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DEMONSTRATION OF ZERO CARBON OPD PLANNING
STATEMENT
FOR
NEW DWELLING AT
GILFACH Yr HAIDD FARM, YSTALYFERA, SA9 2BE.

Client – Mr Simon Cometson

Date – 20th May 2025

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SUMMARY	

This report has been produced on behalf of Mr Simon Coneston to demonstrate how the application for the proposed dwelling at Gilfach Yr Haidd Farm, Ystalyfera, SA9



2BE.Swansea will address the carbon reduction requirements set by One Planet Development.

The proposed dwelling has been designed to achieve a good standard of building energy efficiency which are in line or better than the limiting standards.

The Energy Assessment demonstrates that the proposed specification achieves an 102.95% reduction in carbon emissions beyond Part L of the 2022 Building Regulations

BUILDING SPECIFICATIONS AND SERVICES

The following section outlines the measures which have been taken to reduce the energy demand of the proposal. This includes both architectural and building fabric measures (passive design) and energy efficient services (active design) considered at the earliest design stage.

Passive design measures, including optimising orientation and site layout, natural ventilation and lighting, thermal mass and solar shading.

Active design measures to reduce energy demand are described as including high efficiency lighting and ventilation. Other measures include enhanced U-values, air tightness improvement and the development's approach to limiting thermal bridges. The specification for the proposal is listed below:

	Part L Values		
Element or System	Dwelling Limiting	Dwellings Notional	Proposed
Wall	0.18	0.13	0.18
Roof	0.13	0.11	0.13
Floor	0.15	0.11	0.13
Windows	1.4	1.3	1.29



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Doors	1.4	1	1.29
Air permeability	8	5	5
Ventilation	Natural with extracts	Natural with extracts	Natural with extracts
Heating		Gas	Wood stove

The proposed dwelling is both well insulated and designed to minimise heat loss.

Heating will be provided by a high efficiency wood stove which will burn short rotation coppice that has been harvested on site. The wood stove will be connected to a back boiler which will provide hot water during the winter months.

The proposed dwelling will be off grid; therefore, the following measures have been put in place.

A 6kWp photovoltaic array will be orientated south on a 30-degree inclination with no overshadowing. A diverter will be installed for the hot water immersion heater. Battery storage will also be utilised to store energy so that it can be used during times when the photovoltaic array is not producing sufficient energy.

The dwelling has been assessed using the SAP 10. The results are as follows:

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Wood logs	
Target carbon dioxide emission rate	11.2 kgCO ₂ /m ²	
Dwelling carbon dioxide emission rate	-0.33 kgCO ₂ /m ²	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	59.82 kWh _{PE} /m ²	
Dwelling primary energy	39.1 kWh _{PE} /m ²	OK
1c Minimum energy efficiency rating and dwelling energy efficiency rating		
Minimum energy efficiency rating	81	
Dwelling energy efficiency rating	99	OK

The SAP worksheets have been included at the end of this document.



Water Usage

Water will be provided on-site without the use of mains water.

It is the intention to reduce the consumption of water within the proposed dwelling from all sources using efficient fittings.

There are a variety of specifications available to reduce water usage. A water calculation has been carried out using the following

Fitting	Flow Rate / Capacity
<i>Sanitary Fittings</i>	
Dual Flush WC	4 litres per flush (full) 2.6 litres per flush (part)
Taps (main)	4 litres per minute
Bath	Not present
Shower	6 litres per minute
Taps (kitchen/utility)	6 litres per minute
<i>Appliances</i>	
Washing Machine	7 litres per kilogram (dry load)
Dishwasher	Not accounted for

Rainwater harvesting can be utilised for use within, as well as outside of the dwelling. This has been incorporated into this calculation for use with toilet flushing and the washing machine.

This specification of fittings achieves an internal water consumption rate of 49.6 litres per person per day.

Conclusion



Based on the modelling undertaken, it has been demonstrated that it is possible to reduce regulated on-site carbon dioxide emissions of the proposed dwelling at Gilfach Yr Haidd Farm by 102.95% beyond the requirements of Part L 2021 of the Building Regulations, where the building and services specification described in this report are implemented. This equates to carbon emissions being minus 0.02t/yr, thus demonstrating zero carbon.

Fabric performance has been improved to meet and surpass the requirements of Part L of the Building Regulations, whilst heating, hot water equipment have been chosen to maximize carbon savings.

Full SAP Calculation Printout



Property Reference	Gilfach	Issued on Date	21/05/2025
Assessment Reference	Design	Prop Type Ref	Planning
Property	Gilfach Yr Haidd Farm, Acces Lane to Gilfach Yr Haidd, Ystalyfera, Swansea		

SAP Rating	99 A	DER	-0.33	TER	11.20
Environmental	100 A	% DER < TER			102.95
CO ₂ Emissions (t/year)	-0.02	DPER	39.10	TPER	59.82
Compliance Check	See BRWL	% DPER < TPER			34.64

Assessor Details	Ms. Natalie Wheeler	Assessor ID	AX45-0001
Client			

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

1. Overall dwelling characteristics-----				
Main dwelling	Area (m ²)	Storey height (m)	Volume (m ³)	
Ground floor	55.2400 (1b)	x 2.8900 (2b)	= 159.6436 (1b)	
- (3b)				
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.2400			
(4) Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	
159.6436 (5)				

2. Ventilation rate-----				
			m ³	
per hour				
Number of open chimneys		0 * 80 =	0.0000	
(6a)				
Number of open flues		0 * 20 =	0.0000	
(6b)				
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	
(6c)				
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	
(6d)				
Number of flues attached to other heater		0 * 35 =	0.0000	
(6e)				
Number of blocked chimneys		0 * 20 =	0.0000	
(6f)				
Number of intermittent extract fans		2 * 10 =	20.0000	
(7a)				
Number of passive vents		0 * 10 =	0.0000	
(7b)				
Number of flueless gas fires		0 * 40 =	0.0000	
(7c)				
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			Air changes per hour	
(8)			20.0000 / (5) = 0.1253	
Pressure test				Yes
Pressure Test Method				Blower Door
Measured/design AP50				5.0000
(17)				
Infiltration rate				0.3753
(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) =		0.3753
(21)				

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

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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	0.4785	0.4691	0.4597	0.4128	0.4034	0.3565	0.3565	0.3471	0.3753	0.4034	0.4222	0.4410
(22b) Effective ac	0.6145	0.6100	0.6057	0.5852	0.5814	0.5636	0.5636	0.5603	0.5704	0.5814	0.5891	
0.5972 (25)												

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
Front door			1.9800	1.0000	1.9800		
(26)							
Glazing			12.5000	1.2267	15.3338		
(27)							
Heatloss Floor			55.2400	0.1300	7.1812	20.0000	1104.8000
(28a)							
External walls	87.6000	14.4800	73.1200	0.1800	13.1616	9.0000	658.0800
(29a)							
External Roof 1	55.2400		55.2400	0.1300	7.1812	9.0000	497.1600
(30)							
Total net area of external elements Aum(A, m2)			198.0800				
(31) Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	44.8378	
(33)							
Main dwelling							
Internal Wall 1			107.2800			9.0000	965.5200
(32c)							

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 3225.5600

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

58.3917 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	10.7000	0.1440	1.5408
E3 Sill	7.2500	0.0480	0.3480
E4 Jamb	20.3600	0.0640	1.3030
E5 Ground floor (normal)	30.3100	0.0630	1.9095
E14 Flat roof	30.3100	0.0410	1.2427
E16 Corner (normal)	11.5600	0.0620	0.7167

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

(36)													7.0608
Point Thermal bridges												(36a) =	0.0000
Total fabric heat loss												(33) + (36) + (36a) =	51.8986
(37)													

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	32.3718	32.1377	31.9081	30.8300	30.6283	29.6892	29.6892	29.5153	30.0509	30.6283	31.0363	31.4630
(38) Heat transfer coeff	84.2704	84.0362	83.8067	82.7286	82.5268	81.5878	81.5878	81.4139	81.9495	82.5268	82.9349	83.3615
(39) Average = Sum(39)m / 12 =	82.7276											

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.5255	1.5213	1.5171	1.4976	1.4940	1.4770	1.4770	1.4738	1.4835	1.4940	1.5014	1.5091
(40)												
HLP (average)	1.4976	Days in mont	31	28	31	30	31	30	31	30	31	30
31												

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.8444
(42)													
Hot water usage for mixer showers				68.9961	67.9398	66.3831	63.9883	61.8426	58.8408	56.4666	59.2422		
60.6382	63.6114	66.7076	68.9339	(42a) Hot water usage for baths			0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b) Hot water usage for other uses						
	33.5184	32.2995	31.0807	29.8618	28.6430	27.4241	27.4241	28.6430	29.8618	31.0807	32.2995	33.5184	
(42c) Average daily hot water use (litres/day)													
94.0803 (43)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	102.5145	100.2393	97.4638	93.8501	90.4856	86.2650	83.8907	87.8852	90.5001	94.6920	99.0071	102.4523	
(44)													
Energy conte	150.9191	132.6369	139.2737	122.5917	116.5999	99.7626	92.7017	103.4425	104.9755	122.0203	133.8115	150.4587	
(45)													
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													Total = Sum(45)m = 1469.1941
22.6379	19.8955	20.8911	18.3888	17.4900	14.9644	13.9053	15.5164	15.7463	18.3030	20.0717	22.5688		
(46) Water storage loss:													
Store volume													180.0000
(47) a) If manufacturer declared loss factor is known (kWh/day):													
1.6000 (48) Temperature factor from Table 2b													
0.6000 (49) Enter (49) or (54) in (55)													
0.9600 (55)													
Total storage loss													

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	29.7600	26.8800	29.7600	28.8000	29.7600	28.8000	29.7600	29.7600	28.8000	29.7600	28.8000	29.7600
(56) If cylinder contains dedicated solar storage	29.7600	26.8800	29.7600	28.8000	29.7600	28.8000	29.7600	29.7600	28.8000	29.7600	28.8000	29.7600
(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
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
0.0000 (61)												
Total heat required for water heating calculated for each month												
(62)	180.6791	159.5169	169.0337	151.3917	146.3599	128.5626	122.4617	133.2025	133.7755	151.7803	162.6115	180.2187
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
						0.0000 (63d)						
Output from w/h	180.6791	159.5169	169.0337	151.3917	146.3599	128.5626	122.4617	133.2025	133.7755	151.7803	162.6115	180.2187
(64)												
(64) 12Total per year (kWh/year)												
1820 (64)												
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(64a)												
0.0000 (64a)												
Heat gains from water heating, kWh/month	73.9886	65.6058	70.1165	63.8017	62.5775	56.2110	54.6313	58.2026	57.9444	64.3797	67.5323	73.8355
(65)												

Total per year (kWh/year) = Sum(64)m = 1819.5941

5.	Internal gains (see Table 5 and 5a) -----											
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66) Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	92.2194	92.2194	92.2194	92.2194	92.2194	92.2194	92.2194	92.2194	92.2194	92.2194	92.2194	92.2194
(67) Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	81.0918	89.7802	81.0918	83.7948	81.0918	83.7948	81.0918	81.0918	83.7948	81.0918	83.7948	81.0918
(68)	160.8039	162.4726	158.2676	149.3159	138.0158	127.3954	120.3003	118.6317	122.8366	131.7884	143.0884	153.7088
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2219	32.2219	32.2219	32.2219	32.2219	32.2219	32.2219	32.2219	32.2219	32.2219	32.2219	32.2219
(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
0.0000 (70)												
Losses e.g. evaporation (negative values) (Table 5)	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755
(71)												
Water heating gains (Table 5)	99.4470	97.6276	94.2426	88.6135	84.1095	78.0709	73.4292	78.2293	80.4783	86.5319	93.7949	99.2413
(72) Total internal gains	392.0086	400.5462	384.2679	372.3901	353.8829	339.9270	325.4871	328.6186	337.7756	350.0779	371.3439	384.7077
(73)												

6.	Solar gains -----											
[Jan]												
Gains			Area	Solar flux								
W			m2	Table 6a	g			FF			Access	
				W/m2	Specific data			Specific data			factor	
					or Table 6b			or Table 6c			Table 6d	
East			3.2000	19.6403	0.6300			0.7000			0.7700	19.2074
(76)												
South			6.8500	46.7521	0.6300			0.7000			0.7700	97.8731
(78) West			2.4500	19.6403	0.6300			0.7000			0.7700	
14.7057 (80)												
Solar gains	131.7862	226.6321	313.4367	390.1114	435.7554	431.3286	416.4328	383.0694	340.3599	251.6082	158.2986	112.4598
(83)												
Total gains	523.7947	627.1783	697.7046	762.5014	789.6384	771.2556	741.9199	711.6880	678.1355	601.6861	529.6426	497.1676
(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
10.7482 alpha	10.6323	10.6619	10.6911	10.8305	10.8569	10.9819	10.9819	11.0054	10.9334	10.8569	10.8035	
1.7165		1.7088	1.7108	1.7127	1.7220	1.7238	1.7321	1.7321	1.7337	1.7289	1.7238	1.7202
util living area			0.8755	0.8356	0.7884	0.7150	0.6238	0.5073	0.4015	0.4272	0.5750	0.7386
0.8387	0.8840 (86)											
MIT	17.8913	18.2572	18.7612	19.3995	19.9649	20.4141	20.6349	20.6050	20.2745	19.5288	18.6113	17.8322
(87) Th 2	19.6684	19.6716	19.6747	19.6893	19.6920	19.7048	19.7048	19.7072	19.6999	19.6920	19.6865	
19.6807 (88)												
util rest of house												

