

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Sun 14 Apr 2024 09:45:26

Project Information			
Assessed By	Chris Law	Building Type	House, End-terrace
OCDEA Registration	EES/027443	Assessment Date	2024-04-14

Dwelling Details			
Assessment Type	As designed	Total Floor Area	193 m ²
Site Reference	1 Condor Cottages	Plot Reference	New Build
Address	1 Condor Cottages Buddock Water Falmouth, TR11 5DY		

Client Details	
Name	Garry Becconsall
Company	Garry Becconsall
Address	1 Condor Cottages, Falmouth, Cornwall, TR11 5DY

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	7.48 kgCO ₂ /m ²	
Dwelling carbon dioxide emission rate	3.0 kgCO ₂ /m ²	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	38.94 kWh _{PE} /m ²	
Dwelling primary energy	31.54 kWh _{PE} /m ²	OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	29.3 kWh/m ²	
Dwelling fabric energy efficiency	27.5 kWh/m ²	OK

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.18	Walls (1) (0.18)	OK
Party walls	0.2	N/A	N/A	N/A
Curtain walls	1.6	N/A	N/A	N/A
Floors	0.18	0.13	Ground Floor (0.13)	OK
Roofs	0.16	0.11	Roof (1) (0.11)	OK
Windows, doors, and roof windows	1.6	1.15	Rear (1.2)	OK
Rooflights	2.2	N/A	N/A	N/A

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	Net area [m ²]	U-Value [W/m ² K]
Exposed wall: Walls (1)	29.25	0.18
Exposed wall: Walls (2)	106.61	0.18
Exposed wall: Walls (3)	8.54	0.18
Basement floor: Ground Floor, Ground Floor	51.78	0.13
Exposed roof: Roof (1)	56.06	0.11
Exposed roof: Roof (2)	11.2	0.11

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
Rear, Rear	8.7	East	1.0	1.2
Rear, Rear	14.97	East	1.0	1.2
Front, Front	6.75	West	N/A	1 (!)
Side, Side	0.72	North	1.0	1.2
Side, Side	1.34	North	1.0	1.2
Front, Front	2.21	West	N/A	1 (!)

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))
Building part 1 - Main Dwelling: Thermal bridging calculated from linear thermal transmittances for each junction

Main element	Junction detail	Source	Psi value [W/mK] (!)	Drawing / reference
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3 Air permeability (better than typically expected values are flagged with a subsequent (!))

Maximum permitted air permeability at 50Pa	8 m ³ /hm ²			
Dwelling air permeability at 50Pa	5 m ³ /hm ² , Design value			OK
Air permeability test certificate reference				

4 Space heating

Main heating system 1: Heat pump with radiators or underfloor heating - Electricity

Efficiency	355.8%		
Emitter type	Both radiators and underfloor		
Flow temperature	55°C		
System type	Heat Pump		
Manufacturer	Daikin Europe NV		
Model	ERHQ006BV3 + EKHBH008B		
Commissioning			

Secondary heating system: Open fire in grate

Fuel	Wood logs		
Efficiency	32.0%		
Commissioning			

5 Hot water

Cylinder/store - type: Cylinder

Capacity	150 litres		
Declared heat loss	2.5 kWh/day		
Primary pipework insulated	Yes		
Manufacturer			
Model			
Commissioning			

Waste water heat recovery system 1 - type: N/A

Efficiency			
Manufacturer			
Model			

6 Controls

Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services

Function			
Ecodesign class			
Manufacturer			
Model			

Water heating - type: Cylinder thermostat and HW separately timed

Manufacturer			
Model			

7 Lighting

Minimum permitted light source efficacy	75 lm/W		
Lowest light source efficacy	80 lm/W		OK
External lights control	N/A		

8 Mechanical ventilation

System type: N/A

Maximum permitted specific fan power	N/A		
Specific fan power	N/A		N/A
Minimum permitted heat recovery efficiency	N/A		
Heat recovery efficiency	N/A		N/A
Manufacturer/Model			
Commissioning			

9 Local generation

N/A

10 Heat networks

N/A

11 Supporting documentary evidence	
N/A	
12 Declarations	
a. Assessor Declaration	
<p>This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.</p>	
<p>Signed:</p> <p>Name:</p>	<p>Assessor ID:</p> <p>Date:</p>
b. Client Declaration	
N/A	

Summary for Input Data



Property Reference	1 Condor Cottages		Issued on Date	14/04/2024
Assessment Reference	New Build	Prop Type Ref		
Property	Buddock Water, 1 Condor Cottages, Falmouth, TR11 5DY			

SAP Rating	84 B	DER	3.00	TER	7.48
Environmental	97 A	% DER < TER			59.89
CO ₂ Emissions (t/year)	0.54	DFEE	27.50	TFEE	29.27
Compliance Check	See BREL	% DFEE < TFEE			6.04
% DPER < TPER	19.01	DPER	31.54	TPER	38.94

Assessor Details	Mr. Chris Law	Assessor ID	AX42-0001
Client			

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

Orientation	West	
Property Tenure	1	
Transaction Type	1	
Terrain Type	Suburban	
1.0 Property Type	House, End-Terrace	
2.0 Number of Storeys	4	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m ² K
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
Basement:	1.00 m	51.78 m ²	2.59 m
Ground floor:	1.00 m	51.78 m ²	2.30 m
1st Storey:	1.00 m	64.41 m ²	2.30 m
2nd Storey:	1.00 m	25.08 m ²	1.68 m
3rd Storey:	0.00 m	0.00 m ²	0.00 m
4th Storey:	0.00 m	0.00 m ²	0.00 m
5th Storey:	0.00 m	0.00 m ²	0.00 m
6th Storey:	0.00 m	0.00 m ²	0.00 m
7th Storey:	0.00 m	0.00 m ²	0.00 m

8.0 Living Area	39.36	m ²
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9.0 External Walls	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area (m ²)	Shelter Res	Shelter	Openings	Area Calculation Type
	Basement Wall	Cavity Wall	Cavity wall : dense plaster, AAC block, filled cavity, any outside structure	0.18	70.00	53.64	29.25	0.00	None	24.39	Enter Gross Area
	External Wall	Cavity Wall	Cavity wall : dense plaster, AAC block, filled cavity, any outside structure	0.18	70.00	116.91	106.61	0.00	None	10.30	Enter Gross Area
	Dwarf Wall	Timber Frame	Timber framed wall (one layer of plasterboard)	0.18	9.00	8.54	8.54	0.00	None	0.00	Enter Gross Area

10.0 External Roofs	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area (m ²)	Shelter Code	Shelter Factor	Calculation Type	Openings
	Warm Roof	External Slope Roof	Plasterboard, insulated slope	0.11	9.00	56.06	56.06	None	0.00	Enter Gross Area	0.00
	Flat Roof	External Flat Roof	Plasterboard, insulated flat roof	0.11	9.00	11.20	11.20	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)
	Ground Floor	Basement Floor	Lowest occupied	Slab on ground, screed over insulation	0.13	None	0.00	110.00	51.78

12.0 Opening Types										
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Summary for Input Data



Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Rear	BFRC, BSI or CERTASS data	Window	Double glazed	6 mm	Argon Filled	0.70	PVC	1.00	1.20
Rear	BFRC, BSI or CERTASS data	Window	Double glazed	6 mm	Argon Filled	0.70	PVC	1.00	1.20
Front	BFRC, BSI or CERTASS data	Window	Double glazed	6 mm	Argon Filled	0.70	PVC	1.00	1.20
Side	BFRC, BSI or CERTASS data	Window	Double glazed	6 mm	Argon Filled	0.70	PVC	1.00	1.20
Side	BFRC, BSI or CERTASS data	Window	Double glazed	6 mm	Argon Filled	0.70	PVC	1.00	1.20
Front	BFRC, BSI or CERTASS data	Half Glazed Door	Double glazed	6 mm	Argon Filled	0.70	PVC	1.00	1.00

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Rear	Rear	Basement Wall	East	8.70	
Rear	Rear	Basement Wall	East	14.97	
Front	Front	External Wall	West	6.75	
Side	Side	Basement Wall	North	0.72	
Side	Side	External Wall	North	1.34	
Front	Front	External Wall	West	2.21	

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

Y-value

 W/m²K

18.0 Pressure Testing

Designed AP₅₀

 m²/(h.m²) @ 50 Pa

Property Tested?

Test Method

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System

22.0 Lighting

No Fixed Lighting

Name	Efficacy	Power	Capacity	Count
Lighting	80.00	25	2000	6

24.0 Main Heating 1

Percentage of Heat

 %

Database Ref. No.

