall heat loss coefficient of system													
Heat loss coefficient of collector loop													
Dedicated solar storage volume													
Effective solar volume													
Reference volume													
Storage tank correction coefficient													
Heat delivered to hot water													
Heat delivered to space heating													
Solar input													
Solar input													
FGHRS													
Output from w/h													
Electric shower(s)													
Heat gains from water heating, kWh/month													

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	149.3770	149.3770	149.3770	149.3770	149.3770	149.3770	149.3770	149.3770	149.3770	149.3770	149.3770	149.3770
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
Pumps, fans												

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Losses e.g. evaporation (negative values) (Table 5)	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	(71)
Water heating gains (Table 5)	48.7884	47.5597	45.6628	42.1285	39.7977	37.4052	36.2306	37.6646	39.2770	41.9063	45.3225	48.3926	(72)
Total internal gains	514.0020	512.7500	497.0273	469.5693	439.6271	413.3340	398.3739	399.8311	415.2693	441.8224	472.8500	499.8206	(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	0.6300	10.6334	0.6300	0.7000	0.5400	1.4358 (74)							
East	3.6000	19.6403	0.6300	0.7000	0.5400	15.1539 (76)							
West	5.4500	19.6403	0.6300	0.7000	0.5400	22.9413 (80)							
Solar gains	39.5310	77.2662	127.3902	186.4802	229.4488	235.3544	223.8681	191.6378	148.3432	91.6933	49.2715	32.5246	(83)
Total gains	553.5330	590.0162	624.4175	656.0495	669.0759	648.6884	622.2420	591.4689	563.6125	533.5157	522.1215	532.3452	(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	92.4075	92.6707	92.9302	94.1687	94.4041	95.5155	95.5155	95.7242	95.0843	94.4041	93.9291	93.4376	
alpha	7.1605	7.1780	7.1953	7.2779	7.2936	7.3677	7.3677	7.3816	7.3390	7.2936	7.2619	7.2292	
util living area	0.9995	0.9990	0.9973	0.9886	0.9482	0.8034	0.6082	0.6623	0.9075	0.9918	0.9989	0.9996	(86)
Living	20.0840	20.1748	20.3488	20.5943	20.8218	20.9656	20.9960	20.9928	20.9114	20.6259	20.3145	20.0695	
Non living	18.9340	19.0522	19.2767	19.5964	19.8682	20.0107	20.0264	20.0274	19.9680	19.6402	19.2409	18.9232	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.5314	20.1748	20.3488	20.5943	20.8218	20.9656	20.9960	20.9928	20.9114	20.6259	20.3145	20.1997	(87)
Th 2	19.9978	20.0004	20.0029	20.0147	20.0169	20.0272	20.0272	20.0292	20.0233	20.0169	20.0124	20.0078	(88)
util rest of house	0.9993	0.9985	0.9958	0.9816	0.9150	0.7071	0.4779	0.5300	0.8393	0.9853	0.9981	0.9994	(89)
MIT 2	19.5737	19.0522	19.2767	19.5964	19.8682	20.0107	20.0264	20.0274	19.9680	19.6402	19.2409	19.1187	(90)
Living area fraction	FLA = Living area / (4) = 0.3966 (91)												
MIT	19.9536	19.4974	19.7019	19.9922	20.2464	20.3894	20.4109	20.4103	20.3422	20.0311	19.6667	19.5474	(92)
Temperature adjustment	0.0000												
adjusted MIT	19.9536	19.4974	19.7019	19.9922	20.2464	20.3894	20.4109	20.4103	20.3422	20.0311	19.6667	19.5474	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9992	0.9982	0.9951	0.9813	0.9242	0.7456	0.5302	0.5834	0.8650	0.9854	0.9978	0.9993	(94)
Useful gains	553.1111	588.9483	621.3840	643.8108	618.3498	483.6549	329.8929	345.0823	487.5389	525.7149	520.9712	531.9847	(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	1406.9987	1308.3444	1179.9635	978.3578	751.9353	503.4432	331.3938	347.9702	545.2717	829.7738	1111.2448	1364.2726	(97)
Space heating kWh	635.2924	483.4341	415.5832	240.8738	99.3876	0.0000	0.0000	0.0000	0.0000	226.2198	424.9970	619.2222	(98a)
Space heating requirement - total per year (kWh/year)	3145.0101												
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	635.2924	483.4341	415.5832	240.8738	99.3876	0.0000	0.0000	0.0000	0.0000	226.2198	424.9970	619.2222	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)	3145.0101												
Space heating per m2	(98c) / (4) = 38.6175 (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 %)	384.7972 (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	635.2924	483.4341	415.5832	240.8738	99.3876	0.0000	0.0000	0.0000	0.0000	226.2198	424.9970	619.2222	(98)
Space heating efficiency (main heating system 1)	384.7972	384.7972	384.7972	384.7972	384.7972	0.0000	0.0000	0.0000	0.0000	384.7972	384.7972	384.7972	(210)
Space heating fuel (main heating system)	165.0980	125.6335	108.0006	62.5976	25.8286	0.0000	0.0000	0.0000	0.0000	58.7894	110.4470	160.9217	(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	92.3695	63.7991	38.4422	17.9624	7.6821	6.0711	5.6151	10.4255	21.4369	45.6407	77.1132	91.1916	(64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	92.3695	63.7991	38.4422	17.9624	7.6821	6.0711	5.6151	10.4255	21.4369	45.6407	77.1132	91.1916	(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	6.7945	6.1370	6.7945	6.5753	6.7945	6.5753	6.7945	6.7945	6.5753	6.7945	6.5753	6.7945	(231)
Lighting	27.1500	21.7807	19.6111	14.3680	11.0982	9.0673	10.1242	13.1598	17.0933	22.4273	25.3316	27.9046	(232)