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(89) MIT 2	0.8613	0.8175	0.7645	0.6813	0.5749	0.4351	0.3045	0.3314	0.5068	0.7004	0.8179	0.8707
16.8350 (90)	16.8838	17.2396	17.7290	18.3480	18.8745	19.2770	19.4463	19.4297	19.1644	18.4874	17.6040	
Living area fraction	fLA = Living area / (4) =											0.4569
(91)												
MIT	17.3442	17.7046	18.2007	18.8284	19.3727	19.7966	19.9893	19.9667	19.6716	18.9632	18.0642	17.2906
(92)												
Temperature adjustment												0.3000
adjusted MIT	17.6442	18.0046	18.5007	19.1284	19.6727	20.0966	20.2893	20.2667	19.9716	19.2632	18.3642	17.5906
(93)												

8.	Space heating requirement -----											

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8343	0.7900	0.7398	0.6651	0.5742	0.4583	0.3505	0.3751	0.5222	0.6861	0.7925	0.8443
(94)												
Useful gains	437.0023	495.4999	516.1470	507.1415	453.3720	353.4860	260.0275	266.9766	354.1536	412.8062	419.7647	419.7771
(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	1124.5175	1101.2596	1005.7364	846.1829	657.9610	448.4525	301.0055	314.8028	481.1771	714.9504	934.1992	1116.2629
(97)												
Space heating kWh	511.5113	407.0705	364.2545	244.1098	152.2142	0.0000	0.0000	0.0000	0.0000	224.7953	370.3929	518.1854
(98a)												
Space heating requirement - total per year (kWh/year)												2792.5339
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	511.5113	407.0705	364.2545	244.1098	152.2142	0.0000	0.0000	0.0000	0.0000	224.7953	370.3929	518.1854
(98c)												
Space heating requirement after solar contribution - total per year (kWh/year)												2792.5339
Space heating per m2										(98c) / (4) =		50.5527
(99)												
Energy for space heating												50.5527
(99)												
Energy for space cooling												0.0000
(108)												
Total												0.0000
(109)												
Fabric Energy Efficiency (FEE)												39.1
(109)												

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.1000
(201)												
Fraction of space heat from main system(s)												0.9000
(202)												
Efficiency of main space heating system 1 (in %)												75.0000
(206)												
Efficiency of main space heating system 2 (in %)												0.0000
(207)												
Efficiency of secondary/supplementary heating system, %												100.0000
(208)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	224.7953	370.3929	518.1854 (98)	511.5113	407.0705	364.2545	244.1098	152.2142	0.0000	0.0000	0.0000	0.0000
Space heating efficiency (main heating system 1)	75.0000	75.0000	75.0000	75.0000	75.0000	0.0000	0.0000	0.0000	0.0000	75.0000	75.0000	75.0000
(210) Space heating fuel (main heating system)	613.8136	488.4845	437.1054	292.9318	182.6571	0.0000	0.0000	0.0000	0.0000	269.7544	444.4715	621.8225
(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
0.0000 0.0000 0.0000 0.0000 0.0000 (213) Space heating fuel (secondary)									51.1511	40.7070	36.4254	24.4110
15.2214 0.0000 0.0000 0.0000 0.0000 22.4795 37.0393 51.8185 (215)												
Water heating												
Water heating requirement	180.6791	159.5169	169.0337	151.3917	146.3599	128.5626	122.4617	133.2025	133.7755	151.7803	162.6115	180.2187
(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
100.0000 (217)												
Fuel for water heating, kWh/month	133.7755	151.7803	162.6115	180.2187 (219)	180.6791	159.5169	169.0337	151.3917	146.3599	128.5626	122.4617	133.2025
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	14.9899	12.0254	10.8276	7.9327	6.1275	5.0062	5.5897	7.2657	9.4374	12.3824	13.9859	
15.4065 (232)												

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Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-145.1903	-231.0586	-364.3968	-359.7814	-337.0748	-286.0584	-
277.7453 -288.3091 -290.8036 -280.6864 -169.1017 -122.3265 (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
(235d)							
Annual totals kWh/year							
Space heating fuel - main system 1 (211)							3351.0407
Space heating fuel - main system 2 (213)							0.0000
Space heating fuel - secondary (215)							279.2534
Efficiency of water heater							100.0000
Water heating fuel used (219) Space cooling fuel 0.0000 (221)							1819.5941
Electricity for pumps and fans:							
Total electricity for the above, kWh/year (231) Electricity for lighting (calculated in Appendix L) 120.9769 (232)							0.0000
Energy saving/generation technologies (Appendices M ,N and Q)							
PV generation (233)							-3152.5328
Wind generation (234)							0.0000
Hydro-electric generation (Appendix N) (235a) Electricity generated - Micro CHP (Appendix N) 0.0000 (235)							0.0000
Appendix Q - special features							
Energy saved or generated (236) Energy used (237) Total delivered energy for all uses (238)							-0.0000 0.0000 2418.3323

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

Emissions	Energy kWh/year	Emission factor kg CO2/kWh kg CO2/year
Space heating - main system 1 (261)	3351.0407	0.0280 93.8291
Total CO2 associated with community systems (373)		0.0000
Space heating - secondary (263)	279.2534	0.1541 43.0204
Water heating (other fuel) (264)	1819.5941	0.1410 256.6362
Space and water heating (265)		393.4858
Pumps, fans and electric keep-hot (267) Energy for lighting 17.4607 (268)	0.0000 120.9769	0.0000 0.1443
Energy saving/generation technologies		
PV Unit electricity used in dwelling	-3152.5328	0.1361 -428.9030
PV Unit electricity exported	0.0000	0.0000 0.0000
Total (269)		-428.9030
Total CO2, kg/year (272)		-17.9565
EPC Dwelling Carbon Dioxide Emission Rate (DER) (273)		-0.3300

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

energy	Energy Primary energy factor kWh/year	Primary kg CO2/kWh kWh/year
Space heating - main system 1 (275)	3351.0407	1.0460 3505.1886
Total CO2 associated with community systems (473)		0.0000
Space heating - secondary (277)	279.2534	1.5703 438.5220
Water heating (other fuel) (278)	1819.5941	1.5215 2768.5522

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Space and water heating (279)				6712.2627
Pumps, fans and electric keep-hot (281) Energy for lighting 185.5585 (282)	0.0000 120.9769	0.0000 1.5338		0.0000
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-3152.5328	1.5030		-4738.1517
PV Unit electricity exported	0.0000	0.0000		0.0000
Total (283)				-4738.1517
Total Primary energy kWh/year (286)				2159.6695
Dwelling Primary energy Rate (DPER) (287)				39.1000

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	55.2400 (1b)	x 2.8900 (2b)	= 159.6436 (1b)
- (3b)			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) (4)	55.2400		
Dwelling volume (5)		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	159.6436

2. Ventilation rate

per hour		m ³
Number of open chimneys (6a)	0 * 80 =	0.0000
Number of open flues (6b)	0 * 20 =	0.0000
Number of chimneys / flues attached to closed fire (6c)	0 * 10 =	0.0000
Number of flues attached to solid fuel boiler (6d)	0 * 20 =	0.0000
Number of flues attached to other heater (6e)	0 * 35 =	0.0000
Number of blocked chimneys (6f)	0 * 20 =	0.0000
Number of intermittent extract fans (7a)	2 * 10 =	20.0000
Number of passive vents (7b)	0 * 10 =	0.0000
Number of flueless gas fires (7c)	0 * 40 =	0.0000
Infiltration due to chimneys, flues and fans (8)	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1253
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50 (17)		5.0000
Infiltration rate (18)		0.3753
Number of sides sheltered (19)		0
Shelter factor (20)	(20) = 1 - [0.075 x (19)] =	1.0000
Infiltration rate adjusted to include shelter factor (21)	(21) = (18) x (20) =	0.3753

	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	0.4785	0.4691	0.4597	0.4128	0.4034	0.3565	0.3565	0.3471	0.3753	0.4034	0.4222	0.4410
(22b) Effective ac	0.6145	0.6100	0.6057	0.5852	0.5814	0.5636	0.5636	0.5603	0.5704	0.5814	0.5891	
0.5972 (25)												

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K					
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K					
TER Opaque door			1.9800	1.0000	1.9800							
(26)												
TER Opening Type			11.8300	1.2357	14.6188							
(27)												
Heatloss Floor			55.2400	0.1100	6.0764							
(28a)												
External walls	87.6000	13.8100	73.7900	0.1300	9.5927							
(29a)												
External Roof 1	55.2400		55.2400	0.1100	6.0764							
(30)												
Total net area of external elements Aum(A, m2)			198.0800									
(31)												
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		38.3443							
(33)												
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							58.3917					
(35)												
List of Thermal Bridges												
K1 Element				Length	Psi-value	Total						
E1 Steel lintel with perforated steel base plate				10.7000	0.0500	0.5350						
E3 Sill				7.2500	0.0500	0.3625						
E4 Jamb				20.3600	0.0500	1.0180						
E5 Ground floor (normal)				30.3100	0.1600	4.8496						
E14 Flat roof				30.3100	0.0800	2.4248						
E16 Corner (normal)				11.5600	0.0900	1.0404						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.2303					
(36)												
Point Thermal bridges						(36a) =	0.0000					
Total fabric heat loss						(33) + (36) + (36a) =	48.5746					
(37)												
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.3718	32.1377	31.9081	30.8300	30.6283	29.6892	29.6892	29.5153	30.0509	30.6283	31.0363	31.4630
(38) Heat transfer coeff												
	80.9465	80.7123	80.4828	79.4046	79.2029	78.2639	78.2639	78.0900	78.6256	79.2029	79.6110	80.0376
(39) Average = Sum(39)m / 12 =												
79.4036												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4654	1.4611	1.4570	1.4374	1.4338	1.4168	1.4168	1.4136	1.4233	1.4338	1.4412	1.4489
(40)												
HLP (average)												1.4374
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy (42)													1.8444
Hot water usage for mixer showers													
	70.7845	69.7208	68.1707	65.2048	63.0161	60.5753	59.1879	60.7263	62.4126	65.0333	68.0629	70.5133	
(42a) Hot water usage for baths													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
(42b) Hot water usage for other uses													
	35.2825	33.9995	32.7165	31.4335	30.1505	28.8675	28.8675	30.1505	31.4335	32.7165	33.9995	35.2825	
(42c) Average daily hot water use (litres/day)													
97.3359 (43)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
(44)	106.0670	103.7203	100.8872	96.6383	93.1666	89.4428	88.0554	90.8768	93.8461	97.7498	102.0624	105.7958	
Energy conte	167.9842	147.6963	155.0598	132.2930	125.4202	109.9803	106.4954	112.5244	115.7217	132.6456	145.4066	165.6507	
(45)													
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =			1616.8782
	25.1976	22.1544	23.2590	19.8440	18.8130	16.4971	15.9743	16.8787	17.3582	19.8968	21.8110	24.8476	
(46) Water storage loss:													
Store volume													180.0000
(47) a) If manufacturer declared loss factor is known (kWh/day):													
1.5520 (48) Temperature factor from Table 2b													
0.5400 (49) Enter (49) or (54) in (55)													
0.8381 (55)													
Total storage loss													
	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	
(56) If cylinder contains dedicated solar storage													
	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	
(57) Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	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													
	217.2269	192.1735	204.3025	179.9472	174.6628	157.6345	155.7381	161.7671	163.3759	181.8883	193.0608	214.8933	
(62)													
WWHRS	-49.4385	-43.7238	-45.7850	-37.9118	-35.3324	-30.2342	-28.3398	-30.1365	-31.2815	-36.8774	-41.7777	-48.5229	
(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)													

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Solar input (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
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Output from w/h (64)	167.7884	148.4497	158.5175	142.0354	139.3304	127.4003	127.3983	131.6306	132.0944	145.0108	151.2831	166.3704
(64) 12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											1737.3094
1737 (64)												
Electric shower(s) (64a)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000 (64a)	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											
Heat gains from water heating, kWh/month (65)	95.2489	84.6908	90.9515	82.1108	81.0963	74.6918	74.8039	76.8085	76.6008	83.4988	86.4710	94.4730

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	92.2194	92.2194	92.2194	92.2194	92.2194	92.2194	92.2194	92.2194	92.2194	92.2194	92.2194	92.2194
(66) Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.2300	89.9332	81.2300	83.9376	81.2300	83.9376	81.2300	81.2300	83.9376	81.2300	83.9376	81.2300
(67) Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.8039	162.4726	158.2676	149.3159	138.0158	127.3954	120.3003	118.6317	122.8366	131.7884	143.0884	153.7088
(68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2219	32.2219	32.2219	32.2219	32.2219	32.2219	32.2219	32.2219	32.2219	32.2219	32.2219	32.2219
(69) Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000
3.0000 (70)												
Losses e.g. evaporation (negative values) (Table 5)	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755
(71)												
Water heating gains (Table 5)	128.0227	126.0280	122.2467	114.0428	109.0005	103.7386	100.5428	103.2373	106.3900	112.2296	120.0987	126.9798
(72)												
Total internal gains	423.7224	432.0996	415.4101	400.9621	381.9121	365.7375	352.7389	353.7647	363.8301	378.9138	400.7905	415.5844
(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		

East (76)	3.0300			19.6403		0.6300		0.7000		0.7700		
South (78)	6.4800			46.7521		0.6300		0.7000		0.7700		
West (80)	2.3200			19.6403		0.6300		0.7000		0.7700		

Solar gains	124.6989	214.4515	296.6067	369.1858	412.3974	408.2140	394.1139	362.5280	322.0921	238.0899	149.7870	106.4109
(83)												
Total gains	548.4213	646.5511	712.0169	770.1479	794.3095	773.9515	746.8528	716.2927	685.9221	617.0036	550.5775	521.9954
(84)												