Fuel Type

TestMethod

SAP Code

In Winter

In Summer

Model Name

Manufacturer

System Type

Controls SAP Code

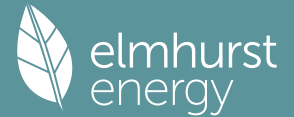
Delayed Start Stat

HETAS approved System

Oil Pump Inside

FI Case

Summary for Input Data



Flue Type	None or Unknown	
Smoke Control Area	Unknown	
Fan Assisted Flue	No	
Is MHS Pumped	Pump in unheated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators and Underfloor	
Underfloor Heating	Yes - Pipes in thin screed	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	No	
<hr/>		
25.0 Main Heating 2	None	
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26.0 Heat Networks	None	
<hr/>		
27.0 Secondary Heating		
Secondary Heating	SAP table	
SAP Code	631	
SHS efficiency	32.00	%
HETAS Approved System	No	
Smoke Control Area	Unknown	
Test Method	not specified	
<hr/>		
28.0 Water Heating		
Water Heating	Main Heating 1	
SAP Code	901	
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	Single	
Summer Immersion	No	
Cold Water Source	From mains	
Bath Count	0	
Supplementary Immersion	No	
Immersion Only Heating Hot Water	No	
<hr/>		
28.3 Waste Water Heat Recovery System		
<hr/>		
29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Insulation Thickness Type	Other	
Insulation Thickness	0	
Cylinder Volume	150.00	L
Loss	2.50	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	Yes	

Summary for Input Data



31.0 Thermal Store

None

34.0 Small-scale Hydro

None

Connected to dwelling's electricity meter

Yes

Electricity Generation

Annual

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

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout



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Compliance Check	See BREL	% DFEE < TFEE			6.04
% DPER < TPER	19.01	DPER	31.54	TPER	38.94
Assessor Details	Mr. Chris Law			Assessor ID	AX42-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Basement floor	51.7800 (1a)	x 2.5900 (2a)	= 134.1102 (1a) - (3a)
Ground floor	51.7800 (1b)	x 2.3000 (2b)	= 119.0940 (1b) - (3b)
First floor	64.4100 (1c)	x 2.3000 (2c)	= 148.1430 (1c) - (3c)
Second floor	25.0800 (1d)	x 1.6800 (2d)	= 42.1344 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	193.0500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	443.4816 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	6 * 10 = 60.0000 (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) =	60.0000 / (5) =	0.1353 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3853	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4176	0.4094	0.4012	0.3602	0.3521	0.3111	0.3111	0.3029	0.3275	0.3521	0.3684	0.3848 (22b)
Effective ac	0.5872	0.5838	0.5805	0.5649	0.5620	0.5484	0.5484	0.5459	0.5536	0.5620	0.5679	0.5740 (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
Rear (Uw = 1.20)			8.7000	1.1450	9.9618		(27)
Rear (Uw = 1.20)			14.9700	1.1450	17.1412		(27)
Front (Uw = 1.20)			6.7500	1.1450	7.7290		(27)
Side (Uw = 1.20)			0.7200	1.1450	0.8244		(27)
Side (Uw = 1.20)			1.3400	1.1450	1.5344		(27)
Front			2.2100	1.0000	2.2100		(26a)
Ground Floor			51.7800	0.1300	6.7314	110.0000	5695.8000 (28)
Basement Wall	53.6400	24.3900	29.2500	0.1800	5.2650	70.0000	2047.5000 (29a)
External Wall	116.9100	10.3000	106.6100	0.1800	19.1898	70.0000	7462.7000 (29a)
Dwarf Wall	8.5400		8.5400	0.1800	1.5372	9.0000	76.8600 (29a)
Warm Roof	56.0600		56.0600	0.1100	6.1666	9.0000	504.5400 (30)
Flat Roof	11.2000		11.2000	0.1100	1.2320	9.0000	100.8000 (30)
Total net area of external elements Aum(A, m ²)			298.1300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	79.5228		(33)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	15888.2000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							82.3010 (35)

Full SAP Calculation Printout



List of Thermal Bridges												
K1 Element												
												Length
												Psi-value
												Total
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												0.0000 (36)
Point Thermal bridges												(36a) = 0.0000
Total fabric heat loss												(33) + (36) + (36a) = 79.5228 (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
	85.9330	85.4376	84.9519	82.6710	82.2442	80.2576	80.2576	79.8897	81.0228	82.2442	83.1076	84.0101 (38)
Heat transfer coeff	165.4558	164.9604	164.4748	162.1938	161.7671	159.7805	159.7805	159.4126	160.5457	161.7671	162.6304	163.5330 (39)
Average = Sum(39)m / 12 =												162.1918
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.8571	0.8545	0.8520	0.8402	0.8380	0.8277	0.8277	0.8258	0.8316	0.8380	0.8424	0.8471 (40)
HLP (average)												0.8402
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.9929 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths												85.8312 (42b)
Hot water usage for other uses												45.2800 (42c)
Average daily hot water use (litres/day)												120.7427 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	131.1112	128.1899	124.7483	119.7920	115.6671	111.2725	109.7881	113.2172	116.8046	121.3916	126.4161	130.8210 (44)
Energy conte	207.6480	182.5407	191.7335	163.9892	155.7102	136.8225	132.7792	140.1865	144.0317	164.7273	180.1029	204.8341 (45)
Energy content (annual)												Total = Sum(45)m = 2005.1060
Distribution loss (46)m = 0.15 x (45)m												30.7251 (46)
Water storage loss:												150.0000 (47)
Store volume												2.5000 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												1.3500 (55)
Enter (49) or (54) in (55)												1.3500 (55)
Total storage loss	41.8500	37.8000	41.8500	40.5000	41.8500	40.5000	41.8500	41.8500	40.5000	41.8500	40.5000	41.8500 (56)
If cylinder contains dedicated solar storage	41.8500	37.8000	41.8500	40.5000	41.8500	40.5000	41.8500	41.8500	40.5000	41.8500	40.5000	41.8500 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	272.7604	241.3519	256.8459	227.0012	220.8226	199.8345	197.8916	205.2989	207.0437	229.8397	243.1149	269.9465 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	272.7604	241.3519	256.8459	227.0012	220.8226	199.8345	197.8916	205.2989	207.0437	229.8397	243.1149	269.9465 (64)
Total per year (kWh/year) = Sum(64)m =												2771.7520 (64)
12Total per year (kWh/year)												2772 (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	121.1329	107.7438	115.8413	104.9360	103.8636	95.9031	96.2390	98.7019	98.3001	106.8617	110.2938	120.1973 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	189.9172	210.2655	189.9172	196.2478	189.9172	196.2478	189.9172	189.9172	196.2478	189.9172	196.2478	189.9172 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	364.3914	368.1726	358.6440	338.3587	312.7522	288.6857	272.6078	268.8265	278.3551	298.6404	324.2469	348.3135 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148 (71)
Water heating gains (Table 5)	162.8130	160.3330	155.7007	145.7445	139.6015	133.1987	129.3535	132.6639	136.5280	143.6314	153.1859	161.5554 (72)
Total internal gains	785.0147	806.6641	772.1550	748.2440	710.1640	686.0253	659.7716	659.3007	679.0240	700.0821	741.5736	767.6792 (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	8.7000		19.6403		0.7000		0.0000		0.7700		92.0991 (76)	
East	14.9700		19.6403		0.7000		0.0000		0.7700		158.4739 (76)	
West	6.7500		19.6403		0.7000		0.0000		0.7700		71.4562 (80)	
North	0.7200		10.6334		0.7000		0.0000		0.7700		4.1266 (74)	
North	1.3400		10.6334		0.7000		0.0000		0.7700		7.6801 (74)	
Solar gains	333.8359	652.5207	1075.7906	1574.6438	1937.2709	1987.0283	1890.0966	1618.1247	1252.6951	774.3561	416.0977	274.6638 (83)
Total gains	1118.8506	1459.1848	1847.9456	2322.8878	2647.4349	2673.0535	2549.8682	2277.4254	1931.7190	1474.4382	1157.6713	1042.3430 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	26.6741	26.7542	26.8332	27.2106	27.2824	27.6216	27.6216	27.6853	27.4899	27.2824	27.1375	26.9878
alpha	2.7783	2.7836	2.7889	2.8140	2.8188	2.8414	2.8414	2.8457	2.8327	2.8188	2.8092	2.7992
util living area	0.9501	0.9051	0.8216	0.6729	0.5119	0.3668	0.2705	0.3132	0.5160	0.7847	0.9192	0.9578 (86)
Living	19.1891	19.5529	20.0213	20.4885	20.7406	20.8493	20.8787	20.8719	20.7795	20.3613	19.6864	19.1333
Non living	18.0413	18.4989	19.0791	19.6455	19.9329	20.0552	20.0822	20.0789	19.9870	19.5127	18.6804	17.9769
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	31	28	31	30	31	30	31	31	30	31	30	31
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000 (87)
Th 2	20.2042	20.2064	20.2085	20.2187	20.2206	20.2294	20.2294	20.2311	20.2260	20.2206	20.2167	20.2127 (88)
util rest of house	0.9444	0.8951	0.8043	0.6461	0.4774	0.3262	0.2248	0.2635	0.4692	0.7577	0.9090	0.9529 (89)
MIT 2	20.2042	20.2064	20.2085	20.2187	20.2206	20.2294	20.2294	20.2311	20.2260	20.2206	20.2167	20.2127 (90)
Living area fraction												0.2039 (91)
MIT	20.3664	20.3682	20.3699	20.3780	20.3795	20.3865	20.3865	20.3878	20.3838	20.3795	20.3764	20.3732 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3664	20.3682	20.3699	20.3780	20.3795	20.3865	20.3865	20.3878	20.3838	20.3795	20.3764	20.3732 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9456	0.8972	0.8080	0.6517	0.4846	0.3346	0.2342	0.2738	0.4790	0.7635	0.9112	0.9539 (94)
Useful gains	1058.0077	1309.2346	1493.1754	1513.8595	1282.9657	894.4499	597.2392	623.4853	925.3815	1125.7956	1054.8835	994.3406 (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	2658.2815	2551.6345	2281.2457	1861.6547	1404.0535	924.5747	605.0137	635.7117	1008.8389	1581.9973	2159.1486	2644.8541 (97)
Space heating kWh	1190.6037	834.8927	586.3244	250.4126	90.0894	0.0000	0.0000	0.0000	0.0000	339.4140	795.0709	1227.9820 (98a)
Space heating requirement - total per year (kWh/year)												5314.7896
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	1190.6037	834.8927	586.3244	250.4126	90.0894	0.0000	0.0000	0.0000	0.0000	339.4140	795.0709	1227.9820 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5314.7896
Space heating per m2										(98c) / (4) =		27.5306 (99)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												355.8164 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												32.0000 (208)
Space heating requirement	1190.6037	834.8927	586.3244	250.4126	90.0894	0.0000	0.0000	0.0000	0.0000	339.4140	795.0709	1227.9820 (98)
Space heating efficiency (main heating system 1)	355.8164	355.8164	355.8164	355.8164	355.8164	0.0000	0.0000	0.0000	0.0000	355.8164	355.8164	355.8164 (210)
Space heating fuel (main heating system)	334.6118	234.6414	164.7828	70.3769	25.3191	0.0000	0.0000	0.0000	0.0000	95.3902	223.4498	345.1168 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	272.7604	241.3519	256.8459	227.0012	220.8226	199.8345	197.8916	205.2989	207.0437	229.8397	243.1149	269.9465 (64)
Efficiency of water heater (217)m	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550 (216)
Fuel for water heating, kWh/month	203.7731	180.3085	191.8837	169.5874	164.9715	149.2918	147.8403	153.3741	154.6776	171.7080	181.6256	201.6708 (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	46.9268	37.6464	33.8964	24.8340	19.1825	15.6723	17.4989	22.7457	29.5445	38.7639	43.7838	48.2311 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1493.6888 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												133.8550
Water heating fuel used												2070.7123 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												0.0000 (231)
Total electricity for the above, kWh/year												378.7263 (232)
Electricity for lighting (calculated in Appendix L)												