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Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-37.6046	-55.5021	-82.2056	-93.4935	-99.3808	-90.5418	-89.6651	-84.1906	-74.3225	-63.5320	-42.0334	-32.1515	(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	-12.4819	-28.0779	-60.1407	-97.2785	-136.3020	-141.1719	-138.9864	-115.5834	-82.1406	-43.3139	-17.3764	-9.7624	(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												817.3162	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												100.0000	
Water heating fuel used												477.7493	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans: pump for solar water heating												80.0000	(230g)
Total electricity for the above, kWh/year												80.0000	(231)
Electricity for lighting (calculated in Appendix L)												219.1160	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1727.2394	(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												467.8220	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	817.3162	16.4900	134.7754	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	477.7493	16.4900	78.7809	(247)
Energy for instantaneous electric shower(s)	600.8799	16.4900	99.0851	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	219.1160	16.4900	36.1322	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-844.6236	16.4900	-139.2784	
PV Unit electricity exported	-882.6158	5.5900	-49.3382	
Total			-188.6166	(252)
Total energy cost			173.3490	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		0.4936	(257)
SAP value	$[(255) \times (256)] / [(4) + 45.0] =$	91.9994	
SAP rating (Section 12)		92	(258)
SAP band		A	

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	817.3162	0.1551	126.8003	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	477.7493	0.1519	72.5786	(264)
Energy for instantaneous electric shower(s)	600.8799	0.1391	83.5957	(264a)
Space and water heating			199.3789	(265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970	(267)
Energy for lighting	219.1160	0.1443	31.6252	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-844.6236	0.1345	-113.6178	
PV Unit electricity exported	-882.6158	0.1237	-109.1452	
Total			-222.7630	(269)
Total CO2, kg/year			102.9338	(272)
CO2 emissions per m2			1.2600	(273)
EI value			98.9091	
EI rating			99	(274)
EI band			A	