7. Mean internal temperature (heating season)	-----											

Temperature during heating periods in the living area from Table 9, Th1 (C)												
(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	11.0689	11.1010	11.1327	11.2838	11.3126	11.4483	11.4483	11.4738	11.3956	11.3126	11.2546	
11.1946 alpha	1.7379	1.7401	1.7422	1.7523	1.7542	1.7632	1.7632	1.7632	1.7649	1.7597	1.7542	1.7503
1.7463												
util living area	0.8265	0.8734	0.8646	0.8250	0.7778	0.7046	0.6127	0.4956	0.3892	0.4147	0.5613	0.7245
0.8265 0.8734 (86)												
MIT	17.2809	17.7474	18.3916	19.2055	19.9256	20.4918	20.7673	20.7302	20.3195	19.3807	18.2084	17.2055
(87) Th 2	19.7136	19.7168	19.7199	19.7347	19.7375	19.7505	19.7505	19.7529	19.7455	19.7375	19.7319	
19.7260 (88)												
util rest of house	0.8499	0.8066	0.7539	0.6714	0.5650	0.4262	0.2973	0.3237	0.4953	0.6865	0.8052	0.8595
(89) MIT 2	15.5968	16.1571	16.9314	17.9012	18.7325	19.3553	19.6180	19.5908	19.1851	18.1314	16.7340	
15.5093 (90) Living area fraction	fLA = Living area / (4) =											
0.4569 (91)												
MIT	16.3663	16.8837	17.5986	18.4971	19.2776	19.8746	20.1431	20.1114	19.7035	18.7023	17.4077	16.2843
(92)												
Temperature adjustment												
adjusted MIT	16.3663	16.8837	17.5986	18.4971	19.2776	19.8746	20.1431	20.1114	19.7035	18.7023	17.4077	16.2843
(93)												

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8.	Space heating requirement											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation (94)	0.7975	0.7539	0.7048	0.6333	0.5456	0.4336	0.3278	0.3515	0.4928	0.6494	0.7544	0.8079
Useful gains (95) Ext temp.	437.3477	487.4196	501.8500	487.7308	433.3599	335.6231	244.8061	251.7591	338.0425	400.6569	415.3535	421.7235
4.2000 (96)	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	
Heat loss rate W		976.7211	967.2356	893.2469	762.0561	600.1681	412.8091	277.2966	289.8241	440.5748	641.7220	
820.6043 967.1995 (97)												
Space heating kWh	401.2939	322.4364	291.1993	197.5142	124.1053	0.0000	0.0000	0.0000	0.0000	179.3525	291.7805	405.8341
(98a)												
Space heating requirement - total per year (kWh/year)												2213.5162
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	401.2939	322.4364	291.1993	197.5142	124.1053	0.0000	0.0000	0.0000	0.0000	179.3525	291.7805	405.8341
(98c)												
Space heating requirement after solar contribution - total per year (kWh/year)												2213.5162
Space heating per m2										(98c) / (4) =		40.0709
(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	401.2939	322.4364	291.1993	197.5142	124.1053	0.0000	0.0000	0.0000	0.0000	179.3525	291.7805	405.8341
(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)	434.7712	349.3352	315.4922	213.9916	134.4586	0.0000	0.0000	0.0000	0.0000	194.3147	316.1219	439.6903
(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
0.0000 (215)												
Water heating												
Water heating requirement	167.7884	148.4497	158.5175	142.0354	139.3304	127.4003	127.3983	131.6306	132.0944	145.0108	151.2831	166.3704
(64)												
Efficiency of water heater												79.8000
(216) (217)m	85.9422	85.7511	85.4048	84.7994	83.8013	79.8000	79.8000	79.8000	79.8000	84.5376	85.5072	
85.9805 (217)												
Fuel for water heating, kWh/month	195.2341	173.1170	185.6071	167.4958	166.2629	159.6495	159.6470	164.9506	165.5318	171.5342	176.9244	193.4977
(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	16.8780	13.5401	12.1914	8.9319	6.8993	5.6368	6.2938	8.1809	10.6261	13.9421	15.7475	
17.3471 (232)												
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-43.6125	-57.7947	-78.1985	-82.6790	-85.0794	-78.1037	-					
77.1965 -74.8300 -70.1150 -63.5538 -46.6458 -38.1626 (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	-37.2698	-76.4962	-148.6385	-218.4911	-284.4400	-284.1233	-					
280.6973 -239.5840 -178.2764 -107.6170 -49.1601 -29.6103 (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												2398.1757
(211)												

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Space heating fuel - main system 2 (213)	0.0000
Space heating fuel - secondary (215)	0.0000
Efficiency of water heater	79.8000
Water heating fuel used (219) Space cooling fuel 0.0000 (221)	2079.4522
Electricity for pumps and fans: Total electricity for the above, kWh/year (231) Electricity for lighting (calculated in Appendix L) 136.2150 (232)	86.0000
Energy saving/generation technologies (Appendices M ,N and Q) PV generation (233)	-2730.3754
Wind generation (234)	0.0000
Hydro-electric generation (Appendix N) (235a) Electricity generated - Micro CHP (Appendix N) 0.0000 (235)	0.0000
Appendix Q - special features Energy saved or generated (236)	-0.0000
Energy used (237)	0.0000
Total delivered energy for all uses (238)	1969.4675

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

Emissions		Energy kWh/year	Emission factor kg CO2/kWh kg CO2/year
Space heating - main system 1 (261)	2398.1757	0.2100	503.6169
Total CO2 associated with community systems (373)			0.0000
Water heating (other fuel) (264)	2079.4522	0.2100	436.6850
Space and water heating (265)			940.3019
Pumps, fans and electric keep-hot (267) Energy for lighting 19.6600 (268)	86.0000 136.2150	0.1387 0.1443	11.9293
Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total (269)	-795.9714 -1934.4040	0.1359 0.1265	-108.1575 -244.7982 -352.9557
Total CO2, kg/year (272)			618.9355
EPC Target Carbon Dioxide Emission Rate (TER) (273)			11.2000

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

energy		Energy kWh/year	Primary energy factor kWh/year	Primary kg CO2/kWh kWh/year
Space heating - main system 1 (275)	2398.1757	1.1300		2709.9386
Total CO2 associated with community systems (473)				0.0000
Water heating (other fuel) (278)	2079.4522	1.1300		2349.7810
Space and water heating (279)				5059.7195
Pumps, fans and electric keep-hot (281) Energy for lighting 208.9311 (282)	86.0000 136.2150	1.5128 1.5338		130.1008
Energy saving/generation technologies PV Unit electricity used in dwelling PV Unit electricity exported Total (283)	-795.9714 -1934.4040	1.5023 0.4646		-1195.7590 -898.6351 -2094.3941
Total Primary energy kWh/year (286)				3304.3574
Target Primary Energy Rate (TPER) (287)				59.8200

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CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	55.2400 (1b)	x 2.8900 (2b)	= 159.6436 (1b)
- (3b)			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.2400		
(4) Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	
159.6436 (5)			

2. Ventilation rate

	m ³
per hour	
Number of open chimneys (6a)	0 * 80 = 0.0000
Number of open flues (6b)	0 * 20 = 0.0000
Number of chimneys / flues attached to closed fire (6c)	0 * 10 = 0.0000
Number of flues attached to solid fuel boiler (6d)	0 * 20 = 0.0000
Number of flues attached to other heater (6e)	0 * 35 = 0.0000
Number of blocked chimneys (6f)	0 * 20 = 0.0000
Number of intermittent extract fans (7a)	2 * 10 = 20.0000
Number of passive vents (7b)	0 * 10 = 0.0000
Number of flueless gas fires (7c)	0 * 40 = 0.0000
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 20.0000 / (5) = 0.1253
(8)	
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50 (17)	5.0000
Infiltration rate (18)	0.3753
Number of sides sheltered (19) Shelter factor	0
1.0000 (20)	(20) = 1 - [0.075 x (19)] =
Infiltration rate adjusted to include shelter factor (21)	(21) = (18) x (20) = 0.3753

	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	0.4785	0.4691	0.4597	0.4128	0.4034	0.3565	0.3565	0.3471	0.3753	0.4034	0.4222	0.4410
(22b) Effective ac	0.6145	0.6100	0.6057	0.5852	0.5814	0.5636	0.5636	0.5603	0.5704	0.5814	0.5891	
0.5972 (25)												

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
(26) Front door			1.9800	1.0000	1.9800		
(27) Glazing			12.5000	1.2267	15.3338		
(28a) Heatloss Floor			55.2400	0.1300	7.1812	20.0000	1104.8000
(29a) External walls	87.6000	14.4800	73.1200	0.1800	13.1616	9.0000	658.0800
(30) External Roof 1	55.2400		55.2400	0.1300	7.1812	9.0000	497.1600
Total net area of external elements Aum(A, m ²)			198.0800				
(31) Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.8378		
(33)							
Main dwelling							
(32c) Internal Wall 1			107.2800			9.0000	965.5200
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			3225.5600
(34) Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							
58.3917 (35)							

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	10.7000	0.1440	1.5408
E3 Sill	7.2500	0.0480	0.3480
E4 Jamb	20.3600	0.0640	1.3030
E5 Ground floor (normal)	30.3100	0.0630	1.9095
E14 Flat roof	30.3100	0.0410	1.2427
E16 Corner (normal)	11.5600	0.0620	0.7167

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

7.0608

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 51.8986

(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	32.3718	32.1377	31.9081	30.8300	30.6283	29.6892	29.6892	29.5153	30.0509	30.6283	31.0363	31.4630
(38) Heat transfer coeff	84.2704	84.0362	83.8067	82.7286	82.5268	81.5878	81.5878	81.4139	81.9495	82.5268	82.9349	83.3615
(39) Average = Sum(39)m / 12 =	82.7276											

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (40)	1.5255	1.5213	1.5171	1.4976	1.4940	1.4770	1.4770	1.4738	1.4835	1.4940	1.5014	1.5091
HLP (average)	1.4976											
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy (42) 1.8444

Hot water usage for mixer showers

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(42a) Hot water usage for baths	68.9961	67.9398	66.3831	63.9883	61.8426	58.8408	56.4666	59.2422	60.6382	63.6114	66.7076	68.9339
0.0000 0.0000 0.0000 (42b) Hot water usage for other uses	33.5184	32.2995	31.0807	29.8618	28.6430	27.4241	27.4241	28.6430	29.8618	31.0807	32.2995	33.5184

(42c) Average daily hot water use (litres/day)

94.0803 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	102.5145	100.2393	97.4638	93.8501	90.4856	86.2650	83.8907	87.8852	90.5001	94.6920	99.0071	102.4523

(44) Energy conte 150.9191 132.6369 139.2737 122.5917 116.5999 99.7626 92.7017 103.4425 104.9755 122.0203 133.8115 150.4587

(45) Energy content (annual) Total = Sum(45)m = 1469.1941

Distribution loss (46)m = 0.15 x (45)m 22.6379 19.8955 20.8911 18.3888 17.4900 14.9644 13.9053 15.5164

15.7463 18.3030 20.0717 22.5688 (46) Water storage loss:

Store volume 180.0000

(47) a) If manufacturer declared loss factor is known (kWh/day):

1.6000 (48) Temperature factor from Table 2b

0.6000 (49) Enter (49) or (54) in (55)

0.9600 (55)

Total storage loss

(56) If cylinder contains dedicated solar storage

(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

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

0.0000 (61)

Total heat required for water heating calculated for each month

(62) 180.6791 159.5169 169.0337 151.3917 146.3599 128.5626 122.4617 133.2025 133.7755 151.7803 162.6115 180.2187

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

Output from w/h 180.6791 159.5169 169.0337 151.3917 146.3599 128.5626 122.4617 133.2025 133.7755 151.7803 162.6115 180.2187

(64) Total per year (kWh/year) = Sum(64)m =

1819.5941 (64)

Electric shower(s)

(64a) 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 (64a)

Heat gains from water heating, kWh/month

(65) 73.9886 65.6058 70.1165 63.8017 62.5775 56.2110 54.6313 58.2026 57.9444 64.3797 67.5323 73.8355

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

Metabolic gains (Table 5), Watts

(66)m 110.6633 110.6633 110.6633 110.6633 110.6633 110.6633 110.6633 110.6633 110.6633 110.6633 110.6633 110.6633

(66) Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

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	17.1255	15.2108	12.3702	9.3650	7.0005	5.9101	6.3861	8.3009	11.1414	14.1466	16.5111	17.6015
(67) Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	240.0059	242.4964	236.2204	222.8595	205.9938	190.1424	179.5527	177.0622	183.3382	196.6991	213.5648	229.4162
(68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.9107	47.9107	47.9107	47.9107	47.9107	47.9107	47.9107	47.9107	47.9107	47.9107	47.9107	47.9107
(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
0.0000 (70)												
Losses e.g. evaporation (negative values) (Table 5)	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755
(71)												
Water heating gains (Table 5)	99.4470	97.6276	94.2426	88.6135	84.1095	78.0709	73.4292	78.2293	80.4783	86.5319	93.7949	99.2413
(72) Total internal gains	441.3769	440.1332	427.6317	405.6366	381.9022	358.9219	344.1665	348.3909	359.7564	382.1760	408.6693	431.0575
(73)												

6. Solar gains

[Jan] Gains W	Area m2			Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		

East (76)			3.2000		19.6403		0.6300		0.7000		0.7700	19.2074
South (78) West			6.8500		46.7521		0.6300		0.7000		0.7700	97.8731
				2.4500		19.6403		0.6300		0.7000	0.7700	0.7700
					14.7057 (80)							