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Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3943.1274	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1493.6888	0.1564	233.6702 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2070.7123	0.1408	291.4738 (264)
Space and water heating			525.1439 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	378.7263	0.1443	54.6619 (268)
Total CO2, kg/year			579.8058 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.0000 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1493.6888	1.5791	2358.7065 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2070.7123	1.5205	3148.4620 (278)
Space and water heating			5507.1685 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	378.7263	1.5338	580.9030 (282)
Total Primary energy kWh/year			6088.0715 (286)
Dwelling Primary energy Rate (DPER)			31.5400 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Basement floor	51.7800 (1a)	x 2.5900 (2a)	= 134.1102 (1a) - (3a)
Ground floor	51.7800 (1b)	x 2.3000 (2b)	= 119.0940 (1b) - (3b)
First floor	64.4100 (1c)	x 2.3000 (2c)	= 148.1430 (1c) - (3c)
Second floor	25.0800 (1d)	x 1.6800 (2d)	= 42.1344 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	193.0500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	443.4816 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.0902 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3402 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2892 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.3687	0.3615	0.3542	0.3181	0.3109	0.2747	0.2747	0.2675	0.2892	0.3109	0.3253	0.3398 (22b)
Effective ac	0.5680	0.5653	0.5627	0.5506	0.5483	0.5377	0.5377	0.5358	0.5418	0.5483	0.5529	0.5577 (25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K
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	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K
TER Semi-glazed door			2.2100	1.0000	2.2100		(26a)
TER Opening Type (Uw = 1.20)			32.4800	1.1450	37.1908		(27)
Ground Floor			51.7800	0.1300	6.7314		(28)
Basement Wall	53.6400	24.3900	29.2500	0.1800	5.2650		(29a)
External Wall	116.9100	10.3000	106.6100	0.1800	19.1898		(29a)
Dwarf Wall	8.5400		8.5400	0.1800	1.5372		(29a)
Warm Roof	56.0600		56.0600	0.1100	6.1666		(30)
Flat Roof	11.2000		11.2000	0.1100	1.2320		(30)
Total net area of external elements Aum(A, m2)			298.1300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		79.5228		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 82.3010 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element			0.0000 (36)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			0.0000 (36a) =
Point Thermal bridges			(33) + (36) + (36a) = 79.5228 (37)
Total fabric heat loss			

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	83.1211	82.7348	82.3562	80.5780	80.2453	78.6965	78.6965	78.4097	79.2931	80.2453	80.9184	81.6220 (38)
Heat transfer coeff	162.6439	162.2577	161.8791	160.1008	159.7681	158.2194	158.2194	157.9326	158.8159	159.7681	160.4412	161.1448 (39)
Average = Sum(39)m / 12 =												160.0993
HLP	0.8425	0.8405	0.8385	0.8293	0.8276	0.8196	0.8196	0.8181	0.8227	0.8276	0.8311	Dec 0.8347 (40)
HLP (average)												0.8293
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42)
Hot water usage for baths	85.8312	84.5565	82.7614	79.4516	76.9733	74.2252	72.7409	74.5234	76.4642	79.4047	82.7827	85.5410 (42b)
Hot water usage for other uses	45.2800	43.6334	41.9869	40.3404	38.6938	37.0473	37.0473	38.6938	40.3404	41.9869	43.6334	45.2800 (42c)
Average daily hot water use (litres/day)												120.7427 (43)
Daily hot water use	131.1112	128.1899	124.7483	119.7920	115.6671	111.2725	109.7881	113.2172	116.8046	121.3916	126.4161	130.8210 (44)
Energy conte	207.6480	182.5407	191.7335	163.9892	155.7102	136.8225	132.7792	140.1865	144.0317	164.7273	180.1029	204.8341 (45)
Energy content (annual)												Total = Sum(45)m = 2005.1060
Distribution loss (46)m = 0.15 x (45)m	31.1472	27.3811	28.7600	24.5984	23.3565	20.5234	19.9169	21.0280	21.6048	24.7091	27.0154	30.7251 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage												
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	254.2429	224.6264	238.3284	209.0811	202.3051	181.9144	179.3741	186.7814	189.1235	211.3222	225.1948	251.4290 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	254.2429	224.6264	238.3284	209.0811	202.3051	181.9144	179.3741	186.7814	189.1235	211.3222	225.1948	251.4290 (64)
Total per year (kWh/year)												2553.7234 (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	106.3189	94.3634	101.0273	90.5999	89.0496	81.5670	81.4250	83.8879	83.9640	92.0477	95.9577	105.3833 (65)