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1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	40.7200 (1b)	x 2.3500 (2b)	= 95.6920 (1b) - (3b)
First floor	40.7200 (1c)	x 2.5800 (2c)	= 105.0576 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 200.7496 (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) =	0.1494 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.3494	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.3494 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	6.3000	6.0000	6.0000	5.4000	5.2000	4.7000	4.5000	4.4000	4.9000	5.6000	5.8000	6.1000 (22)
Wind factor	1.5750	1.5000	1.5000	1.3500	1.3000	1.1750	1.1250	1.1000	1.2250	1.4000	1.4500	1.5250 (22a)
Adj infilt rate												
Effective ac	0.5504	0.5242	0.5242	0.4717	0.4543	0.4106	0.3931	0.3844	0.4281	0.4892	0.5067	0.5329 (22b)
	0.6515	0.6374	0.6374	0.6113	0.6032	0.5843	0.5773	0.5739	0.5916	0.6197	0.6284	0.6420 (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
WIND 1.4 (Uw = 1.40)			9.6800	1.3258	12.8333		(27)
HG DOOR			2.1000	1.0000	2.1000		(26a)
Heatloss Floor 1			40.7200	0.1400	5.7008	110.0000	4479.2000 (28a)
Rendered walls	136.0680	11.7800	124.2880	0.1500	18.6432	190.0000	23614.7200 (29a)
Plane roof	40.7200		40.7200	0.1000	4.0720	9.0000	366.4800 (30)
Total net area of external elements Aum(A, m ²)			217.5080				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.3493		(33)
G floor walls			16.3400			9.0000	147.0600 (32c)
F Floor walls			21.6000			9.0000	194.4000 (32c)
Internal Floor 1			40.7200			18.0000	732.9600 (32d)
Internal Ceiling 1			40.7200			9.0000	366.4800 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	29901.3000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		367.1574 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	12.7000	0.0570	0.7239
E12 Gable (insulation at ceiling level)	14.9000	0.1130	1.6837
E10 Eaves (insulation at ceiling level)	8.1000	0.0240	0.1944
E2 Other lintels (including other steel lintels)	7.1000	0.0150	0.1065
E3 Sill	22.3000	0.0100	0.2230
E4 Jamb	27.6000	0.0750	2.0700
E5 Ground floor (normal)	27.6000	0.0000	0.0000
E6 Intermediate floor within a dwelling	24.6500	0.0620	1.5283
E16 Corner (normal)	4.9300	0.0620	0.3057
E17 Corner (inverted - internal area greater than external area)			6.8355 (36)

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	(36a) =	0.0000
Point Thermal bridges	(33) + (36) + (36a) =	50.1848 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	43.1570	42.2242	42.2242	40.4951	39.9592	38.7079	38.2427	38.0177	39.1932	41.0512	41.6276	42.5301 (38)
Heat transfer coeff	93.3418	92.4090	92.4090	90.6799	90.1440	88.8927	88.4275	88.2025	89.3780	91.2360	91.8124	92.7149 (39)
Average = Sum(39)m / 12 =												90.8040

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1461	1.1347	1.1347	1.1135	1.1069	1.0915	1.0858	1.0830	1.0975	1.1203	1.1274	1.1384 (40)
HLP (average)												1.1150
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4896 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	28.4892	28.0661	27.4703	26.3717	25.5491	24.6370	24.1443	24.7359	25.3801	26.3561	27.4773	28.3929 (42b)
Hot water usage for other uses	40.1262	38.6670	37.2079	35.7488	34.2896	32.8305	32.8305	34.2896	35.7488	37.2079	38.6670	40.1262 (42c)
Average daily hot water use (litres/day)												62.8923 (43)