Solar gains (83) Total gains	131.7862	226.6321	313.4367	390.1114	435.7554	431.3286	416.4328	383.0694	340.3599	251.6082	158.2986	112.4598
	573.1631	666.7653	741.0684	795.7479	817.6577	790.2505	760.5992	731.4603	700.1163	633.7842	566.9679	543.5173 (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	
10.7482 alpha	10.6323	10.6619	10.6911	10.8305	10.8569	10.9819	10.9819	11.0054	10.9334	10.8569	10.8035	1.7202	
1.7165		1.7088	1.7108	1.7127	1.7220	1.7238	1.7321	1.7321	1.7337	1.7289	1.7238	1.7202	
util living area			0.8600	0.8228	0.7735	0.7027	0.6127	0.4994	0.3941	0.4188	0.5646	0.7241	
0.8246	0.8695 (86)												
MIT	17.9976	18.3334	18.8332	19.4432	19.9911	20.4248	20.6407	20.6122	20.2913	19.5744	18.6842	17.9352	
(87) Th 2	19.6684	19.6716	19.6747	19.6893	19.6920	19.7048	19.7048	19.7072	19.6999	19.6920	19.6865	19.6865	
					19.6807 (88)								
util rest of house	0.8445	0.8038	0.7487	0.6684	0.5636	0.4275	0.2982	0.3241	0.4965	0.6850	0.8026	0.8550	
(89) MIT 2	16.9856	17.3116	17.7956	18.3866	18.8958	19.2843	19.4492	19.4335	19.1767	18.5273	17.6723	17.6723	
16.9340 (90)													
Living area fraction										fLA = Living area / (4) =		0.4569	
(91)													
MIT	17.4480	17.7785	18.2697	18.8694	19.3963	19.8054	19.9936	19.9721	19.6860	19.0058	18.1347	17.3915	
(92)													
Temperature adjustment												0.3000	
adjusted MIT	17.7480	18.0785	18.5697	19.1694	19.6963	20.1054	20.2936	20.2721	19.9860	19.3058	18.4347	17.6915	
(93)													

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(94)	0.8169	0.7765	0.7247	0.6532	0.5637	0.4511	0.3439	0.3676	0.5126	0.6719	0.7774	0.8278	
Useful gains	468.2370	517.7196	537.0472	519.7462	460.9526	356.5127	261.5799	268.9099	358.9103	425.8131	440.7885	449.9299	
(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	7.1000	
4.2000 (96)													
Heat loss rate W	1133.2683	1107.4716	1011.5224	849.5718	659.9092	449.1746	301.3521	315.2395	482.3547	718.4587	940.0409	1124.6728	
(97)													
Space heating kWh	494.7833	396.3134	353.0096	237.4744	148.0237	0.0000	0.0000	0.0000	0.0000	217.7283	359.4618	502.0088	
(98a)													
Space heating requirement - total per year (kWh/year)												2708.8032	
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	
0.0000													
Space heating kWh	494.7833	396.3134	353.0096	237.4744	148.0237	0.0000	0.0000	0.0000	0.0000	217.7283	359.4618	502.0088	
(98c)													
Space heating requirement after solar contribution - total per year (kWh/year)												2708.8032	
Space heating per m ²												(98c) / (4) =	49.0370
(99)													

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

Fraction of space heat from secondary/supplementary system (Table 11) (201)	0.1000											
Fraction of space heat from main system(s) (202)	0.9000											
Efficiency of main space heating system 1 (in %) (206)	75.0000											
Efficiency of main space heating system 2 (in %) (207)	0.0000											
Efficiency of secondary/supplementary heating system, % (208)	100.0000											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement 217.7283	359.4618	502.0088	494.7833	396.3134	353.0096	237.4744	148.0237	0.0000	0.0000	0.0000	0.0000	
Space heating efficiency (main heating system 1) 75.0000	75.0000	75.0000	75.0000	75.0000	75.0000	0.0000	0.0000	0.0000	0.0000	75.0000	75.0000	75.0000
(210) Space heating fuel (main heating system) 593.7399	475.5761	423.6115	284.9693	177.6285	0.0000	0.0000	0.0000	0.0000	0.0000	261.2740	431.3541	602.4105
(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	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	0.0000
(213) Space heating fuel (secondary) 49.4783	39.6313	35.3010	23.7474	14.8024	0.0000	0.0000	0.0000	0.0000	0.0000	21.7728	35.9462	50.2009
(215)												
Water heating Water heating requirement 180.6791	159.5169	169.0337	151.3917	146.3599	128.5626	122.4617	133.2025	133.7755	151.7803	162.6115	180.2187	
(64)												
Efficiency of water heater (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
100.0000 (217)												
Fuel for water heating, kWh/month 133.7755	151.7803	162.6115	180.2187	180.6791	159.5169	169.0337	151.3917	146.3599	128.5626	122.4617	133.2025	
(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 (231) Lighting	14.9899	12.0254	10.8276	7.9327	6.1275	5.0062	5.5897	7.2657	9.4374	12.3824	13.9859	
15.4065 (232)												
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m 277.7453	-288.3091	-290.8036	-280.5833	-169.0670	-122.3093	-145.1644	-230.9874	-364.1791	-359.1178	-336.6557	-286.0584	-
(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	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	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	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	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	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	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	0.0000
(235d)												
Annual totals kWh/year												
Space heating fuel - main system 1 (211)												3250.5638
(213)												
Space heating fuel - main system 2 (213)												0.0000
(215)												
Space heating fuel - secondary (215)												270.8803
(215)												
Efficiency of water heater												100.0000
Water heating fuel used												1819.5941
(219) Space cooling fuel 0.0000 (221)												
(221)												
Electricity for pumps and fans: Total electricity for the above, kWh/year (231) Electricity for lighting (calculated in Appendix L) 120.9769 (232)												0.0000
(232)												
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation (233)												-3150.9804
(233)												
Wind generation (234)												0.0000
(234)												
Hydro-electric generation (Appendix N) (235a) Electricity generated - Micro CHP (Appendix N) 0.0000 (235)												0.0000
(235)												
Appendix Q - special features												
Energy saved or generated (236)												-0.0000
(236)												
Energy used (237) Total delivered energy for all uses 2311.0347 (238)												0.0000
(238)												

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10a. Fuel costs - using Table 12 prices

Fuel cost		Fuel kWh/year	Fuel price p/kWh £/year
Space heating - main system 1 (240)	3250.5638	5.1200	166.4289
Total CO2 associated with community systems (473)			0.0000
Space heating - secondary (242)	270.8803	16.4900	44.6682
Water heating (other fuel) (247)	1819.5941	16.4900	300.0511
Energy for instantaneous electric shower(s) (247a)	0.0000	16.4900	0.0000
Pumps, fans and electric keep-hot (249)	0.0000	0.0000	0.0000
Energy for lighting (250) Additional standing charges 0.0000 (251)	120.9769	16.4900	19.9491
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-3150.9804	16.4900	-519.5967
PV Unit electricity exported	0.0000	5.5900	0.0000
Total (252) Total energy cost 11.5005 (255)			-519.5967

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12): (256)		0.3600
Energy cost factor (ECF) (257)	$[(255) \times (256)] / [(4) + 45.0] =$	0.0413
SAP value		99.3305
SAP rating (Section 12) (258)		99
SAP band		A

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

Emissions		Energy kWh/year	Emission factor kg CO2/kWh kg CO2/year
Space heating - main system 1 (261)	3250.5638	0.0280	91.0158
Total CO2 associated with community systems (373)			0.0000
Space heating - secondary (263)	270.8803	0.1540	41.7285
Water heating (other fuel) (264)	1819.5941	0.1410	256.6362
Space and water heating (265)			389.3806
Pumps, fans and electric keep-hot (267) Energy for lighting 17.4607 (268)	0.0000 120.9769	0.0000 0.1443	0.0000
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-3150.9804	0.1360	-428.6818
PV Unit electricity exported	0.0000	0.0000	0.0000
Total (269)			-428.6818
Total CO2, kg/year (272)			-21.8406
CO2 emissions per m2 (273)			-0.4000
EI value			100.2920
EI rating (274)			100
EI band			A

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			

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Ground floor 55.2400 (1b) x 2.8900 (2b) = 159.6436 (1b)
- (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 55.2400
(4)
Dwelling volume (3a) + (3b) + (3c) + (3d) + (3e) ... (3n) = 159.6436
(5)

2. Ventilation rate-----

per hour m3
Number of open chimneys 0 * 80 = 0.0000
(6a)
Number of open flues 0 * 20 = 0.0000
(6b)
Number of chimneys / flues attached to closed fire 0 * 10 = 0.0000
(6c)
Number of flues attached to solid fuel boiler 0 * 20 = 0.0000
(6d)
Number of flues attached to other heater 0 * 35 = 0.0000
(6e)
Number of blocked chimneys 0 * 20 = 0.0000
(6f)
Number of intermittent extract fans 2 * 10 = 20.0000
(7a)
Number of passive vents 0 * 10 = 0.0000
(7b)
Number of flueless gas fires 0 * 40 = 0.0000
(7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 20.0000 / (5) = 0.1253
(8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 5.0000
(17)
Infiltration rate 0.3753
(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) = 0.3753
(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.9000	4.6000	4.7000	4.3000	4.3000	3.8000	3.8000	3.7000	3.8000	4.3000	4.3000	4.6000
(22) Wind factor	1.2250	1.1500	1.1750	1.0750	1.0750	0.9500	0.9500	0.9250	0.9500	1.0750	1.0750	
1.1500 (22a)												
Adj infilt rate	0.4597	0.4316	0.4410	0.4034	0.4034	0.3565	0.3565	0.3471	0.3565	0.4034	0.4034	0.4316
(22b) Effective ac	0.6057	0.5931	0.5972	0.5814	0.5814	0.5636	0.5636	0.5603	0.5636	0.5814	0.5814	
0.5931 (25)												

3. Heat losses and heat loss parameter -----

Element Gross Openings NetArea U-value A x U K-value A x K
Main dwelling m2 m2 m2 W/m2K W/K kJ/m2K kJ/K
Front door 1.9800 1.9800
(26)
Glazing 12.5000 1.2267 15.3338
(27)
Heatloss Floor 55.2400 0.1300 7.1812 20.0000 1104.8000
(28a)
External walls 87.6000 14.4800 73.1200 0.1800 13.1616 9.0000 658.0800
(29a)
External Roof 1 55.2400 0.1300 7.1812 9.0000 497.1600
(30)
Total net area of external elements Aum(A, m2) 198.0800
(31) Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) = 44.8378
(33)
Main dwelling
Internal Wall 1 107.2800 9.0000 965.5200
(32c)
Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 3225.5600
(34) Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
58.3917 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	10.7000	0.1440	1.5408
E3 Sill	7.2500	0.0480	0.3480
E4 Jamb	20.3600	0.0640	1.3030
E5 Ground floor (normal)	30.3100	0.0630	1.9095
E14 Flat roof	30.3100	0.0410	1.2427

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E16 Corner (normal)													11.5600	0.0620	0.7167	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)																7.0608
(36)																
Point Thermal bridges															(36a) =	0.0000
Total fabric heat loss															(33) + (36) + (36a) =	51.8986
(37)																
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)																
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
(38)m	31.9081	31.2473	31.4630	30.6283	30.6283	29.6892	29.6892	29.5153	29.6892	30.6283	30.6283	31.2473				
(38) Heat transfer coeff	83.8067	83.1459	83.3615	82.5268	82.5268	81.5878	81.5878	81.4139	81.5878	82.5268	82.5268	83.1459				
(39) Average = Sum(39)m / 12 =																
82.4787																
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
HLP	1.5171	1.5052	1.5091	1.4940	1.4940	1.4770	1.4770	1.4738	1.4770	1.4940	1.4940	1.5052				
(40)																
HLP (average)																1.4931
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31				31

4. Water heating energy requirements (kWh/year)																
Assumed occupancy																1.8444
(42)																
Hot water usage for mixer showers																
	68.9961	67.9398	66.3831	63.9883	61.8426	58.8408	56.4666	59.2422	60.6382	63.6114	66.7076	68.9339				
(42a) Hot water usage for baths																
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000				
(42b) Hot water usage for other uses																
	33.5184	32.2995	31.0807	29.8618	28.6430	27.4241	27.4241	28.6430	29.8618	31.0807	32.2995	33.5184				
(42c) Average daily hot water use (litres/day)																
94.0803 (43)																
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
Daily hot water use	102.5145	100.2393	97.4638	93.8501	90.4856	86.2650	83.8907	87.8852	90.5001	94.6920	99.0071	102.4523				
(44)																
Energy conte	150.9191	132.6369	139.2737	122.5917	116.5999	99.7626	92.7017	103.4425	104.9755	122.0203	133.8115	150.4587				
(45)																
Energy content (annual)																
Distribution loss (46)m = 0.15 x (45)m																
	22.6379	19.8955	20.8911	18.3888	17.4900	14.9644	13.9053	15.5164	15.7463	18.3030	20.0717	22.5688				
(46)																
Water storage loss:																
Store volume																180.0000
(47) a) If manufacturer declared loss factor is known (kWh/day):																
1.6000 (48) Temperature factor from Table 2b																
0.6000 (49) Enter (49) or (54) in (55)																
0.9600 (55)																
Total storage loss																
	29.7600	26.8800	29.7600	28.8000	29.7600	28.8000	29.7600	29.7600	28.8000	29.7600	28.8000	29.7600				
(56) If cylinder contains dedicated solar storage																
	29.7600	26.8800	29.7600	28.8000	29.7600	28.8000	29.7600	29.7600	28.8000	29.7600	28.8000	29.7600				
(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				
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				
0.0000 (61)																
Total heat required for water heating calculated for each month																
	180.6791	159.5169	169.0337	151.3917	146.3599	128.5626	122.4617	133.2025	133.7755	151.7803	162.6115	180.2187				
(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)																
FV 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				
0.0000 (63d)																
Output from w/h																
	180.6791	159.5169	169.0337	151.3917	146.3599	128.5626	122.4617	133.2025	133.7755	151.7803	162.6115	180.2187				
(64)																
1819.5941 (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																
	73.9886	65.6058	70.1165	63.8017	62.5775	56.2110	54.6313	58.2026	57.9444	64.3797	67.5323	73.8355				
(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	110.6633	110.6633	110.6633	110.6633	110.6633	110.6633	110.6633	110.6633	110.6633	110.6633	110.6633	110.6633				
(66) Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5																
	17.1255	15.2108	12.3702	9.3650	7.0005	5.9101	6.3861	8.3009	11.1414	14.1466	16.5111	17.6015				
(67) Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5																
	240.0059	242.4964	236.2204	222.8595	205.9938	190.1424	179.5527	177.0622	183.3382	196.6991	213.5648	229.4162				
(68)																