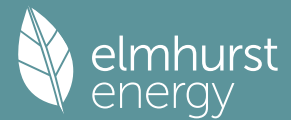
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	189.9172	210.2655	189.9172	196.2478	189.9172	196.2478	189.9172	189.9172	196.2478	189.9172	196.2478	189.9172 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	364.3914	368.1726	358.6440	338.3587	312.7522	288.6857	272.6078	268.8265	278.3551	298.6404	324.2469	348.3135 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148 (71)
Water heating gains (Table 5)	142.9017	140.4217	135.7894	125.8332	119.6903	113.2874	109.4422	112.7526	116.6167	123.7201	133.2746	141.6442 (72)
Total internal gains	768.1034	789.7528	755.2437	731.3328	693.2527	666.1140	639.8603	639.3894	659.1127	683.1708	724.6624	750.7679 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
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North	2.0600	10.6334	0.6300	0.7000	0.7700	6.6944 (74)
East	23.6700	19.6403	0.6300	0.7000	0.7700	142.0749 (76)
West	6.7500	19.6403	0.6300	0.7000	0.7700	40.5157 (80)

Solar gains	189.2850	369.9792	609.9733	892.8230	1098.4326	1126.6450	1071.6848	917.4767	710.2781	439.0599	235.9274	155.7344 (83)
Total gains	957.3883	1159.7320	1365.2169	1624.1558	1791.6853	1792.7590	1711.5451	1556.8661	1369.3908	1122.2307	960.5897	906.5023 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	27.1353	27.1999	27.2635	27.5663	27.6237	27.8941	27.8941	27.9448	27.7893	27.6237	27.5078	27.3877
alpha	2.8090	2.8133	2.8176	2.8378	2.8416	2.8596	2.8596	2.8630	2.8526	2.8416	2.8339	2.8258
util living area	0.9647	0.9407	0.8960	0.8006	0.6671	0.5109	0.3877	0.4370	0.6533	0.8633	0.9455	0.9693 (86)
MIT	18.5940	18.9562	19.4887	20.1402	20.6074	20.8689	20.9559	20.9374	20.7276	20.0640	19.2168	18.5373 (87)
Th 2	20.2167	20.2184	20.2201	20.2280	20.2295	20.2364	20.2364	20.2377	20.2337	20.2295	20.2265	20.2233 (88)
util rest of house	0.9606	0.9339	0.8841	0.7787	0.6320	0.4610	0.3261	0.3729	0.6050	0.8428	0.9382	0.9657 (89)
MIT 2	17.3419	17.8008	18.4706	19.2772	19.8299	20.1229	20.2065	20.1933	19.9807	19.2020	18.1408	17.2738 (90)
Living area fraction												FLA = Living area / (4) = 0.2039 (91)
MIT	17.5972	18.0364	18.6782	19.4532	19.9885	20.2750	20.3593	20.3450	20.1330	19.3778	18.3602	17.5314 (92)
Temperature adjustment												0.0000
adjusted MIT	17.5972	18.0364	18.6782	19.4532	19.9885	20.2750	20.3593	20.3450	20.1330	19.3778	18.3602	17.5314 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	900.7655	1053.9318	1167.5123	1224.3660	1111.2111	831.2193	575.5775	595.0733	819.1305	915.3292	878.1704	858.9997 (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	2162.7049	2131.4749	1971.3923	1689.5701	1324.2305	897.8894	594.7964	623.0396	958.1314	1402.4094	1806.6023	2148.2827 (97)
Space heating kWh	938.8829	724.1090	598.0867	334.9470	158.4865	0.0000	0.0000	0.0000	0.0000	362.3877	668.4710	959.2266 (98a)
Space heating requirement - total per year (kWh/year)												4744.5973
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	938.8829	724.1090	598.0867	334.9470	158.4865	0.0000	0.0000	0.0000	0.0000	362.3877	668.4710	959.2266 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4744.5973
Space heating per m2												(98c) / (4) = 24.5770 (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	938.8829	724.1090	598.0867	334.9470	158.4865	0.0000	0.0000	0.0000	0.0000	362.3877	668.4710	959.2266 (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)	1017.2080	784.5168	647.9813	362.8894	171.7080	0.0000	0.0000	0.0000	0.0000	392.6194	724.2372	1039.2487 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	254.2429	224.6264	238.3284	209.0811	202.3051	181.9144	179.3741	186.7814	189.1235	211.3222	225.1948	251.4290 (64)
Efficiency of water heater (217)m	86.7160	86.4905	86.0352	85.1109	83.5183	79.8000	79.8000	79.8000	79.8000	85.2582	86.3461	79.8000 (216)
Fuel for water heating, kWh/month	293.1904	259.7124	277.0128	245.6572	242.2284	227.9629	224.7796	234.0620	236.9969	247.8615	260.8049	289.7726 (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	39.4610	31.6571	28.5037	20.8830	16.1307	13.1789	14.7149	19.1270	24.8441	32.5968	36.8180	40.5578 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-50.6055	-72.4885	-105.8014	-120.7733	-131.6575	-123.2597	-121.6089	-114.0429	-101.0270	-83.5836	-55.9914	-43.6081 (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	-25.2106	-53.3910	-106.8275	-161.5328	-214.7168	-216.2789	-213.8679	-180.6775	-131.8062	-76.8659	-33.8136	-19.9198 (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												5140.4088 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.8000
Water heating fuel used												3040.0416 (219)

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Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	318.4732 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2559.3562 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	6025.5673 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	5140.4088	0.2100	1079.4858 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3040.0416	0.2100	638.4087 (264)
Space and water heating			1717.8946 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	318.4732	0.1443	45.9655 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1124.4477	0.1343	-151.0019
PV Unit electricity exported	-1434.9086	0.1257	-180.3427
Total			-331.3445 (269)
Total CO2, kg/year			1444.4448 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			7.4800 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	5140.4088	1.1300	5808.6619 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3040.0416	1.1300	3435.2470 (278)
Space and water heating			9243.9089 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	318.4732	1.5338	488.4848 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1124.4477	1.4963	-1682.5067
PV Unit electricity exported	-1434.9086	0.4613	-661.9651
Total			-2344.4718 (283)
Total Primary energy kWh/year			7518.0227 (286)
Target Primary Energy Rate (TPER)			38.9400 (287)

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Property Reference	1 Condor Cottages		Issued on Date	14/04/2024	
Assessment Reference	New Build	Prop Type Ref			
Property	Buddock Water, 1 Condor Cottages, Falmouth, TR11 5DY				
SAP Rating	84 B	DER	3.00	TER	7.48
Environmental	97 A	% DER < TER			59.89
CO ₂ Emissions (t/year)	0.54	DFEE	27.50	TFEE	29.27
Compliance Check	See BREL	% DFEE < TFEE			6.04
% DPER < TPER	19.01	DPER	31.54	TPER	38.94
Assessor Details	Mr. Chris Law			Assessor ID	AX42-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Basement floor	51.7800 (1a)	x 2.5900 (2a)	= 134.1102 (1a) - (3a)
Ground floor	51.7800 (1b)	x 2.3000 (2b)	= 119.0940 (1b) - (3b)
First floor	64.4100 (1c)	x 2.3000 (2c)	= 148.1430 (1c) - (3c)
Second floor	25.0800 (1d)	x 1.6800 (2d)	= 42.1344 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	193.0500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 443.4816 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0902 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000 (17)	
Infiltration rate	0.3402 (18)	
Number of sides sheltered	2 (19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2892 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3687	0.3615	0.3542	0.3181	0.3109	0.2747	0.2747	0.2675	0.2892	0.3109	0.3253	0.3398 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5680	0.5653	0.5627	0.5506	0.5483	0.5377	0.5377	0.5358	0.5418	0.5483	0.5529	0.5577 (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
Rear (Uw = 1.20)			8.7000	1.1450	9.9618		(27)
Rear (Uw = 1.20)			14.9700	1.1450	17.1412		(27)
Front (Uw = 1.20)			6.7500	1.1450	7.7290		(27)
Side (Uw = 1.20)			0.7200	1.1450	0.8244		(27)
Side (Uw = 1.20)			1.3400	1.1450	1.5344		(27)
Front			2.2100	1.0000	2.2100		(26a)
Ground Floor			51.7800	0.1300	6.7314	110.0000	5695.8000 (28)
Basement Wall	53.6400	24.3900	29.2500	0.1800	5.2650	70.0000	2047.5000 (29a)
External Wall	116.9100	10.3000	106.6100	0.1800	19.1898	70.0000	7462.7000 (29a)
Dwarf Wall	8.5400		8.5400	0.1800	1.5372	9.0000	76.8600 (29a)
Warm Roof	56.0600		56.0600	0.1100	6.1666	9.0000	504.5400 (30)
Flat Roof	11.2000		11.2000	0.1100	1.2320	9.0000	100.8000 (30)
Total net area of external elements Aum(A, m ²)			298.1300				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	79.5228	(33)