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Daily hot water use	68.6154	66.7331	64.6782	62.1205	59.8387	57.4674	56.9747	59.0255	61.1289	63.5640	66.1444	68.5191 (44)
Energy conte	108.6700	95.0271	99.4079	85.0398	80.5544	70.6629	68.9060	73.0859	75.3780	86.2558	94.2348	107.2843 (45)
Energy content (annual)	Total = Sum(45)m = 1044.5069											
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	92.3695	80.7730	84.4968	72.2838	68.4713	60.0635	58.5701	62.1231	64.0713	73.3174	80.0996	91.1916 (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)
Aperture area of solar collector	3.0000 (H1)											
Zero-loss collector efficiency	0.8000 (H2)											
Collector linear heat loss coefficient	1.8000 (H3)											
Collector 2nd order heat loss coefficient	0.0000 (H4)											
Collector loop efficiency	0.9000 (H5)											
Incidence angle modifier	1.0000 (H6)											
Overshading factor	0.8000 (H8)											
Overall heat loss coefficient of system	6.5000 (H10)											
Heat loss coefficient of collector loop	3.9667 (H11)											
Dedicated solar storage volume	75.0000 (H12)											
Effective solar volume	75.0000 (H14)											
Reference volume	225.0000 (H15)											
Storage tank correction coefficient	1.3161 (H16)											
Heat delivered to hot water	479.1909 (H24)											
Heat delivered to space heating	0.0000 (H29)											
Solar input	479.1909											
Solar input	-9.9529	-23.7475	-53.4376	-60.1958	-63.1418	-57.6566	-54.5489	-55.8645	-49.3362	-36.0867	-13.6594	-1.5630 (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	82.4166	57.0255	31.0591	12.0880	5.3295	2.4069	4.0212	6.2585	14.7351	37.2307	66.4402	89.6286 (64)
	Total per year (kWh/year) = Sum(64)m = 408.6400 (64)											
Electric shower(s)	52.8249	47.0674	51.3958	49.0464	49.9667	47.6634	49.2522	49.9667	49.0464	51.3958	50.4294	52.8249 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 600.8799 (64a)											
Heat gains from water heating, kWh/month	36.2986	31.9601	33.9731	30.3326	29.6095	26.9317	26.9556	28.0224	28.2794	31.1783	32.6322	36.0041 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	149.3770	149.3770	149.3770	149.3770	149.3770	149.3770	149.3770	149.3770	149.3770	149.3770	149.3770	149.3770 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	31.0181	27.5500	22.4052	16.9622	12.6794	10.7045	11.5666	15.0347	20.1795	25.6226	29.9053	31.8802 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	331.9758	335.4206	326.7397	308.2589	284.9303	263.0047	248.3571	244.9122	253.5932	272.0739	295.4025	317.3281 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.4273	52.4273	52.4273	52.4273	52.4273	52.4273	52.4273	52.4273	52.4273	52.4273	52.4273	52.4273 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846	-99.5846 (71)
Water heating gains (Table 5)	48.7884	47.5597	45.6628	42.1285	39.7977	37.4052	36.2306	37.6646	39.2770	41.9063	45.3225	48.3926 (72)
Total internal gains	514.0020	512.7500	497.0273	469.5693	439.6271	413.3340	398.3739	399.8311	415.2693	441.8224	472.8500	499.8206 (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	0.6300	14.1491	0.6300	0.7000	0.5400	1.9105 (74)						
East	3.6000	26.5119	0.6300	0.7000	0.5400	20.4559 (76)						
West	5.4500	26.5119	0.6300	0.7000	0.5400	30.9679 (80)						
Solar gains	53.3343	89.4167	145.6587	216.6342	250.3217	279.5226	243.6598	225.0689	178.5734	110.0223	64.0488	42.2354 (83)
Total gains	567.3363	602.1667	642.6860	686.2035	689.9488	692.8566	642.0337	624.9000	593.8427	551.8447	536.8988	542.0560 (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	88.9839	89.8821	89.8821	91.5960	92.1406	93.4376	93.9291	94.1687	92.9302	91.0377	90.4662	89.5856
util living area	6.9323	6.9921	6.9921	7.1064	7.1427	7.2292	7.2619	7.2779	7.1953	7.0692	7.0311	6.9724
	0.9986	0.9978	0.9948	0.9850	0.9473	0.8264	0.6970	0.6883	0.8681	0.9794	0.9962	0.9987 (86)
Living	20.2438	20.3065	20.4325	20.6109	20.8128	20.9519	20.9880	20.9895	20.9367	20.7294	20.4804	20.2721
Non living	19.1118	19.1989	19.3592	19.5961	19.8386	19.9815	20.0087	20.0116	19.9686	19.7398	19.4259	19.1530
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.6132	20.3065	20.4325	20.6109	20.8128	20.9519	20.9880	20.9895	20.9367	20.7294	20.4804	20.3740 (87)
Th 2	19.9633	19.9726	19.9726	19.9899	19.9952	20.0078	20.0124	20.0147	20.0029	19.9843	19.9785	19.9696 (88)
util rest of house	0.9978	0.9965	0.9917	0.9758	0.9137	0.7403	0.5755	0.5627	0.7816	0.9619	0.9934	0.9979 (89)
MIT 2	19.6238	19.1989	19.3592	19.5961	19.8386	19.9815	20.0087	20.0116	19.9686	19.7398	19.4259	19.3001 (90)
Living area fraction	FLA = Living area / (4) = 0.3966 (91)											
MIT	20.0162	19.6382	19.7849	19.9986	20.2250	20.3664	20.3971	20.3994	20.3525	20.1323	19.8441	19.7260 (92)
Temperature adjustment	0.0000											
adjusted MIT	20.0162	19.6382	19.7849	19.9986	20.2250	20.3664	20.3971	20.3994	20.3525	20.1323	19.8441	19.7260 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9978	0.9959	0.9910	0.9759	0.9229	0.7741	0.6246	0.6135	0.8157	0.9652	0.9929	0.9976	(94)
Useful gains	566.1085	599.6861	636.8872	669.6454	636.7330	536.3184	400.9869	383.3646	484.3900	532.6393	533.0760	540.7602	(95)
Ext temp.	6.5000	6.7000	7.7000	9.1000	11.6000	14.0000	15.8000	16.0000	14.5000	12.0000	9.3000	7.0000	(96)
Heat loss rate W	1261.6278	1195.6059	1116.7507	988.2839	777.4919	565.9268	406.5105	388.0421	523.0884	741.9547	968.0816	1179.8904	(97)
Space heating kWh	517.4663	400.4581	357.0185	229.4197	104.7246	0.0000	0.0000	0.0000	0.0000	155.7306	313.2041	475.5129	(98a)
Space heating requirement - total per year (kWh/year)													2553.5348
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	517.4663	400.4581	357.0185	229.4197	104.7246	0.0000	0.0000	0.0000	0.0000	155.7306	313.2041	475.5129	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)													2553.5348
Space heating per m2													(98c) / (4) = 31.3548 (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 %)													382.2877 (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	517.4663	400.4581	357.0185	229.4197	104.7246	0.0000	0.0000	0.0000	0.0000	155.7306	313.2041	475.5129	(98)
Space heating efficiency (main heating system 1)	382.2877	382.2877	382.2877	382.2877	382.2877	0.0000	0.0000	0.0000	0.0000	382.2877	382.2877	382.2877	(210)
Space heating fuel (main heating system)	135.3604	104.7531	93.3900	60.0123	27.3942	0.0000	0.0000	0.0000	0.0000	40.7365	81.9289	124.3861	(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	82.4166	57.0255	31.0591	12.0880	5.3295	2.4069	4.0212	6.2585	14.7351	37.2307	66.4402	89.6286	(64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	82.4166	57.0255	31.0591	12.0880	5.3295	2.4069	4.0212	6.2585	14.7351	37.2307	66.4402	89.6286	(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	6.7945	6.1370	6.7945	6.5753	6.7945	6.5753	6.7945	6.5753	6.7945	6.5753	6.7945	6.7945	(231)
Lighting	27.1500	21.7807	19.6111	14.3680	11.0982	9.0673	10.1242	13.1598	17.0933	22.4273	25.3316	27.9046	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-46.8874	-60.3905	-88.0438	-100.9978	-103.7049	-97.6805	-93.0549	-90.6941	-81.5479	-69.9977	-50.1812	-38.9778	(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	-19.0873	-34.2117	-71.8383	-117.9853	-151.4737	-175.9286	-154.1848	-141.5968	-103.8976	-55.5697	-25.2472	-14.1452	(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													667.9615 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													100.0000
Water heating fuel used													408.6400 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
pump for solar water heating													80.0000 (230g)
Total electricity for the above, kWh/year													80.0000 (231)
Electricity for lighting (calculated in Appendix L)													219.1160 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-1987.3246 (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													-10.7272 (238)