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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	47.9107	47.9107	47.9107	47.9107	47.9107	47.9107	47.9107	47.9107	47.9107	47.9107	47.9107	47.9107
(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
0.0000 (70)												
Losses e.g. evaporation (negative values) (Table 5)												
(71)	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755
Water heating gains (Table 5)												
(72) Total internal gains	99.4470	97.6276	94.2426	88.6135	84.1095	78.0709	73.4292	78.2293	80.4783	86.5319	93.7949	99.2413
(73)	441.3769	440.1332	427.6317	405.6366	381.9022	358.9219	344.1665	348.3909	359.7564	382.1760	408.6693	431.0575

6. Solar gains

[Jan] Gains W	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		
East (76)	3.2000	23.8018	0.6300	0.7000	0.7700	23.2772	
South (78)	6.8500	54.2217	0.6300	0.7000	0.7700	113.5104	
West (80)	2.4500	23.8018	0.6300	0.7000	0.7700	17.8216	
Solar gains (83)	154.6092	236.2105	328.5085	419.9636	444.9756	477.4351	443.7895
Total gains (84)	595.9861	676.3438	756.1402	825.6002	826.8779	836.3570	787.9560

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
10.7761 alpha	10.6911	10.7761	10.7482	10.8569	10.8569	10.9819	10.9819	11.0054	10.9819	10.8569	10.8569	1.7238
1.7184		1.7127	1.7184	1.7165	1.7238	1.7238	1.7321	1.7321	1.7337	1.7321	1.7238	1.7238
util living area			0.8454	0.8130	0.7586	0.6813	0.5913	0.4604	0.3769	0.3859	0.5354	0.7020
0.8688	0.8569	(86)										
MIT	18.2014	18.4685	18.9774	19.5627	20.0827	20.4978	20.6579	20.6517	20.3607	19.6992	18.5733	18.1425
(87) Th 2	19.6747	19.6836	19.6807	19.6920	19.6920	19.7048	19.7048	19.7072	19.7048	19.6920	19.6920	
19.6836 (88)												
util rest of house												
(89) MIT 2	0.8281	0.7929	0.7319	0.6448	0.5388	0.3858	0.2815	0.2891	0.4647	0.6593	0.8499	0.8406
17.1394 (90)	17.1889	17.4512	17.9380	18.4990	18.9774	19.3394	19.4591	19.4585	19.2364	18.6426	17.5787	
Living area fraction										fLA = Living area / (4) =	0.4569	
(91)												
MIT	17.6515	17.9160	18.4129	18.9850	19.4824	19.8687	20.0069	20.0037	19.7501	19.1253	18.0332	17.5977
(92)												
Temperature adjustment												0.3000
adjusted MIT	17.9515	18.2160	18.7129	19.2850	19.7824	20.1687	20.3069	20.3037	20.0501	19.4253	18.3332	17.8977
(93)												

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(94)	0.8008	0.7662	0.7095	0.6323	0.5427	0.4140	0.3279	0.3359	0.4849	0.6495	0.8254	0.8135
Useful gains	477.2403	518.2314	536.4656	521.9970	448.7698	346.2247	258.3602	256.2154	353.7875	423.2306	352.4286	454.5087
(95) Ext temp.	4.9000	5.3000	7.0000	9.3000	12.2000	15.0000	16.7000	16.7000	14.4000	11.1000	7.8000	
4.9000 (96)												
Heat loss rate W	1093.8052	1073.9123	976.4094	824.0324	625.7529	421.7022	294.2760	293.3928	460.9804	687.0646	869.2683	1080.7095
(97)												
Space heating kWh	458.7242	373.4175	327.3182	217.4655	131.6754	0.0000	0.0000	0.0000	0.0000	196.2925	372.1246	465.8934
(98a)												
Space heating requirement - total per year (kWh/year)												2542.9113
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	458.7242	373.4175	327.3182	217.4655	131.6754	0.0000	0.0000	0.0000	0.0000	196.2925	372.1246	465.8934
(98c)												
Space heating requirement after solar contribution - total per year (kWh/year)												2542.9113
Space heating per m2										(98c) / (4) =		46.0339
(99)												

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

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Fraction of space heat from secondary/supplementary system (Table 11) (201)	0.1000											
Fraction of space heat from main system(s) (202)	0.9000											
Efficiency of main space heating system 1 (in %) (206)	75.0000											
Efficiency of main space heating system 2 (in %) (207)	0.0000											
Efficiency of secondary/supplementary heating system, % (208)	100.0000											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement (98)	458.7242	373.4175	327.3182	217.4655	131.6754	0.0000	0.0000	0.0000	0.0000	196.2925	372.1246	465.8934
Space heating efficiency (main heating system 1) (210)	75.0000	75.0000	75.0000	75.0000	75.0000	0.0000	0.0000	0.0000	0.0000	75.0000	75.0000	75.0000
Space heating fuel (main heating system 2) (211)	550.4691	448.1010	392.7818	260.9586	158.0105	0.0000	0.0000	0.0000	0.0000	235.5510	446.5495	559.0721
Space heating efficiency (main heating system 2) (212)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Space heating fuel (main heating system 2) (213)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Space heating fuel (secondary) (215)	45.8724	37.3418	32.7318	21.7465	13.1675	0.0000	0.0000	0.0000	0.0000	19.6293	37.2125	46.5893
Water heating Water heating requirement (64)	180.6791	159.5169	169.0337	151.3917	146.3599	128.5626	122.4617	133.2025	133.7755	151.7803	162.6115	180.2187
Efficiency of water heater (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
100.0000 (217) Fuel for water heating, kWh/month (219)	180.6791	159.5169	169.0337	151.3917	146.3599	128.5626	122.4617	133.2025	133.7755	151.7803	162.6115	180.2187
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 (231) Lighting	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	14.9899	12.0254	10.8276	7.9327	6.1275	5.0062	5.5897	7.2657	9.4374	12.3824	13.9859	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m 277.7453 -288.3091 -290.8036 -300.8250 -20.9088 -140.2878 (233a)	-171.6040 -243.4766 -382.7365 -357.1169 -335.0209 -286.0584 -											
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 (211)	3051.4936											
Space heating fuel - main system 2 (213)	0.0000											
Space heating fuel - secondary (215)	254.2911											
Efficiency of water heater Water heating fuel used	100.0000											
	1819.5941											
	(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)											
	120.9769 (232)											
Energy saving/generation technologies (Appendices M ,N and Q) PV generation (233)	-3094.8928											
Wind generation (234)	0.0000											
Hydro-electric generation (Appendix N) (235a) Electricity generated - Micro CHP (Appendix N) 0.0000 (235) Appendix Q - special features	0.0000											

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Energy saved or generated (236)	-0.0000
Energy used (237)	0.0000
Total delivered energy for all uses (238)	2151.4629

10a. Fuel costs - using BEDF prices (571)

Fuel cost		Fuel kWh/year	Fuel price p/kWh £/year
Space heating - main system 1 (240)	3051.4936	6.7600	206.2810
Total CO2 associated with community systems (473)			0.0000
Space heating - secondary (242)	254.2911	26.0600	66.2683
Water heating (other fuel) (247)	1819.5941	26.0600	474.1862
Energy for instantaneous electric shower(s) (247a)	0.0000	26.0600	0.0000
Pumps, fans and electric keep-hot (249)	0.0000	0.0000	0.0000
Energy for lighting (250) Additional standing charges 0.0000 (251)	120.9769	26.0600	31.5266
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-3094.8928	26.0600	-806.5291
PV Unit electricity exported	0.0000	5.8100	0.0000
Total (252)			-806.5291
Total energy cost (255)			-28.2670

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

Emissions		Energy kWh/year	Emission factor kg CO2/kWh kg CO2/year
Space heating - main system 1 (261)	3051.4936	0.0280	85.4418
Total CO2 associated with community systems (373)			0.0000
Space heating - secondary (263)	254.2911	0.1541	39.1904
Water heating (other fuel) (264)	1819.5941	0.1410	256.6362
Space and water heating (265)			381.2685
Pumps, fans and electric keep-hot (267)	0.0000	0.0000	0.0000
Energy for lighting (268) Energy saving/generation technologies	120.9769	0.1443	17.4607
PV Unit electricity used in dwelling	-3094.8928	0.1359	-420.6386
PV Unit electricity exported	0.0000	0.0000	0.0000
Total (269)			-420.6386
Total CO2, kg/year (272)			-21.9094

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

energy		Energy Primary energy factor kWh/year	Primary kg CO2/kWh kWh/year
Space heating - main system 1 (275)	3051.4936	1.0460	3191.8623
Total CO2 associated with community systems (473)			0.0000
Space heating - secondary (277)	254.2911	1.5706	399.3776
Water heating (other fuel) (278)	1819.5941	1.5215	2768.5522
Space and water heating (279)			6359.7921
Pumps, fans and electric keep-hot (281) Energy for lighting 185.5585 (282)	0.0000 120.9769	0.0000 1.5338	0.0000
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-3094.8928	1.5025	-4650.0880
PV Unit electricity exported	0.0000	0.0000	0.0000
Total (283)			-4650.0880

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Total Primary energy kWh/year
(286)

1895.2626

SAP 10 EPC IMPROVEMENTS

Design

Current energy efficiency rating: A 99
Current environmental impact rating: A 100

N Solar water heating SAP increase too small
U Solar photovoltaic panels Already installed
V2 Wind turbine Recommended

Recommended measures:	SAP change	Cost change	CO2 change
V2 Wind turbine	+ 24.0	-£ 652	-347 kg (1584.6%)

Measures omitted - SAP change or cost saving too small:

	SAP change	Cost change	CO2 change
N Solar water heating	+ 0.9	-£ 21	-12 kg (55.4%)

Typical annual savings	efficiency	impact	Energy	Environmental	
Recommended measures					
Wind turbine		£652	6.28 kg/m²	A 123	A 105
Total Savings		£652	6.28 kg/m²		
Potential energy efficiency rating:			A 123		
Potential environmental impact rating:					A 105

Fuel prices for cost data on this page from database revision number 571 TEST (07 May 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Severn (Wales)):

	Current	Potential	Saving
Electricity	£572	£572	£0
Wood	£206	£206	£0
Space heating	£273	£273	£0
Water heating	£474	£474	£0
Lighting	£32	£32	£0
Generated (PV)	-£807	-£807	£0
Generated (wind)	-£0	-£652	£652
Total cost of fuels	-£29	-£681	£652
Total cost of uses	-£28	-£680	£652
Delivered energy	39 kWh/m²	-6 kWh/m²	45 kWh/m²
Carbon dioxide emissions	-0.0 tonnes	-0.4 tonnes	0.3 tonnes
CO2 emissions per m²	-0 kg/m²	-7 kg/m²	6 kg/m²
Primary energy	34 kWh/m²	-34 kWh/m²	69 kWh/m²

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
- Ground floor	55.2400 (1b)	x 2.8900 (2b)	= 159.6436 (1b)
- (3b)			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.2400		
(4)			
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 159.6436
(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)	

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Number of flues attached to other heater (6e)	0 * 35 =	0.0000
Number of blocked chimneys (6f)	0 * 20 =	0.0000
Number of intermittent extract fans (7a)	2 * 10 =	20.0000
Number of passive vents (7b)	0 * 10 =	0.0000
Number of flueless gas fires (7c)	0 * 40 =	0.0000

Infiltration due to chimneys, flues and fans (8)	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000	Air changes per hour (5) =	0.1253
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50 (17)			5.0000	
Infiltration rate (18)			0.3753	
Number of sides sheltered (19)			0	
Shelter factor (20)	(20) = 1 - [0.075 x (19)] =	1.0000		
Infiltration rate adjusted to include shelter factor (21)	(21) = (18) x (20) =	0.3753		

	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	0.4785	0.4691	0.4597	0.4128	0.4034	0.3565	0.3565	0.3471	0.3753	0.4034	0.4222	0.4410
(22b) Effective ac	0.6145	0.6100	0.6057	0.5852	0.5814	0.5636	0.5636	0.5603	0.5704	0.5814	0.5891	
0.5972 (25)												

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
Front door			1.9800	1.0000	1.9800		
(26)							
Glazing			12.5000	1.2267	15.3338		
(27)							
Heatloss Floor			55.2400	0.1300	7.1812	20.0000	1104.8000
(28a)							
External walls	87.6000	14.4800	73.1200	0.1800	13.1616	9.0000	658.0800
(29a)							
External Roof 1	55.2400		55.2400	0.1300	7.1812	9.0000	497.1600
(30)							
Total net area of external elements Aum(A, m2)			198.0800				
(31) Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	44.8378	
(33)							
Main dwelling							
Internal Wall 1			107.2800			9.0000	965.5200
(32c)							

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	3225.5600
(34) Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		
58.3917 (35)		

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	10.7000	0.1440	1.5408
E3 Sill	7.2500	0.0480	0.3480
E4 Jamb	20.3600	0.0640	1.3030
E5 Ground floor (normal)	30.3100	0.0630	1.9095
E14 Flat roof	30.3100	0.0410	1.2427
E16 Corner (normal)	11.5600	0.0620	0.7167

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		7.0608
(36)		
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	51.8986
(37)		