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Heat capacity Cm = Sum(A x k)
 Thermal mass parameter (TMP) = Cm / TFA) in kJ/m2K (28)...(30) + (32) + (32a)...(32e) = 15888.2000 (34)
 List of Thermal Bridges 82.3010 (35)

Length	Psi-value	Total
		0.0000 (36)
		0.0000 (36a) =
		79.5228 (37) (33) + (36) + (36a) =

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	83.1211	82.7348	82.3562	80.5780	80.2453	78.6965	78.6965	78.4097	79.2931	80.2453	80.9184	81.6220 (38)
Average = Sum(39)m / 12 =	162.6439	162.2577	161.8791	160.1008	159.7681	158.2194	158.2194	157.9326	158.8159	159.7681	160.4412	161.1448 (39)
HLP	0.8425	0.8405	0.8385	0.8293	0.8276	0.8196	0.8196	0.8181	0.8227	0.8276	0.8311	0.8347 (40)
HLP (average)												0.8293
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.9929 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	32.1179	31.6409	30.9692	29.7306	28.8033	27.7749	27.2195	27.8865	28.6128	29.7131	30.9771	32.0093 (42b)
Hot water usage for other uses	45.2800	43.6334	41.9869	40.3404	38.6938	37.0473	37.0473	38.6938	40.3404	41.9869	43.6334	45.2800 (42c)
Average daily hot water use (litres/day)												70.9419 (43)
Daily hot water use	77.3978	75.2743	72.9561	70.0710	67.4971	64.8222	64.2668	66.5803	68.9531	71.7000	74.6106	77.2893 (44)
Energy content (annual)	122.5793	107.1896	112.1307	95.9237	90.8640	79.7065	77.7251	82.4403	85.0261	97.2962	106.2964	121.0163 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	104.1924	91.1112	95.3111	81.5351	77.2344	67.7505	66.0663	70.0743	72.2722	82.7018	90.3520	102.8639 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	104.1924	91.1112	95.3111	81.5351	77.2344	67.7505	66.0663	70.0743	72.2722	82.7018	90.3520	102.8639 (64)
Total per year (kWh/year)												1001.4651 (64)
Electric shower(s)	59.5824	53.0884	57.9705	55.3205	56.3586	53.7606	55.5526	56.3586	55.3205	57.9705	56.8804	59.5824 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												677.7460 (64a)
Heat gains from water heating, kWh/month	40.9437	36.0499	38.3204	34.2139	33.3983	30.3778	30.4047	31.6082	31.8982	35.1681	36.8081	40.6116 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	189.9172	210.2655	189.9172	196.2478	189.9172	196.2478	189.9172	189.9172	196.2478	189.9172	196.2478	189.9172 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	364.3914	368.1726	358.6440	338.3587	312.7522	288.6857	272.6078	268.8265	278.3551	298.6404	324.2469	348.3135 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148 (71)
Water heating gains (Table 5)	55.0318	53.6457	51.5059	47.5193	44.8901	42.1914	40.8666	42.4842	44.3030	47.2689	51.1223	54.5854 (72)
Total internal gains	677.2335	699.9768	667.9602	650.0189	615.4526	595.0179	571.2846	569.1210	586.7990	603.7196	639.5101	660.7092 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b g	Specific data or Table 6c FF	Access factor Table 6d	Gains W						
East	8.7000	19.6403	0.7000	0.0000	0.7700	92.0991 (76)						
East	14.9700	19.6403	0.7000	0.0000	0.7700	158.4739 (76)						
West	6.7500	19.6403	0.7000	0.0000	0.7700	71.4562 (80)						
North	0.7200	10.6334	0.7000	0.0000	0.7700	4.1266 (74)						
North	1.3400	10.6334	0.7000	0.0000	0.7700	7.6801 (74)						
Solar gains	333.8359	652.5207	1075.7906	1574.6438	1937.2709	1987.0283	1890.0966	1618.1247	1252.6951	774.3561	416.0977	274.6638 (83)
Total gains	1011.0694	1352.4975	1743.7508	2224.6626	2552.7235	2582.0462	2461.3813	2187.2457	1839.4941	1378.0757	1055.6078	935.3730 (84)

7. Mean internal temperature (heating season)

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Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	27.1353	27.1999	27.2635	27.5663	27.6237	27.8941	27.8941	27.9448	27.7893	27.6237	27.5078	27.3877
alpha	2.8090	2.8133	2.8176	2.8378	2.8416	2.8596	2.8596	2.8630	2.8526	2.8416	2.8339	2.8258
util living area	0.9600	0.9176	0.8360	0.6864	0.5223	0.3753	0.2773	0.3226	0.5321	0.8044	0.9329	0.9669 (86)
MIT	18.6571	19.1578	19.8040	20.4461	20.7940	20.9410	20.9816	20.9715	20.8416	20.2528	19.3201	18.5720 (87)
Th 2	20.2167	20.2184	20.2201	20.2280	20.2295	20.2364	20.2364	20.2377	20.2337	20.2295	20.2265	20.2233 (88)
util rest of house	0.9553	0.9088	0.8197	0.6600	0.4879	0.3344	0.2309	0.2720	0.4851	0.7789	0.9242	0.9631 (89)
MIT 2	18.0384	18.5305	19.1557	19.7617	20.0710	20.1979	20.2270	20.2225	20.1230	19.6011	18.7015	17.9590 (90)
Living area fraction									fLA = Living area / (4) =			0.2039 (91)
MIT	18.1645	18.6584	19.2879	19.9013	20.2184	20.3494	20.3808	20.3752	20.2695	19.7340	18.8276	18.0839 (92)
Temperature adjustment												0.0000
adjusted MIT	18.1645	18.6584	19.2879	19.9013	20.2184	20.3494	20.3808	20.3752	20.2695	19.7340	18.8276	18.0839 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9392	0.8870	0.7977	0.6481	0.4874	0.3405	0.2398	0.2812	0.4874	0.7605	0.9042	0.9487 (94)
Useful gains	949.5761	1199.7238	1390.9452	1441.8695	1244.1728	879.2985	590.2410	615.1541	896.5214	1048.0099	954.5123	887.3662 (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	2254.9815	2232.4017	2070.0892	1761.3100	1360.9742	909.6678	598.2032	627.8156	979.8111	1459.3208	1881.5920	2237.3253 (97)
Space heating kWh	971.2217	693.9595	505.2831	229.9971	86.9002	0.0000	0.0000	0.0000	0.0000	306.0153	667.4974	1004.3696 (98a)
Space heating requirement - total per year (kWh/year)												4465.2439
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	971.2217	693.9595	505.2831	229.9971	86.9002	0.0000	0.0000	0.0000	0.0000	306.0153	667.4974	1004.3696 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4465.2439
Space heating per m2												(98c) / (4) = 23.1300 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1487.2621	1170.8233	1200.2874	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9235	0.9498	0.9309	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1373.4540	1112.0713	1117.3024	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2927.9906	2790.7105	2474.1788	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1119.2664	1248.9076	1009.5161	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	279.8166	312.2269	252.3790	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												844.4225 (107)
Energy for space heating												23.1300 (99)
Energy for space cooling												4.3741 (108)
Total												27.5041 (109)
Fabric Energy Efficiency (DFEE)												27.5 (109)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Basement floor	51.7800 (1a)	x 2.5900 (2a)	= 134.1102 (1a) - (3a)
Ground floor	51.7800 (1b)	x 2.3000 (2b)	= 119.0940 (1b) - (3b)
First floor	64.4100 (1c)	x 2.3000 (2c)	= 148.1430 (1c) - (3c)
Second floor	25.0800 (1d)	x 1.6800 (2d)	= 42.1344 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	193.0500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	443.4816 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
	Air changes per hour