10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	667.9615	25.1600	168.0591	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	408.6400	25.1600	102.8138	(247)
Energy for instantaneous electric shower(s)	600.8799	25.1600	151.1814	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Pump for solar water heating	80.0000	25.1600	20.1280	(249)
Energy for lighting	219.1160	25.1600	55.1296	(250)

Full SAP Calculation Printout



Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-922.1585	25.1600	-232.0151
PV Unit electricity exported		5.8100	-61.8862
Total	-1065.1661		-293.9012 (252)
Total energy cost			203.4107 (255)

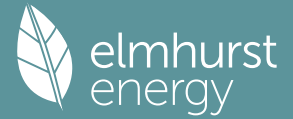
 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	667.9615	0.1549	103.4971 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	408.6400	0.1534	62.6812 (264)
Energy for instantaneous electric shower(s)	600.8799	0.1391	83.5957 (264a)
Space and water heating			166.1783 (265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970 (267)
Energy for lighting	219.1160	0.1443	31.6252 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-922.1585	0.1350	-124.5153
PV Unit electricity exported	-1065.1661	0.1244	-132.5576
Total			-257.0729 (269)
Total CO2, kg/year			35.4233 (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	667.9615	1.5736	1051.1368 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	408.6400	1.5676	640.5992 (278)
Energy for instantaneous electric shower(s)	600.8799	1.5143	909.9330 (278a)
Space and water heating			1691.7360 (279)
Pumps, fans and electric keep-hot	80.0000	1.5128	121.0240 (281)
Energy for lighting	219.1160	1.5338	336.0874 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-922.1585	1.4991	-1382.3621
PV Unit electricity exported	-1065.1661	0.4567	-486.4955
Total			-1868.8576 (283)
Total Primary energy kWh/year			1189.9229 (286)

Predicted Energy Assessment



Adj. 1, Higher Broad Lane Cottages, Illogan, TR15 3JW

Dwelling type:

House, Detached

Date of assessment:

21/03/2024

Produced by:

Martin Richards

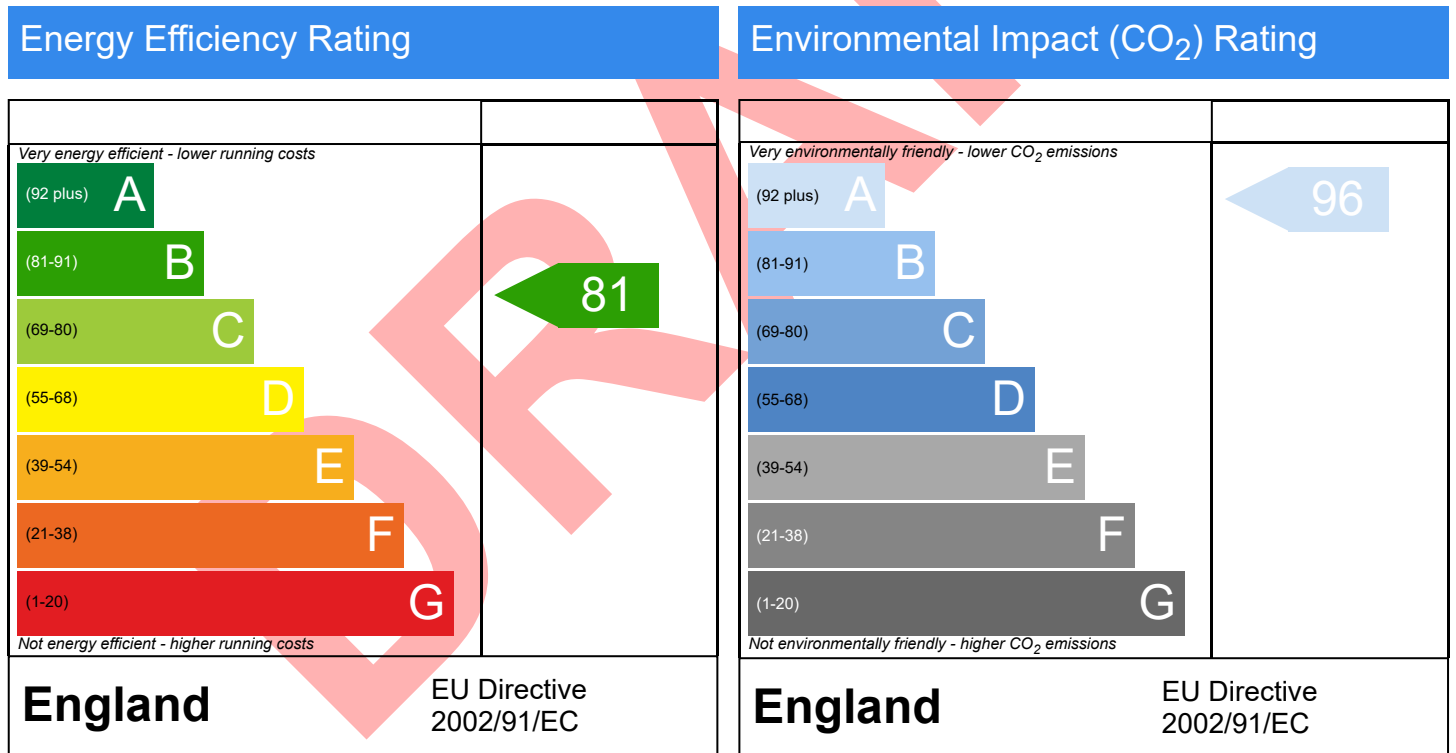
Total floor area:

81.44 m²

DRRN:

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

Summary for Input Data



Property Reference	1408_01 1 HBL	Issued on Date	21/03/2024
Assessment Reference	1408_01	Prop Type Ref	
Property	Adj. 1, Higher Broad Lane Cottages, Illogan, TR15 3JW		

SAP Rating	81 B	DER	4.60	TER	13.51
Environmental	96 A	% DER < TER			65.95
CO ₂ Emissions (t/year)	0.34	DFEE	41.30	TFEE	46.26
Compliance Check	See BREL	% DFEE < TFEE			10.74
% DPER < TPER	31.62	DPER	48.60	TPER	71.07