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	32.3718	32.1377	31.9081	30.8300	30.6283	29.6892	29.6892	29.5153	30.0509	30.6283	31.0363	31.4630
(38) Heat transfer coeff	84.2704	84.0362	83.8067	82.7286	82.5268	81.5878	81.5878	81.4139	81.9495	82.5268	82.9349	83.3615
(39) Average = Sum(39)m / 12 =												
82.7276												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.5255	1.5213	1.5171	1.4976	1.4940	1.4770	1.4770	1.4738	1.4835	1.4940	1.5014	1.5091
(40)												
HLP (average)												1.4976
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

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4. Water heating energy requirements (kWh/year)													
Assumed occupancy (42)												1.8444	
Hot water usage for mixer showers													
	68.9961	67.9398	66.3831	63.9883	61.8426	58.8408	56.4666	59.2422	60.6382	63.6114	66.7076	68.9339	
(42a) Hot water usage for baths													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
(42b) Hot water usage for other uses													
	33.5184	32.2995	31.0807	29.8618	28.6430	27.4241	27.4241	28.6430	29.8618	31.0807	32.2995	33.5184	
(42c) Average daily hot water use (litres/day)													
94.0803 (43)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	102.5145	100.2393	97.4638	93.8501	90.4856	86.2650	83.8907	87.8852	90.5001	94.6920	99.0071	102.4523	
(44)													
Energy content (45)													
	150.9191	132.6369	139.2737	122.5917	116.5999	99.7626	92.7017	103.4425	104.9755	122.0203	133.8115	150.4587	
Energy content (annual)													
											Total = Sum(45)m =		1469.1941
Distribution loss (46)m = 0.15 x (45)m													
	22.6379	19.8955	20.8911	18.3888	17.4900	14.9644	13.9053	15.5164	15.7463	18.3030	20.0717	22.5688	
(46) Water storage loss:													
Store volume												180.0000	
(47) a) If manufacturer declared loss factor is known (kWh/day):													
1.6000 (48) Temperature factor from Table 2b													
0.6000 (49) Enter (49) or (54) in (55)													
0.9600 (55)													
Total storage loss													
	29.7600	26.8800	29.7600	28.8000	29.7600	28.8000	29.7600	29.7600	28.8000	29.7600	28.8000	29.7600	
(56) If cylinder contains dedicated solar storage													
	29.7600	26.8800	29.7600	28.8000	29.7600	28.8000	29.7600	29.7600	28.8000	29.7600	28.8000	29.7600	
(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	
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	
0.0000 (61)													
Total heat required for water heating calculated for each month													
	180.6791	159.5169	169.0337	151.3917	146.3599	128.5626	122.4617	133.2025	133.7755	151.7803	162.6115	180.2187	
(62)													
WWHRS (63a)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
FV diverter (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	
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	
0.0000 (63d)													
Output from w/h													
	180.6791	159.5169	169.0337	151.3917	146.3599	128.5626	122.4617	133.2025	133.7755	151.7803	162.6115	180.2187	
(64)													
											Total per year (kWh/year) = Sum(64)m =		
1819.5941 (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													
	73.9886	65.6058	70.1165	63.8017	62.5775	56.2110	54.6313	58.2026	57.9444	64.3797	67.5323	73.8355	
(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	110.6633	110.6633	110.6633	110.6633	110.6633	110.6633	110.6633	110.6633	110.6633	110.6633	110.6633	110.6633	
(66) Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.1255	15.2108	12.3702	9.3650	7.0005	5.9101	6.3861	8.3009	11.1414	14.1466	16.5111	17.6015	
(67) Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	240.0059	242.4964	236.2204	222.8595	205.9938	190.1424	179.5527	177.0622	183.3382	196.6991	213.5648	229.4162	
(68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	47.9107	47.9107	47.9107	47.9107	47.9107	47.9107	47.9107	47.9107	47.9107	47.9107	47.9107	47.9107	
(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	
0.0000 (70)													
Losses e.g. evaporation (negative values) (Table 5)													
	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	
(71)													
Water heating gains (Table 5)													
	86.5319	93.7949	99.2413	99.4470	97.6276	94.2426	88.6135	84.1095	78.0709	73.4292	78.2293	80.4783	
(72) Total internal gains													
	441.3769	440.1332	427.6317	405.6366	381.9022	358.9219	344.1665	348.3909	359.7564	382.1760	408.6693	431.0575	
(73)													

6. Solar gains													

[Jan] Gains W	Area	m2	Solar flux	Table 6a	g	Specific data	FF	Specific data	Access	factor			
				W/m2		or Table 6b		or Table 6c		Table 6d			
East (76)	3.2000		19.6403		0.6300		0.7000		0.7700		19.2074		
South (78)	6.8500		46.7521		0.6300		0.7000		0.7700		97.8731		

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West (80)	2.4500	19.6403	0.6300	0.7000	0.7700	14.7057

Solar gains (83)	131.7862	226.6321	313.4367	390.1114	435.7554	431.3286
Total gains (84)	573.1631	666.7653	741.0684	795.7479	817.6577	790.2505
	543.5173					

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	10.6323	10.6619	10.6911	10.8305	10.8569	10.9819	10.9819	11.0054	10.9334	10.8569	10.8035	
10.7482 alpha		1.7088	1.7108	1.7127	1.7220	1.7238	1.7321	1.7321	1.7337	1.7289	1.7238	1.7202
1.7165												
util living area			0.8600	0.8228	0.7735	0.7027	0.6127	0.4994	0.3941	0.4188	0.5646	0.7241
0.8246	0.8695	(86)										
MIT	17.9976	18.3334	18.8332	19.4432	19.9911	20.4248	20.6407	20.6122	20.2913	19.5744	18.6842	17.9352
(87) Th 2	19.6684	19.6716	19.6747	19.6893	19.6920	19.7048	19.7048	19.7072	19.6999	19.6920	19.6865	
19.6807 (88)												
util rest of house												
	0.8445	0.8038	0.7487	0.6684	0.5636	0.4275	0.2982	0.3241	0.4965	0.6850	0.8026	0.8550
(89) MIT 2	16.9856	17.3116	17.7956	18.3866	18.8958	19.2843	19.4492	19.4335	19.1767	18.5273	17.6723	
16.9340 (90)												
Living area fraction									fLA = Living area / (4) =			0.4569
(91)												
MIT	17.4480	17.7785	18.2697	18.8694	19.3963	19.8054	19.9936	19.9721	19.6860	19.0058	18.1347	17.3915
(92)												
Temperature adjustment												
adjusted MIT	17.7480	18.0785	18.5697	19.1694	19.6963	20.1054	20.2936	20.2721	19.9860	19.3058	18.4347	17.6915
(93)												

8.	Space heating requirement -----											

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation (94)	0.8169	0.7765	0.7247	0.6532	0.5637	0.4511	0.3439	0.3676	0.5126	0.6719	0.7774	0.8278
Useful gains (95)	468.2370	517.7196	537.0472	519.7462	460.9526	356.5127	261.5799	268.9099	358.9103	425.8131	440.7885	449.9299
Ext temp. (96)	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	
Heat loss rate W (97)	1133.2683	1107.4716	1011.5224	849.5718	659.9092	449.1746	301.3521	315.2395	482.3547	718.4587	940.0409	1124.6728
Space heating kWh (98a)	494.7833	396.3134	353.0096	237.4744	148.0237	0.0000	0.0000	0.0000	0.0000	217.7283	359.4618	502.0088
Space heating requirement - total per year (kWh/year)												2708.8032
Solar heating kWh (98b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh (98c)	494.7833	396.3134	353.0096	237.4744	148.0237	0.0000	0.0000	0.0000	0.0000	217.7283	359.4618	502.0088
Space heating requirement after solar contribution - total per year (kWh/year)												2708.8032
Space heating per m2 (99)	(98c) / (4) =										49.0370	

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

Fraction of space heat from secondary/supplementary system (Table 11) (201)											
Fraction of space heat from main system(s) (202)											0.9000
Efficiency of main space heating system 1 (in %) (206)											75.0000
Efficiency of main space heating system 2 (in %) (207)											0.0000
Efficiency of secondary/supplementary heating system, % (208)											100.0000
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Space heating requirement (98)	494.7833	396.3134	353.0096	237.4744	148.0237	0.0000	0.0000	0.0000	0.0000	217.7283	359.4618
Space heating efficiency (main heating system 1) (210)	75.0000	75.0000	75.0000	75.0000	75.0000	0.0000	0.0000	0.0000	0.0000	75.0000	75.0000
Space heating fuel (main heating system) (211)	593.7399	475.5761	423.6115	284.9693	177.6285	0.0000	0.0000	0.0000	0.0000	261.2740	431.3541
Space heating efficiency (main heating system 2) (212)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Space heating fuel (main heating system 2)											

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	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)	49.4783	39.6313	35.3010	23.7474	14.8024	0.0000	0.0000	0.0000	0.0000	21.7728	35.9462	50.2009
(215)												
Water heating												
Water heating requirement	180.6791	159.5169	169.0337	151.3917	146.3599	128.5626	122.4617	133.2025	133.7755	151.7803	162.6115	180.2187
(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
100.0000 (217)												
Fuel for water heating, kWh/month	180.6791	159.5169	169.0337	151.3917	146.3599	128.5626	122.4617	133.2025	133.7755	151.7803	162.6115	180.2187
(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	14.9899	12.0254	10.8276	7.9327	6.1275	5.0062	5.5897	7.2657	9.4374	12.3824	13.9859	
15.4065 (232) Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-145.1644	-230.9874	-364.1791	-359.1178	-336.6557	-286.0584	-277.7453	-288.3091	-290.8036	-280.5833	-169.0670	-122.3093
(233a)												
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m							-212.5732	-192.0016	-212.5732	-205.7160	-212.5732	-
205.7160 -212.5732 -212.5732 -205.7160 -212.5732 -205.7160 -212.5732 (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 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 (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
(235d)	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												3250.5638
(211)												
Space heating fuel - main system 2												0.0000
(213)												
Space heating fuel - secondary												270.8803
(215)												
Efficiency of water heater												100.0000
Water heating fuel used												1819.5941
							(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)					
							120.9769 (232)					
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-3150.9804
(233)												
Wind generation												-3575.5408
(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												-191.8438
(238)												

10a. Fuel costs - using Table 12 prices

Fuel cost	Fuel kWh/year	Fuel price p/kWh £/year
Space heating - main system 1	3250.5638	5.1200
(240)		
Total CO2 associated with community systems		0.0000
(473)		
Space heating - secondary	270.8803	16.4900
(242)		
Water heating (other fuel)	1819.5941	16.4900
(247)		
Energy for instantaneous electric shower(s)	0.0000	16.4900
(247a)		
Pumps, fans and electric keep-hot	0.0000	0.0000
(249)		
Energy for lighting	120.9769	16.4900
(250) Additional standing charges		
0.0000 (251)		
Energy saving/generation technologies		

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PV Unit electricity used in dwelling	-3150.9804	16.4900	-519.5967
PV Unit electricity exported	0.0000	5.5900	0.0000
Total (252)			-519.5967
Wind Turbine electricity used in dwelling	-2502.8785	16.4900	-412.7247
Wind Turbine electricity exported	0.0000	5.5900	0.0000
Total (252)			-412.7247
Total energy cost (255)			-401.2241

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12): (256)		0.3600
Energy cost factor (ECF) (257)	$[(255) \times (256)] / [(4) + 45.0] =$	-1.4409
SAP value		123.3578
SAP rating (Section 12) (258)		123
SAP band		A

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

Emissions		Energy kWh/year	Emission factor kg CO2/kWh kg CO2/year	
Space heating - main system 1 (261)	3250.5638	0.0280		91.0158
Total CO2 associated with community systems (373)				0.0000
Space heating - secondary (263)	270.8803	0.1540		41.7285
Water heating (other fuel) (264)	1819.5941	0.1410		256.6362
Space and water heating (265)				389.3806
Pumps, fans and electric keep-hot (267) Energy for lighting 17.4607 (268)	0.0000 120.9769	0.0000	0.1443	0.0000
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-3150.9804	0.1360		-428.6818
PV Unit electricity exported	0.0000	0.0000		0.0000
Total (269)				-428.6818
Wind Turbine electricity used in dwelling	-2502.8785	0.1387		-347.1801
Wind Turbine electricity exported	0.0000	0.0000		0.0000
Total (269)				-347.1801
Total CO2, kg/year (272)				-369.0207
CO2 emissions per m2 (273)				-6.6800
EI value				104.9330
EI rating (274)				105
EI band				A

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	55.2400 (1b)	x 2.8900 (2b)	= 159.6436 (1b)
- (3b)			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) (4)	55.2400		
Dwelling volume (5)		(3a) + (3b) + (3c) + (3d) + (3e) ... (3n) =	159.6436

2. Ventilation rate

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per hour		m3
Number of open chimneys (6a)	0 * 80 =	0.0000
Number of open flues (6b)	0 * 20 =	0.0000
Number of chimneys / flues attached to closed fire (6c)	0 * 10 =	0.0000
Number of flues attached to solid fuel boiler (6d)	0 * 20 =	0.0000
Number of flues attached to other heater (6e)	0 * 35 =	0.0000
Number of blocked chimneys (6f)	0 * 20 =	0.0000
Number of intermittent extract fans (7a)	2 * 10 =	20.0000
Number of passive vents (7b)	0 * 10 =	0.0000
Number of flueless gas fires (7c)	0 * 40 =	0.0000

Infiltration due to chimneys, flues and fans (8)	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c) =	20.0000	Air changes per hour (5) =	0.1253
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50 (17)			5.0000	
Infiltration rate (18)			0.3753	
Number of sides sheltered (19)			0	
Shelter factor (20)	(20) = 1 - [0.075 x (19)] =		1.0000	
Infiltration rate adjusted to include shelter factor (21)	(21) = (18) x (20) =		0.3753	