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Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0902 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.3402 (18)
Number of sides sheltered			2 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2892 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3687	0.3615	0.3542	0.3181	0.3109	0.2747	0.2747	0.2675	0.2892	0.3109	0.3253	0.3398 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5680	0.5653	0.5627	0.5506	0.5483	0.5377	0.5377	0.5358	0.5418	0.5483	0.5529	0.5577 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Semi-glazed door			2.2100	1.0000	2.2100		(26a)					
TER Opening Type (Uw = 1.20)			32.4800	1.1450	37.1908		(27)					
Ground Floor			51.7800	0.1300	6.7314		(28)					
Basement Wall	53.6400	24.3900	29.2500	0.1800	5.2650		(29a)					
External Wall	116.9100	10.3000	106.6100	0.1800	19.1898		(29a)					
Dwarf Wall	8.5400		8.5400	0.1800	1.5372		(29a)					
Warm Roof	56.0600		56.0600	0.1100	6.1666		(30)					
Flat Roof	11.2000		11.2000	0.1100	1.2320		(30)					
Total net area of external elements Aum(A, m2)			298.1300				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	79.5228	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							82.3010 (35)					
List of Thermal Bridges												
K1 Element				Length	Psi-value	Total						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							0.0000 (36)					
Point Thermal bridges						(36a) =	0.0000					
Total fabric heat loss						(33) + (36) + (36a) =	79.5228 (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
	83.1211	82.7348	82.3562	80.5780	80.2453	78.6965	78.6965	78.4097	79.2931	80.2453	80.9184	81.6220 (38)
Heat transfer coeff	162.6439	162.2577	161.8791	160.1008	159.7681	158.2194	158.2194	157.9326	158.8159	159.7681	160.4412	161.1448 (39)
Average = Sum(39)m / 12 =												160.0993
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.8425	0.8405	0.8385	0.8293	0.8276	0.8196	0.8196	0.8181	0.8227	0.8276	0.8311	0.8347 (40)
HLP (average)												0.8293
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9929 (42)	
Hot water usage for mixer showers														
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)	
Hot water usage for baths														
32.1179	31.6409	30.9692	29.7306	28.8033	27.7749	27.2195	27.8865	28.6128	29.7131	30.9771	32.0093	32.0093 (42b)		
Hot water usage for other uses														
45.2800	43.6334	41.9869	40.3404	38.6938	37.0473	37.0473	38.6938	40.3404	41.9869	43.6334	45.2800	45.2800 (42c)		
Average daily hot water use (litres/day)													70.9419 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	77.3978	75.2743	72.9561	70.0710	67.4971	64.8222	64.2668	66.5803	68.9531	71.7000	74.6106	77.2893 (44)		
Energy conte	122.5793	107.1896	112.1307	95.9237	90.8640	79.7065	77.7251	82.4403	85.0261	97.2962	106.2964	121.0163 (45)		
Energy content (annual)										Total = Sum(45)m =		1178.1942		
Distribution loss (46)m = 0.15 x (45)m														
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)		
Water storage loss:														
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)		
If cylinder contains dedicated solar storage														
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)		
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)		
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)		
Total heat required for water heating calculated for each month														
104.1924	91.1112	95.3111	81.5351	77.2344	67.7505	66.0663	70.0743	72.2722	82.7018	90.3520	102.8639	102.8639 (62)		
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)		
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)		
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)		
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)		
Output from w/h	104.1924	91.1112	95.3111	81.5351	77.2344	67.7505	66.0663	70.0743	72.2722	82.7018	90.3520	102.8639 (64)		
12Total per year (kWh/year)									Total per year (kWh/year) = Sum(64)m =			1001.4651 (64)		
Electric shower(s)												1001 (64)		
59.5824	53.0884	57.9705	55.3205	56.3586	53.7606	55.5526	56.3586	55.3205	57.9705	56.8804	59.5824	59.5824 (64a)		
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												677.7460 (64a)		
Heat gains from water heating, kWh/month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	40.9437	36.0499	38.3204	34.2139	33.3983	30.3778	30.4047	31.6082	31.8982	35.1681	36.8081	40.6116 (65)		

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												

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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	189.9172	210.2655	189.9172	196.2478	189.9172	196.2478	189.9172	196.2478	189.9172	196.2478	189.9172	(67)
364.3914	368.1726	358.6440	338.3587	312.7522	288.6857	272.6078	268.8265	278.3551	298.6404	324.2469	348.3135	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	(71)
Water heating gains (Table 5)	55.0318	53.6457	51.5059	47.5193	44.8901	42.1914	40.8666	42.4842	44.3030	47.2689	51.1223	(72)
Total internal gains	677.2335	699.9768	667.9602	650.0189	615.4526	595.0179	571.2846	569.1210	586.7990	603.7196	639.5101	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	2.0600	10.6334	0.6300	0.7000	0.7700	6.6944 (74)
East	23.6700	19.6403	0.6300	0.7000	0.7700	142.0749 (76)
West	6.7500	19.6403	0.6300	0.7000	0.7700	40.5157 (80)

Solar gains	189.2850	369.9792	609.9733	892.8230	1098.4326	1126.6450	1071.6848	917.4767	710.2781	439.0599	235.9274	155.7344 (83)
Total gains	866.5184	1069.9560	1277.9335	1542.8419	1713.8852	1721.6629	1642.9694	1486.5977	1297.0771	1042.7795	875.4375	816.4435 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	27.1353	27.1999	27.2635	27.5663	27.6237	27.8941	27.8941	27.9448	27.7893	27.6237	27.5078	27.3877
alpha	2.8090	2.8133	2.8176	2.8378	2.8416	2.8596	2.8596	2.8630	2.8526	2.8416	2.8339	2.8258
util living area	0.9721	0.9504	0.9089	0.8168	0.6848	0.5272	0.4020	0.4544	0.6752	0.8810	0.9559	0.9762 (86)
MIT	18.4850	18.8567	19.4057	20.0860	20.5783	20.8577	20.9516	20.9308	20.7021	19.9963	19.1204	18.4272 (87)
Th 2	20.2167	20.2184	20.2201	20.2280	20.2295	20.2364	20.2364	20.2377	20.2337	20.2295	20.2265	20.2233 (88)
util rest of house	0.9688	0.9446	0.8982	0.7959	0.6501	0.4767	0.3387	0.3886	0.6274	0.8624	0.9497	0.9733 (89)
MIT 2	17.8687	18.2371	18.7771	19.4373	19.8936	20.1399	20.2107	20.1992	20.0165	19.3659	18.5070	17.8159 (90)
Living area fraction	17.9943	18.3634	18.9053	19.5696	20.0332	20.2863	20.3618	20.3483	fLA = Living area / (4) =	19.4944	18.6321	0.2039 (91)
Temperature adjustment	17.9943	18.3634	18.9053	19.5696	20.0332	20.2863	20.3618	20.3483	20.1563	19.4944	18.6321	17.9405 (92)
adjusted MIT	17.9943	18.3634	18.9053	19.5696	20.0332	20.2863	20.3618	20.3483	20.1563	19.4944	18.6321	17.9405 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9557	0.9267	0.8762	0.7758	0.6406	0.4801	0.3493	0.3985	0.6221	0.8412	0.9330	0.9615 (94)
Useful gains	828.1329	991.5152	1119.7039	1196.9585	1097.9230	826.5662	573.9532	592.3858	806.9645	877.1446	816.7847	785.0111 (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	2227.3023	2184.5373	2008.1543	1708.2104	1331.3861	899.6804	595.1848	623.5674	961.8402	1421.0452	1850.2172	2214.2175 (97)
Space heating kWh	1040.9820	801.7109	661.0071	368.1013	173.6966	0.0000	0.0000	0.0000	0.0000	404.6621	744.0714	1063.3295 (98a)
Space heating requirement - total per year (kWh/year)												5257.5609
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	1040.9820	801.7109	661.0071	368.1013	173.6966	0.0000	0.0000	0.0000	0.0000	404.6621	744.0714	1063.3295 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5257.5609
Space heating per m2												(98c) / (4) = 27.2342 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1487.2621	1170.8233	1200.2874	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8271	0.8783	0.8460	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1230.1727	1028.3111	1015.4088	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1922.3479	1834.1252	1655.2396	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	498.3661	599.5257	476.0341	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												fc = cooled area / (4) = 1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	124.5915	149.8814	119.0085	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												393.4815 (107)
Energy for space heating												27.2342 (99)
Energy for space cooling												2.0382 (108)
Total												29.2724 (109)
Fabric Energy Efficiency (TFEE)												29.3 (109)

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Property Reference	1 Condor Cottages		Issued on Date	14/04/2024	
Assessment Reference	New Build	Prop Type Ref			
Property	Buddock Water, 1 Condor Cottages, Falmouth, TR11 5DY				
SAP Rating	84 B	DER	3.00	TER	7.48
Environmental	97 A	% DER < TER			59.89
CO ₂ Emissions (t/year)	0.54	DFEE	27.50	TFEE	29.27
Compliance Check	See BREL	% DFEE < TFEE			6.04
% DPER < TPER	19.01	DPER	31.54	TPER	38.94
Assessor Details	Mr. Chris Law			Assessor ID	AX42-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Basement floor	51.7800 (1a)	x 2.5900 (2a)	= 134.1102 (1a) - (3a)
Ground floor	51.7800 (1b)	x 2.3000 (2b)	= 119.0940 (1b) - (3b)
First floor	64.4100 (1c)	x 2.3000 (2c)	= 148.1430 (1c) - (3c)
Second floor	25.0800 (1d)	x 1.6800 (2d)	= 42.1344 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	193.0500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	443.4816 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	6 * 10 = 60.0000 (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) =	60.0000 / (5) =	0.1353 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3853	(18)
Number of sides sheltered	2	(19)

Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.4176	0.4094	0.4012	0.3602	0.3521	0.3111	0.3111	0.3029	0.3275	0.3521	0.3684	0.3848 (22b)
Effective ac	0.5872	0.5838	0.5805	0.5649	0.5620	0.5484	0.5484	0.5459	0.5536	0.5620	0.5679	0.5740 (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
Rear (Uw = 1.20)			8.7000	1.1450	9.9618		(27)
Rear (Uw = 1.20)			14.9700	1.1450	17.1412		(27)
Front (Uw = 1.20)			6.7500	1.1450	7.7290		(27)
Side (Uw = 1.20)			0.7200	1.1450	0.8244		(27)
Side (Uw = 1.20)			1.3400	1.1450	1.5344		(27)
Front			2.2100	1.0000	2.2100		(26a)
Ground Floor			51.7800	0.1300	6.7314	110.0000	5695.8000 (28)
Basement Wall	53.6400	24.3900	29.2500	0.1800	5.2650	70.0000	2047.5000 (29a)
External Wall	116.9100	10.3000	106.6100	0.1800	19.1898	70.0000	7462.7000 (29a)
Dwarf Wall	8.5400		8.5400	0.1800	1.5372	9.0000	76.8600 (29a)
Warm Roof	56.0600		56.0600	0.1100	6.1666	9.0000	504.5400 (30)
Flat Roof	11.2000		11.2000	0.1100	1.2320	9.0000	100.8000 (30)
Total net area of external elements Aum(A, m ²)			298.1300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	79.5228		(33)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15888.2000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		82.3010 (35)

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List of Thermal Bridges		Length	Psi-value	Total								
K1 Element												
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				0.0000 (36)								
Point Thermal bridges				(36a) = 0.0000								
Total fabric heat loss				(33) + (36) + (36a) = 79.5228 (37)								
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	85.9330	85.4376	84.9519	82.6710	82.2442	80.2576	80.2576	79.8897	81.0228	82.2442	83.1076	84.0101 (38)
Average = Sum(39)m / 12 =	165.4558	164.9604	164.4748	162.1938	161.7671	159.7805	159.7805	159.4126	160.5457	161.7671	162.6304	163.5330 (39)
												162.1918
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8571	0.8545	0.8520	0.8402	0.8380	0.8277	0.8277	0.8258	0.8316	0.8380	0.8424	0.8471 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	0.8402
												31

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.9929 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	85.8312	84.5565	82.7614	79.4516	76.9733	74.2252	72.7409	74.5234	76.4642	79.4047	82.7827	85.5410 (42b)
Hot water usage for other uses	45.2800	43.6334	41.9869	40.3404	38.6938	37.0473	37.0473	38.6938	40.3404	41.9869	43.6334	45.2800 (42c)
Average daily hot water use (litres/day)												120.7427 (43)
Daily hot water use	131.1112	128.1899	124.7483	119.7920	115.6671	111.2725	109.7881	113.2172	116.8046	121.3916	126.4161	130.8210 (44)
Energy content (annual)	207.6480	182.5407	191.7335	163.9892	155.7102	136.8225	132.7792	140.1865	144.0317	164.7273	180.1029	204.8341 (45)
Distribution loss (46)m = 0.15 x (45)m	31.1472	27.3811	28.7600	24.5984	23.3565	20.5234	19.9169	21.0280	21.6048	24.7091	27.0154	30.7251 (46)
Water storage loss:												150.0000 (47)
Store volume												2.5000 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												1.3500 (55)
Enter (49) or (54) in (55)												
Total storage loss	41.8500	37.8000	41.8500	40.5000	41.8500	40.5000	41.8500	41.8500	40.5000	41.8500	40.5000	41.8500 (56)
If cylinder contains dedicated solar storage	41.8500	37.8000	41.8500	40.5000	41.8500	40.5000	41.8500	41.8500	40.5000	41.8500	40.5000	41.8500 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	272.7604	241.3519	256.8459	227.0012	220.8226	199.8345	197.8916	205.2989	207.0437	229.8397	243.1149	269.9465 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	272.7604	241.3519	256.8459	227.0012	220.8226	199.8345	197.8916	205.2989	207.0437	229.8397	243.1149	269.9465 (64)
Total per year (kWh/year)												2771.7520 (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	121.1329	107.7438	115.8413	104.9360	103.8636	95.9031	96.2390	98.7019	98.3001	106.8617	110.2938	120.1973 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	189.9172	210.2655	189.9172	196.2478	189.9172	196.2478	189.9172	189.9172	196.2478	189.9172	196.2478	189.9172 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	364.3914	368.1726	358.6440	338.3587	312.7522	288.6857	272.6078	268.8265	278.3551	298.6404	324.2469	348.3135 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148 (71)
Water heating gains (Table 5)	162.8130	160.3330	155.7007	145.7445	139.6015	133.1987	129.3535	132.6639	136.5280	143.6314	153.1859	161.5554 (72)
Total internal gains	785.0147	806.6641	772.1550	748.2440	710.1640	686.0253	659.7716	659.3007	679.0240	700.0821	741.5736	767.6792 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W					
East	8.7000	19.6403	0.7000	0.0000	0.7700	92.0991 (76)						
East	14.9700	19.6403	0.7000	0.0000	0.7700	158.4739 (76)						
West	6.7500	19.6403	0.7000	0.0000	0.7700	71.4562 (80)						
North	0.7200	10.6334	0.7000	0.0000	0.7700	4.1266 (74)						
North	1.3400	10.6334	0.7000	0.0000	0.7700	7.6801 (74)						
Solar gains	333.8359	652.5207	1075.7906	1574.6438	1937.2709	1987.0283	1890.0966	1618.1247	1252.6951	774.3561	416.0977	274.6638 (83)
Total gains	1118.8506	1459.1848	1847.9456	2322.8878	2647.4349	2673.0535	2549.8682	2277.4254	1931.7190	1474.4382	1157.6713	1042.3430 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	26.6741	26.7542	26.8332	27.2106	27.2824	27.6216	27.6216	27.6853	27.4899	27.2824	27.1375	26.9878
alpha	2.7783	2.7836	2.7889	2.8140	2.8188	2.8414	2.8414	2.8457	2.8327	2.8188	2.8092	2.7992
util living area	0.9501	0.9051	0.8216	0.6729	0.5119	0.3668	0.2705	0.3132	0.5160	0.7847	0.9192	0.9578 (86)
Living	19.1891	19.5529	20.0213	20.4885	20.7406	20.8493	20.8787	20.8719	20.7795	20.3613	19.6864	19.1333
Non living	18.0413	18.4989	19.0791	19.6455	19.9329	20.0552	20.0822	20.0789	19.9870	19.5127	18.6804	17.9769
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	31	28	31	30	31	30	31	31	30	31	30	31
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000 (87)
Th 2	20.2042	20.2064	20.2085	20.2187	20.2206	20.2294	20.2294	20.2311	20.2260	20.2206	20.2167	20.2127 (88)
util rest of house	0.9444	0.8951	0.8043	0.6461	0.4774	0.3262	0.2248	0.2635	0.4692	0.7577	0.9090	0.9529 (89)
MIT 2	20.2042	20.2064	20.2085	20.2187	20.2206	20.2294	20.2294	20.2311	20.2260	20.2206	20.2167	20.2127 (90)
Living area fraction									flA = Living area / (4) =			0.2039 (91)
MIT	20.3664	20.3682	20.3699	20.3780	20.3795	20.3865	20.3865	20.3878	20.3838	20.3795	20.3764	20.3732 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3664	20.3682	20.3699	20.3780	20.3795	20.3865	20.3865	20.3878	20.3838	20.3795	20.3764	20.3732 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9456	0.8972	0.8080	0.6517	0.4846	0.3346	0.2342	0.2738	0.4790	0.7635	0.9112	0.9539 (94)
Useful gains	1058.0077	1309.2346	1493.1754	1513.8595	1282.9657	894.4499	597.2392	623.4853	925.3815	1125.7956	1054.8835	994.3406 (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	2658.2815	2551.6345	2281.2457	1861.6547	1404.0535	924.5747	605.0137	635.7117	1008.8389	1581.9973	2159.1486	2644.8541 (97)
Space heating kWh	1190.6037	834.8927	586.3244	250.4126	90.0894	0.0000	0.0000	0.0000	0.0000	339.4140	795.0709	1227.9820 (98a)
Space heating requirement - total per year (kWh/year)												5314.7896
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	1190.6037	834.8927	586.3244	250.4126	90.0894	0.0000	0.0000	0.0000	0.0000	339.4140	795.0709	1227.9820 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5314.7896
Space heating per m2										(98c) / (4) =		27.5306 (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 %)												355.8164 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												32.0000 (208)
Space heating requirement	1190.6037	834.8927	586.3244	250.4126	90.0894	0.0000	0.0000	0.0000	0.0000	339.4140	795.0709	1227.9820 (98)
Space heating efficiency (main heating system 1)	355.8164	355.8164	355.8164	355.8164	355.8164	0.0000	0.0000	0.0000	0.0000	355.8164	355.8164	355.8164 (210)
Space heating fuel (main heating system)	334.6118	234.6414	164.7828	70.3769	25.3191	0.0000	0.0000	0.0000	0.0000	95.3902	223.4498	345.1168 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	272.7604	241.3519	256.8459	227.0012	220.8226	199.8345	197.8916	205.2989	207.0437	229.8397	243.1149	269.9465 (64)
Efficiency of water heater (217)m	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550 (216)
Fuel for water heating, kWh/month	203.7731	180.3085	191.8837	169.5874	164.9715	149.2918	147.8403	153.3741	154.6776	171.7080	181.6256	201.6708 (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	46.9268	37.6464	33.8964	24.8340	19.1825	15.6723	17.4989	22.7457	29.5445	38.7639	43.7838	48.2311 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1493.6888 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												133.8550
Water heating fuel used												2070.7123 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												0.0000 (231)
Total electricity for the above, kWh/year												378.7263 (232)
Electricity for lighting (calculated in Appendix L)												