Assessor Details	Mr. Martin Richards	Assessor ID	B046-0001
Client	MRD, MRD		

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	East
Property Tenure	ND
Transaction Type	6
Terrain Type	Suburban
1.0 Property Type	House, Detached
2.0 Number of Storeys	2
3.0 Date Built	2024
4.0 Sheltered Sides	0
5.0 Sunlight/Shade	More than average
6.0 Thermal Mass Parameter	Precise calculation

7.0 Electricity Tariff	Standard
Smart electricity meter fitted	Yes
Smart gas meter fitted	Yes

7.0 Measurements	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	27.60 m	40.72 m ²	2.35 m
1st Storey:	27.60 m	40.72 m ²	2.58 m

8.0 Living Area	32.30	m ²
-----------------	-------	----------------

9.0 External Walls	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area (m ²)	Shelter Res	Shelter	Openings	Area Calculation Type
	Rendered walls	Cavity Wall	Cavity wall : dense plaster, dense block, filled cavity, any outside structure	0.15	190.00	136.07	124.29	0.00	None	11.78	Calculate Wall Area

9.2 Internal Walls	Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
	G floor walls	Plasterboard on timber frame	9.00	16.34
	F Floor walls	Plasterboard on timber frame	9.00	21.60

10.0 External Roofs	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area (m ²)	Shelter Code	Shelter Factor	Calculation Type	Openings
	Plane roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	9.00	40.72	40.72	None	0.00	Calculate Wall Area	0.00

10.2 Internal Ceilings	Description	Storey	Construction	Area (m ²)
	Internal Ceiling 1	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	40.72

11.0 Heat Loss Floors	Description	Type	Storey Index	Construction	U-Value (W/m ² K)	Shelter Code	Shelter Factor	Kappa (kJ/m ² K)	Area (m ²)
	Heatloss Floor 1	Ground Floor - Solid	Lowest occupied	Slab on ground, screed over insulation	0.14	None	0.00	110.00	40.72

11.2 Internal Floors	Description	Storey Index	Construction	Kappa (kJ/m ² K)	Area (m ²)
	Internal Floor 1		Plasterboard ceiling, carpeted chipboard floor	9.00	40.72

Summary for Input Data



12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m ² K)
WIND 1.4 HG DOOR	Manufacturer Manufacturer	Window Half Glazed Door	Double Low-E Soft 0.1 Double Low-E Soft 0.1			0.63 0.63		0.70 0.70	1.40 1.00

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m ²)	Pitch
E WINDS REND	WIND 1.4	Rendered walls	East	3.60	
N WINDS REND	WIND 1.4	Rendered walls	North	0.63	
HG DOOR	HG DOOR	Rendered walls	East	2.10	
W WINDS REND	WIND 1.4	Rendered walls	West	5.45	

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E12 Gable (insulation at ceiling level)	Non Gov Approved Schemes	12.70	0.06	0.06	No
E10 Eaves (insulation at ceiling level)	Non Gov Approved Schemes	14.90	0.11	0.11	No
E2 Other lintels (including other steel lintels)	Non Gov Approved Schemes	8.10	0.02	0.02	Yes
E3 Sill	Non Gov Approved Schemes	7.10	0.01	0.01	Yes
E4 Jamb	Non Gov Approved Schemes	22.30	0.01	0.01	Yes
E5 Ground floor (normal)	Non Gov Approved Schemes	27.60	0.07	0.07	Yes
E6 Intermediate floor within a dwelling	Non Gov Approved Schemes	27.60	0.00	0.00	Yes
E16 Corner (normal)	Non Gov Approved Schemes	24.65	0.06	0.06	No
E17 Corner (inverted – internal area greater than external area)	Non Gov Approved Schemes	4.93	0.06	0.06	No

Y-value W/m²K

18.0 Pressure Testing

Designed AP₅₀ m³/(h.m²) @ 50 Pa

Test Method

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System

22.0 Lighting

No Fixed Lighting

Name	Efficacy	Power	Capacity	Count
Lighting 1	80.00	7	560	30

24.0 Main Heating 1

Description

Percentage of Heat %

Database Ref. No.