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(22) Wind factor	4.9000	4.6000	4.7000	4.3000	4.3000	3.8000	3.8000	3.7000	3.8000	4.3000	4.3000	4.6000
1.1500 (22a)	1.2250	1.1500	1.1750	1.0750	1.0750	0.9500	0.9500	0.9250	0.9500	1.0750	1.0750	
Adj infilt rate												
(22b) Effective ac	0.4597	0.4316	0.4410	0.4034	0.4034	0.3565	0.3565	0.3471	0.3565	0.4034	0.4034	0.4316
0.5931 (25)	0.6057	0.5931	0.5972	0.5814	0.5814	0.5636	0.5636	0.5603	0.5636	0.5814	0.5814	

3. Heat losses and heat loss parameter								
Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
(26) Front door			1.9800	1.0000	1.9800			
(27) Glazing			12.5000	1.2267	15.3338			
(28a) Heatloss Floor			55.2400	0.1300	7.1812	20.0000	1104.8000	
(29a) External walls	87.6000	14.4800	73.1200	0.1800	13.1616	9.0000	658.0800	
(30) External Roof 1	55.2400		55.2400	0.1300	7.1812	9.0000	497.1600	
Total net area of external elements Aum(A, m2)			198.0800					
(31) Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.8378			

Main dwelling								
(32c) Internal Wall 1			107.2800			9.0000	965.5200	
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	3225.5600	
(34) Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								
58.3917 (35)								

List of Thermal Bridges								
K1 Element	Length	Psi-value	Total					
E1 Steel lintel with perforated steel base plate	10.7000	0.1440	1.5408					
E3 Sill	7.2500	0.0480	0.3480					
E4 Jamb	20.3600	0.0640	1.3030					
E5 Ground floor (normal)	30.3100	0.0630	1.9095					
E14 Flat roof	30.3100	0.0410	1.2427					
E16 Corner (normal)	11.5600	0.0620	0.7167					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.0608	
(36) Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss						(33) + (36) + (36a) =	51.8986	
(37)								

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38) Heat transfer coeff	31.9081	31.2473	31.4630	30.6283	30.6283	29.6892	29.6892	29.5153	29.6892	30.6283	30.6283	31.2473

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	83.8067	83.1459	83.3615	82.5268	82.5268	81.5878	81.5878	81.4139	81.5878	82.5268	82.5268	83.1459						
(39) Average = Sum(39)m / 12 =																		
82.4787																		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec						
HLP	1.5171	1.5052	1.5091	1.4940	1.4940	1.4770	1.4770	1.4738	1.4770	1.4940	1.4940	1.5052						
(40)																		
HLP (average)												1.4931						
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31						

4.	Water heating energy requirements (kWh/year) -----																	

Assumed occupancy												1.8444						
(42)																		
Hot water usage for mixer showers	68.9961	67.9398	66.3831	63.9883	61.8426	58.8408	56.4666	59.2422	60.6382	63.6114	66.7076	68.9339						
(42a) Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
(42b) Hot water usage for other uses	33.5184	32.2995	31.0807	29.8618	28.6430	27.4241	27.4241	28.6430	29.8618	31.0807	32.2995	33.5184						
(42c) Average daily hot water use (litres/day)																		
94.0803 (43)																		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec						
Daily hot water use	102.5145	100.2393	97.4638	93.8501	90.4856	86.2650	83.8907	87.8852	90.5001	94.6920	99.0071	102.4523						
(44)																		
Energy conte	150.9191	132.6369	139.2737	122.5917	116.5999	99.7626	92.7017	103.4425	104.9755	122.0203	133.8115	150.4587						
(45)																		
Energy content (annual)												Total = Sum(45)m =	1469.1941					
Distribution loss (46)m = 0.15 x (45)m												15.7463	18.3030	20.0717	22.5688	(46) Water storage loss:		
Store volume												180.0000						
(47) a) If manufacturer declared loss factor is known (kWh/day):																		
1.6000 (48) Temperature factor from Table 2b																		
0.6000 (49) Enter (49) or (54) in (55)																		
0.9600 (55)																		
Total storage loss	29.7600	26.8800	29.7600	28.8000	29.7600	28.8000	29.7600	29.7600	28.8000	29.7600	28.8000	29.7600						
(56) If cylinder contains dedicated solar storage	29.7600	26.8800	29.7600	28.8000	29.7600	28.8000	29.7600	29.7600	28.8000	29.7600	28.8000	29.7600						
(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						
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						
0.0000 (61)																		
Total heat required for water heating calculated for each month	180.6791	159.5169	169.0337	151.3917	146.3599	128.5626	122.4617	133.2025	133.7755	151.7803	162.6115	180.2187						
(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						
0.0000 (63d)																		
Output from w/h	180.6791	159.5169	169.0337	151.3917	146.3599	128.5626	122.4617	133.2025	133.7755	151.7803	162.6115	180.2187						
(64)																		
1819.5941 (64)												Total per year (kWh/year) = Sum(64)m =						
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	73.9886	65.6058	70.1165	63.8017	62.5775	56.2110	54.6313	58.2026	57.9444	64.3797	67.5323	73.8355						
(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	110.6633	110.6633	110.6633	110.6633	110.6633	110.6633	110.6633	110.6633	110.6633	110.6633	110.6633	110.6633						
(66) Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.1255	15.2108	12.3702	9.3650	7.0005	5.9101	6.3861	8.3009	11.1414	14.1466	16.5111	17.6015						
(67) Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	240.0059	242.4964	236.2204	222.8595	205.9938	190.1424	179.5527	177.0622	183.3382	196.6991	213.5648	229.4162						
(68)																		
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.9107	47.9107	47.9107	47.9107	47.9107	47.9107	47.9107	47.9107	47.9107	47.9107	47.9107	47.9107						
(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						
0.0000 (70)																		
Losses e.g. evaporation (negative values) (Table 5)	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755	-73.7755						
(71)																		
Water heating gains (Table 5)	99.4470	97.6276	94.2426	88.6135	84.1095	78.0709	73.4292	78.2293	80.4783	86.5319	93.7949	99.2413						
(72) Total internal gains	441.3769	440.1332	427.6317	405.6366	381.9022	358.9219	344.1665	348.3909	359.7564	382.1760	408.6693	431.0575						
(73)																		

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6. Solar gains

[Jan] Gains W				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		
East (76)				3.2000	23.8018	0.6300		0.7000		0.7700		23.2772
South (78)				6.8500	54.2217	0.6300		0.7000		0.7700		113.5104
West (80)				2.4500	23.8018	0.6300		0.7000		0.7700		17.8216

Solar gains (83)	154.6092	236.2105	328.5085	419.9636	444.9756	477.4351	443.7895	414.4051	369.8710	269.4310	18.2905	127.6309
Total gains (84)	595.9861	676.3438	756.1402	825.6002	826.8779	836.3570	787.9560	762.7960	729.6274	651.6071	426.9597	558.6884

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) (85)	21.0000											
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
10.7761 alpha	10.6911	10.7761	10.7482	10.8569	10.8569	10.9819	10.9819	11.0054	10.9819	10.8569	10.8569	1.7238
1.7184		1.7127	1.7184	1.7165	1.7238	1.7238	1.7321	1.7321	1.7337	1.7321	1.7238	1.7238
util living area			0.8454	0.8130	0.7586	0.6813	0.5913	0.4604	0.3769	0.3859	0.5354	0.7020
0.8688	0.8569	(86)										
MIT	18.2014	18.4685	18.9774	19.5627	20.0827	20.4978	20.6579	20.6517	20.3607	19.6992	18.5733	18.1425
(87) Th 2	19.6747	19.6836	19.6807	19.6920	19.6920	19.7048	19.7048	19.7072	19.7048	19.6920	19.6920	
19.6836 (88)												
util rest of house												
(89) MIT 2	0.8281	0.7929	0.7319	0.6448	0.5388	0.3858	0.2815	0.2891	0.4647	0.6593	0.8499	0.8406
17.1394 (90)	17.1889	17.4512	17.9380	18.4990	18.9774	19.3394	19.4591	19.4585	19.2364	18.6426	17.5787	
Living area fraction												
(91)												
MIT	17.6515	17.9160	18.4129	18.9850	19.4824	19.8687	20.0069	20.0037	19.7501	19.1253	18.0332	17.5977
(92) Temperature adjustment												
0.3000 adjusted MIT	17.9515	18.2160	18.7129	19.2850	19.7824	20.1687	20.3069	20.3037	20.0501	19.4253	18.3332	
17.8977 (93)												

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(94)	0.8008	0.7662	0.7095	0.6323	0.5427	0.4140	0.3279	0.3359	0.4849	0.6495	0.8254	0.8135
Useful gains	477.2403	518.2314	536.4656	521.9970	448.7698	346.2247	258.3602	256.2154	353.7875	423.2306	352.4286	454.5087
(95) Ext temp.	4.9000	5.3000	7.0000	9.3000	12.2000	15.0000	16.7000	16.7000	14.4000	11.1000	7.8000	
4.9000 (96)												
Heat loss rate W	1093.8052	1073.9123	976.4094	824.0324	625.7529	421.7022	294.2760	293.3928	460.9804	687.0646	869.2683	1080.7095
(97)												
Space heating kWh	458.7242	373.4175	327.3182	217.4655	131.6754	0.0000	0.0000	0.0000	0.0000	196.2925	372.1246	465.8934
(98a)												
Space heating requirement - total per year (kWh/year)												2542.9113
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	458.7242	373.4175	327.3182	217.4655	131.6754	0.0000	0.0000	0.0000	0.0000	196.2925	372.1246	465.8934
(98c)												
Space heating requirement after solar contribution - total per year (kWh/year)												2542.9113
Space heating per m2											(98c) / (4) =	46.0339
(99)												

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

Fraction of space heat from secondary/supplementary system (Table 11) (201)	0.1000											
Fraction of space heat from main system(s) (202)	0.9000											
Efficiency of main space heating system 1 (in %) (206)	75.0000											
Efficiency of main space heating system 2 (in %) (207)	0.0000											
Efficiency of secondary/supplementary heating system, % (208)	100.0000											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Full SAP Calculation Printout



Space heating requirement	458.7242	373.4175	327.3182	217.4655	131.6754	0.0000	0.0000	0.0000	0.0000	196.2925	372.1246	465.8934
(98)												
Space heating efficiency (main heating system 1)	75.0000	75.0000	75.0000	75.0000	75.0000	0.0000	0.0000	0.0000	0.0000	75.0000	75.0000	75.0000
(210) Space heating fuel (main heating system)	550.4691	448.1010	392.7818	260.9586	158.0105	0.0000	0.0000					
0.0000 0.0000 235.5510 446.5495 559.0721 (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)	45.8724	37.3418	32.7318	21.7465	13.1675	0.0000	0.0000	0.0000	0.0000	19.6293	37.2125	46.5893
(215)												
Water heating												
Water heating requirement	180.6791	159.5169	169.0337	151.3917	146.3599	128.5626	122.4617	133.2025	133.7755	151.7803	162.6115	180.2187
(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	180.6791	159.5169	169.0337	151.3917	146.3599	128.5626	122.4617	133.2025	133.7755	151.7803	162.6115	180.2187
(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	14.9899	12.0254	10.8276	7.9327	6.1275	5.0062	5.5897	7.2657	9.4374	12.3824	13.9859	
15.4065 (232)												
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-171.6040	-243.4766	-382.7365	-357.1169	-335.0209	-286.0584	-277.7453	-288.3091	-290.8036	-300.8250	-20.9088	-140.2878
(233a)												
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m							-212.5732	-192.0016	-212.5732	-205.7160	-212.5732	-
205.7160 -212.5732 -212.5732 -205.7160 -212.5732 -205.7160 -212.5732 (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 (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 (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 (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
(235d)												
Annual totals kWh/year												
Space heating fuel - main system 1												3051.4936
(211)												
Space heating fuel - main system 2												0.0000
(213)												
Space heating fuel - secondary												254.2911
(215)												
Efficiency of water heater												100.0000
Water heating fuel used												1819.5941
(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)												
120.9769 (232)												
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-3094.8928
(233)												
Wind generation												-3575.5408
(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												-351.4156
(238)												

10a. Fuel costs - using BEDF prices (571)

Fuel cost	Fuel kWh/year	Fuel price p/kWh £/year
Space heating - main system 1	3051.4936	6.7600
(240)		206.2810
Total CO2 associated with community systems		0.0000
(473)		

Full SAP Calculation Printout

Space heating - secondary (242)	254.2911	26.0600	66.2683
Water heating (other fuel) (247)	1819.5941	26.0600	474.1862
Energy for instantaneous electric shower(s) (247a) Pumps, fans and electric keep-hot 0.0000 (249)	0.0000 0.0000	26.0600 0.0000	0.0000
Energy for lighting (250) Additional standing charges 0.0000 (251)	120.9769	26.0600	31.5266
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-3094.8928	26.0600	-806.5291
PV Unit electricity exported	0.0000	5.8100	0.0000
Total (252)			-806.5291
Wind Turbine electricity used in dwelling	-2502.8785	26.0600	-652.2501
Wind Turbine electricity exported	0.0000	5.8100	0.0000
Total (252)			-652.2501
Total energy cost (255)			-680.5172

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

kWh/year	kg CO2/kWh	kg CO2/year	Energy	Emission factor	Emissions
Space heating - main system 1 (261)			3051.4936	0.0280	85.4418
Total CO2 associated with community systems (373)					0.0000
Space heating - secondary (263)			254.2911	0.1541	39.1904
Water heating (other fuel) (264)			1819.5941	0.1410	256.6362
Space and water heating (265)					381.2685
Pumps, fans and electric keep-hot (267) Energy for lighting 17.4607 (268)			0.0000 120.9769	0.0000 0.1443	0.0000
Energy saving/generation technologies					
PV Unit electricity used in dwelling			-3094.8928	0.1359	-420.6386
PV Unit electricity exported			0.0000	0.0000	0.0000
Total (269)					-420.6386
Wind Turbine electricity used in dwelling			-2502.8785	0.1387	-347.1801
Wind Turbine electricity exported			0.0000	0.0000	0.0000
Total (269)					-347.1801
Total CO2, kg/year (272)					-369.0895

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

kWh/year	kg CO2/kWh	kWh/year	Energy	Primary energy factor	Primary energy
Space heating - main system 1 (275)			3051.4936	1.0460	3191.8623
Total CO2 associated with community systems (473)					0.0000
Space heating - secondary (277)			254.2911	1.5706	399.3776
Water heating (other fuel) (278)			1819.5941	1.5215	2768.5522
Space and water heating (279)					6359.7921
Pumps, fans and electric keep-hot (281) Energy for lighting 185.5585 (282)			0.0000 120.9769	0.0000 1.5338	0.0000
Energy saving/generation technologies					
PV Unit electricity used in dwelling			-3094.8928	1.5025	-4650.0880
PV Unit electricity exported			0.0000	0.0000	0.0000
Total (283)					-4650.0880
Wind Turbine electricity used in dwelling			-2502.8785	1.5128	-3786.3546
Wind Turbine electricity exported			0.0000	0.0000	0.0000
Total (283) Total Primary energy kWh/year 1891.0920 (286)					-3786.3546 -

Summary for Input Data

Ystalyfera, Swansea

Summary for Input Data



Property Reference	Gilfach		Issued on Date	21/05/2025
Assessment Reference	Design		Prop Type Ref	Planning
Property	Gilfach Yr Haidd Farm, Acces Lane to Gilfach Yr Haidd, Ystalyfera, Swansea			

SAP Rating	99 A	DER	-0.33	TER	11.20
Environmental	100 A	% DER < TER	102.95		
CO ₂ Emissions (t/year)	-0.02	DPER	39.10	TPER	59.82
Compliance Check	See BRWL	% DPER < TPER	34.64		

Assessor Details	Ms. Natalie Wheeler	Assessor ID	AX45-0001
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Client	
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SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	East
Property Tenure	ND
Transaction Type	6
Terrain Type	Rural
1.0 Property Type	Bungalow, Detached
2.0 Number of Storeys	1
3.0 Date Built	2025
4.0 Sheltered Sides	0
5.0 Sunlight/Shade	Average or unknown
6.0 Thermal Mass Parameter	Precise calculation
Thermal Mass kJ/m ² K	58.39

7.0 Electricity Tariff	Standard Smart electricity meter fitted	No
	Smart gas meter fitted	No

7.0 Measurements	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	30.31 m	55.24 m ²	2.89 m

8.0 Living Area m ²	25.24
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9.0 External Walls	Description	Type	Construction	U-Value (kJ/m ² K)	Kappa Area (m ²)	Gross Area (m ²)	Shelter (W/m ² K)	Openings Area Calculation
	External walls	Timber Frame	Timber framed wall (one layer of plasterboard)	0.18	9.00	87.60	73.12	0.00
								None
								14.48
								Enter Gross Area

9.2 Internal Walls	Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
	Internal Wall 1	Plasterboard on timber frame	9.00	107.28

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 Calculation	Shelter Code	Shelter Factor	Openings Type	Shelter Area
	External Roof 1	External Flat Roof	Plasterboard, insulated flat roof	0.13	9.00	55.24	55.24	None	0.00	Enter Gross Area	0.00	

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)
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Summary for Input Data



Heatloss Floor Ground Floor Timber Lowest occupied Suspended timber, insulation between joists 0.13 None 0.00 20.00 55.24

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Factor (W/m²K)	Frame U Value	Type
Front door	Manufacturer	Solid Door				0.00			1.00
Glazing	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.29

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Front door	Front door	External walls	East	1.98	
Glazing	Glazing	External walls	East	3.20	
Glazing	Glazing	External walls	West	2.45	
Glazing	Glazing	External walls	South	6.85	

14.0 Conservatory

None

15.0 Draught Proofing%

100

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E1 Steel lintel with perforated steel base plate	Gov Approved Scheme	10.70	0.14	0.14	Yes
E3 Sill	Gov Approved Scheme	7.25	0.05	0.05	No
E4 Jamb	Gov Approved Scheme	20.36	0.06	0.06	Yes
E5 Ground floor (normal)	Gov Approved Scheme	30.31	0.06	0.06	Yes
E14 Flat roof	Gov Approved Scheme	30.31	0.04	0.04	Yes
E16 Corner (normal)	Gov Approved Scheme	11.56	0.06	0.06	Yes

Y-valueW/m²K

0.04

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present

No

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys 0
 Number of open flues 0
 Number of chimneys/flues attached to closed fire 0
 Number of flues attached to solid fuel boiler 0
 Number of flues attached to other heater 0
 Number of blocked chimneys 0
 Number of intermittent extract fans 2
 Number of passive vents 0
 Number of flueless gas fires 0

21.0 Fixed Cooling System

No

22.0 Pressure Testing

Yes

Designed AP₅₀m²/(h.m²) @ 50 Pa

5.00

Test Method

Blower Door

22.0 Lighting

No Fixed Lighting

No

Summary for Input Data

Name Lighting 1	Efficacy 120.00	Power 5.00	Capacity 600.00	Count 10
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24.0 Main Heating 1

SAP table

Percentage of Heat%	100.00
Fuel Type	Wood Logs
SAP Code	636
In Winter	75.00
In Summer	100.00
Controls SAP Code	2601
HETAS approved System	Yes
Flue Type	None or Unknown

25.0 Main Heating 2

None

26.0 Heat Networks

None

27.0 Secondary Heating

SAP table

SAP Code	691
Heating System Description	Electric Panel, convector or radiant heaters
Fuel Type	Electricity
SHS efficiency%	100.00

28.0 Water Heating

Water Heating	Independent
SAP Code	903
Fuel Type	Electricity
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Immersion Heater	Dual
Cold Water Source	From header tank
Bath Count	0

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected Connected To
Shower	Vented hot water system + pump	6.00		No

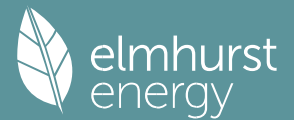
28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder

Hot Water Cylinder

Cylinder In Heated Space	Yes
Insulation Type	Measured Loss
Cylinder VolumeL	180.00
LosskWh/day	1.60
In Airing Cupboard	No

Summary for Input Data



32.0 Photovoltaic Unit One Dwelling Export Capable Meter? No

Connected To Dwelling Yes
 Diverter Yes
 Battery Capacity [kWh] 9.84

PV Cells kWp	Orientation	Elevation	Overshading FGHRs	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
6.00	South	30°	None Or Little	No	1.00		

34.0 Small-scale Hydro

None

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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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
£15,000 - £25,000	£652	A 100	A 100
		0	0
		A 123	A 105

Energy Report



Dwelling Address	Gilfach Yr Haidd Farm, Acces Lane to Gilfach Yr Haidd, Ystalyfera, Swansea
Reference	Gilfach-Design
Assessment Date	20/05/2025
Submission Date	
Property Type	Bungalow, Detached
Total Floor Area	55

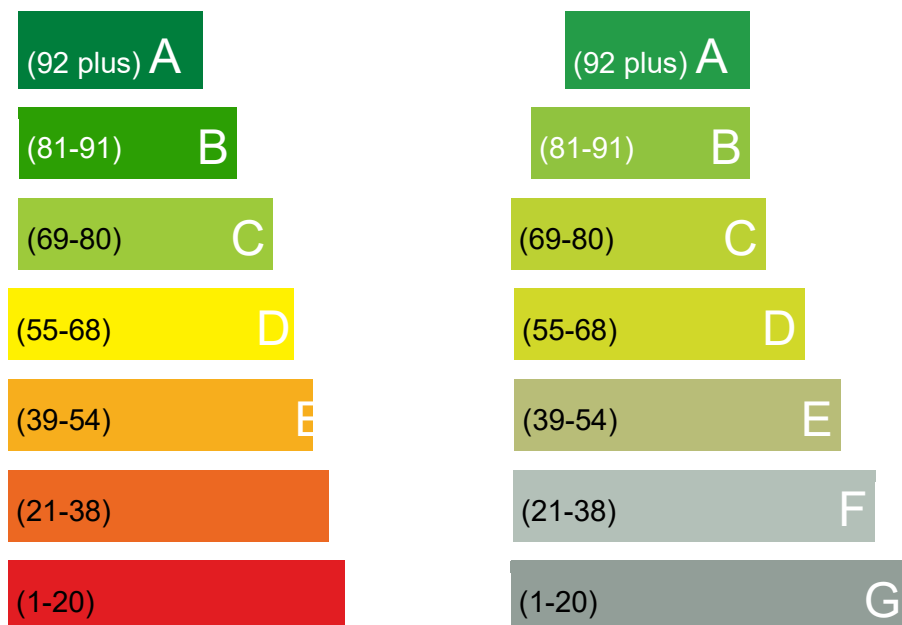
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

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

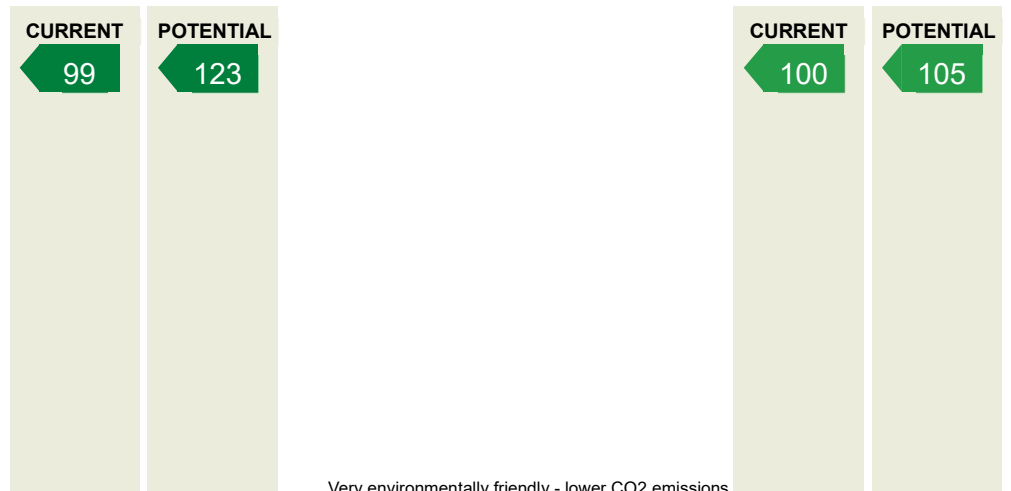
Energy Efficiency Rating

Carbon Dioxide (CO₂) Emissions Rating

Most energy
efficient - lower



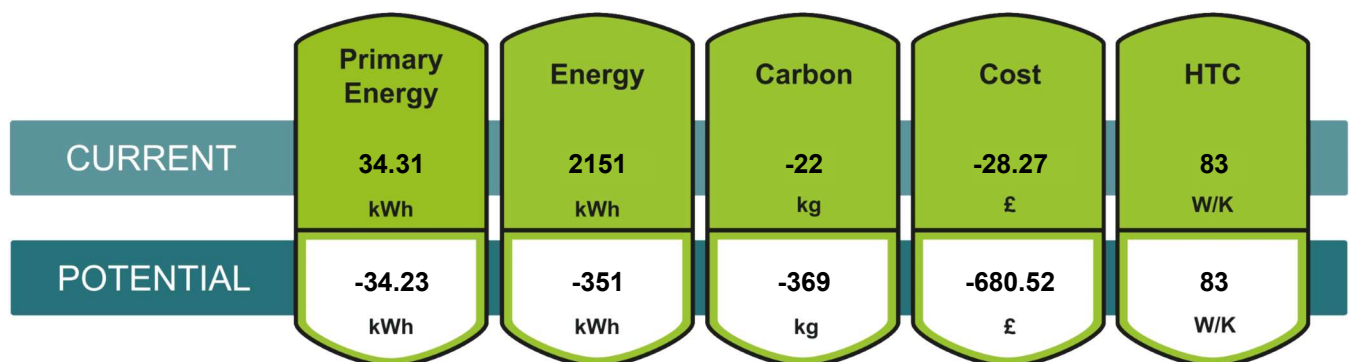
Energy Report



running costs

Very environmentally friendly - lower CO2 emissions

Additional ratings for your home



Breakdown of property's energy performance

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
Solar water heating	£21	 A 100			 A 100

Energy Report

Wind turbine	£673	 A 123	£15,000 £25,000	£652	 A 105
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Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good
Feature	Description	Energy Performance		
Walls	Average thermal transmittance 0.18 W/m ² K	Very Good		
Roof	Average thermal transmittance 0.13 W/m ² K	Very Good		
Floor	Average thermal transmittance 0.13 W/m ² K	Very Good		
Windows	High performance glazing	Good		
Main heating	Room heaters, wood logs	Average		
Main heating controls	No thermostatic control of room temperature	Poor		
Secondary heating	Room heaters, electric			
Hot water	Electric immersion, standard tariff	Very Poor		
Lighting	Excellent lighting efficiency	Very Good		
Air tightness	Air permeability [AP50] = 5.0 m ³ /h.m ² (assumed)	Good		

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.

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings

Energy Report

Lighting 	£32	£32	
Heating 	£273	£273	
Hot Water 	£474	£474	
New Technologies e.g. Impact of PV	-(£807)	-(£1459)	
TOTAL	-(£28)	-(£681)	

Estimated energy use and potential savings



Space Heating

3051
kWh per year



Water Heating

1820
kWh per year

About this document

Created by:

Company/Trading name:

Phone number:

Email address:

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g. heating system) is working correctly.

This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.

This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.

The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.