Fuel Type

In Winter

In Summer

Model Name

Manufacturer

System Type

Controls SAP Code

Is MHS Pumped

Heating Pump Age

Heat Emitter

Flow Temperature

Flow Temperature Value

Summary for Input Data



25.0 Main Heating 2

26.0 Heat Networks

Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1									
Heat source 2									
Heat source 3									
Heat source 4									
Heat source 5									

28.0 Water Heating

Water Heating

SAP Code

Fuel Type

Flue Gas Heat Recovery System

Waste Water Heat Recovery Instantaneous System 1

Waste Water Heat Recovery Instantaneous System 2

Waste Water Heat Recovery Storage System

Solar Panel

Water use <= 125 litres/person/day

Cold Water Source

Bath Count

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder

In Airing Cupboard

34.0 Small-scale Hydro

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

Typical Cost	Typical savings per year	Ratings after improvement	
		SAP rating	Environmental Impact
£4,000 - £6,000	£100	B 83	A 97
£3,500 - £5,500	£294	A 92	A 99
		0	0

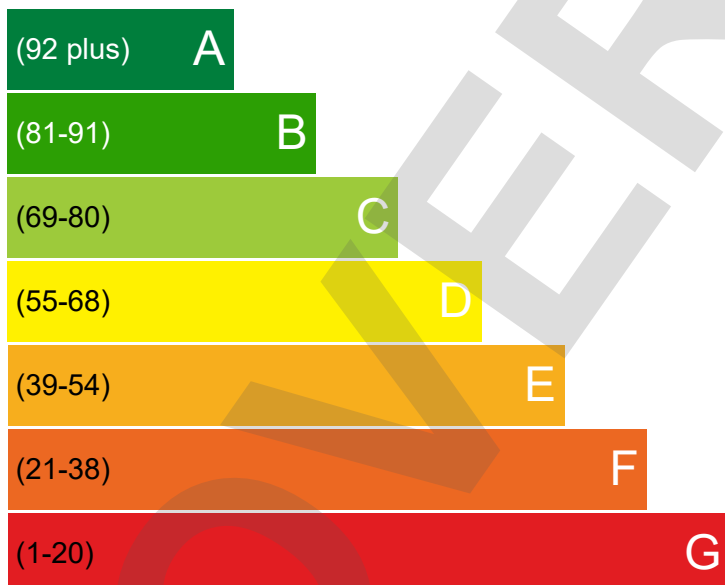
Dwelling Address	Adj. 1, Higher Broad Lane Cottages, Illogan, TR15 3JW
Report Date	21/03/2024
Property Type	House, Detached
Floor Area [m ²]	81

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

Energy Rating

The current energy rating represents the overall energy efficiency of the dwelling. The potential energy rating is the overall energy rating of the dwelling after all of the recommend measures provided on the next page have been installed. A higher score represents a more energy efficient dwelling with lower fuel bills.

Most energy efficient - lower running costs



CURRENT

81

POTENTIAL

92

Least energy efficient - higher running costs

Breakdown of property's energy performance

Each feature is assessed as one of the following:



Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.15 W/m ² K	Very Good
Roof	Average thermal transmittance 0.1 W/m ² K	Very Good
Floor	Average thermal transmittance 0.14 W/m ² K	Very Good
Windows	High performance glazing	Good
Main heating	Air source heat pump, radiators, electric	Very Good
Main heating controls	Time and temperature zone control	Very Good
Secondary heating	None	
Hot water	Electric instantaneous at point of use	Very Poor
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 4.0 m ³ /h.m ² (assumed)	Good

Primary Energy use

The primary energy use for this property per year is 45 kilowatt hour (kWh) per square metre

Estimated CO₂ emissions of the dwelling





The estimated CO rating provides an indication of the dwelling's impact on the environment in terms of carbon dioxide emissions; the higher the rating the less impact it has on the environment.

The estimated CO emissions for this dwellings is: **0.3** per year

With the recommended measures the potential CO emissions could be: **0.0** per year

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling. To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed. Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measure	Typical Yearly Saving	Potential Rating after measure installed	Cumulative savings (per year)	Cumulative Potential Rating
Solar water heating	£100	 2	£100	 B 83
Photovoltaic	£294	 9	£394	 A 92

Estimated energy use and potential savings

Estimated energy cost for this property over a year

£598

Over a year you could save

£394

The estimated cost and savings show how much the average household would spend in this property for heating, lighting and hot water. It is not based on how energy is used by the people living at the property.

Contacting the assessor and the accreditation scheme

Assessor contact details

Assessor name	Mr. Martin Richards
Assessor's accreditation number	
Email Address	

Accreditation scheme contact details

Accreditation scheme	
Telephone	
Email Address	

Assessment details

Related party disclosure	
Date of assessment	21/03/2024
Date of certificate	21/03/2024
Type of assessment	SAP, new dwelling