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Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3943.1274	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1493.6888	0.1564	233.6702 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2070.7123	0.1408	291.4738 (264)
Space and water heating			525.1439 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	378.7263	0.1443	54.6619 (268)
Total CO2, kg/year			579.8058 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.0000 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1493.6888	1.5791	2358.7065 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2070.7123	1.5205	3148.4620 (278)
Space and water heating			5507.1685 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	378.7263	1.5338	580.9030 (282)
Total Primary energy kWh/year			6088.0715 (286)
Dwelling Primary energy Rate (DPER)			31.5400 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Basement floor	51.7800 (1a)	x 2.5900 (2a)	= 134.1102 (1a) - (3a)
Ground floor	51.7800 (1b)	x 2.3000 (2b)	= 119.0940 (1b) - (3b)
First floor	64.4100 (1c)	x 2.3000 (2c)	= 148.1430 (1c) - (3c)
Second floor	25.0800 (1d)	x 1.6800 (2d)	= 42.1344 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	193.0500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	443.4816 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.0902 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3402 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2892 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.3687	0.3615	0.3542	0.3181	0.3109	0.2747	0.2747	0.2675	0.2892	0.3109	0.3253	0.3398 (22b)
Effective ac	0.5680	0.5653	0.5627	0.5506	0.5483	0.5377	0.5377	0.5358	0.5418	0.5483	0.5529	0.5577 (25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K
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	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K
TER Semi-glazed door			2.2100	1.0000	2.2100		(26a)
TER Opening Type (Uw = 1.20)			32.4800	1.1450	37.1908		(27)
Ground Floor			51.7800	0.1300	6.7314		(28)
Basement Wall	53.6400	24.3900	29.2500	0.1800	5.2650		(29a)
External Wall	116.9100	10.3000	106.6100	0.1800	19.1898		(29a)
Dwarf Wall	8.5400		8.5400	0.1800	1.5372		(29a)
Warm Roof	56.0600		56.0600	0.1100	6.1666		(30)
Flat Roof	11.2000		11.2000	0.1100	1.2320		(30)
Total net area of external elements Aum(A, m2)			298.1300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		79.5228		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 82.3010 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			0.0000 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 79.5228 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	83.1211	82.7348	82.3562	80.5780	80.2453	78.6965	78.6965	78.4097	79.2931	80.2453	80.9184	81.6220 (38)
Average = Sum(39)m / 12 =	162.6439	162.2577	161.8791	160.1008	159.7681	158.2194	158.2194	157.9326	158.8159	159.7681	160.4412	161.1448 (39)
												160.0993

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8425	0.8405	0.8385	0.8293	0.8276	0.8196	0.8196	0.8181	0.8227	0.8276	0.8311	0.8347 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9929 (42)

Hot water usage for mixer showers 0.0000 (42a)

Hot water usage for baths 85.8312 (42b)

Hot water usage for other uses 45.2800 (42c)

Average daily hot water use (litres/day) 120.7427 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	131.1112	128.1899	124.7483	119.7920	115.6671	111.2725	109.7881	113.2172	116.8046	121.3916	126.4161	130.8210 (44)
Energy content (annual)	207.6480	182.5407	191.7335	163.9892	155.7102	136.8225	132.7792	140.1865	144.0317	164.7273	180.1029	204.8341 (45)
Distribution loss (46)m = 0.15 x (45)m	31.1472	27.3811	28.7600	24.5984	23.3565	20.5234	19.9169	21.0280	21.6048	24.7091	27.0154	30.7251 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage												
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	254.2429	224.6264	238.3284	209.0811	202.3051	181.9144	179.3741	186.7814	189.1235	211.3222	225.1948	251.4290 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	254.2429	224.6264	238.3284	209.0811	202.3051	181.9144	179.3741	186.7814	189.1235	211.3222	225.1948	251.4290 (64)
Total per year (kWh/year)												2553.7234 (64)
Electric shower(s)												2554 (64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	106.3189	94.3634	101.0273	90.5999	89.0496	81.5670	81.4250	83.8879	83.9640	92.0477	95.9577	105.3833 (65)

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

Metabolic gains (Table 5), Watts

(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435	149.6435 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	189.9172	210.2655	189.9172	196.2478	189.9172	196.2478	189.9172	189.9172	196.2478	189.9172	196.2478	189.9172 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	364.3914	368.1726	358.6440	338.3587	312.7522	288.6857	272.6078	268.8265	278.3551	298.6404	324.2469	348.3135 (68)
Pumps, fans	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644	37.9644 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148 (71)
Total internal gains	142.9017	140.4217	135.7894	125.8332	119.6903	113.2874	109.4422	112.7526	116.6167	123.7201	133.2746	141.6442 (72)
	768.1034	789.7528	755.2437	731.3328	693.2527	666.1140	639.8603	639.3894	659.1127	683.1708	724.6624	750.7679 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
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North	2.0600	10.6334	0.6300	0.7000	0.7700	6.6944 (74)
East	23.6700	19.6403	0.6300	0.7000	0.7700	142.0749 (76)
West	6.7500	19.6403	0.6300	0.7000	0.7700	40.5157 (80)

Solar gains	189.2850	369.9792	609.9733	892.8230	1098.4326	1126.6450	1071.6848	917.4767	710.2781	439.0599	235.9274	155.7344 (83)
Total gains	957.3883	1159.7320	1365.2169	1624.1558	1791.6853	1792.7590	1711.5451	1556.8661	1369.3908	1122.2307	960.5897	906.5023 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	27.1353	27.1999	27.2635	27.5663	27.6237	27.8941	27.8941	27.9448	27.7893	27.6237	27.5078	27.3877
alpha	2.8090	2.8133	2.8176	2.8378	2.8416	2.8596	2.8596	2.8630	2.8526	2.8416	2.8339	2.8258
util living area	0.9647	0.9407	0.8960	0.8006	0.6671	0.5109	0.3877	0.4370	0.6533	0.8633	0.9455	0.9693 (86)
MIT	18.5940	18.9562	19.4887	20.1402	20.6074	20.8689	20.9559	20.9374	20.7276	20.0640	19.2168	18.5373 (87)
Th 2	20.2167	20.2184	20.2201	20.2280	20.2295	20.2364	20.2364	20.2377	20.2337	20.2295	20.2265	20.2233 (88)
util rest of house	0.9606	0.9339	0.8841	0.7787	0.6320	0.4610	0.3261	0.3729	0.6050	0.8428	0.9382	0.9657 (89)
MIT 2	17.3419	17.8008	18.4706	19.2772	19.8299	20.1229	20.2065	20.1933	19.9807	19.2020	18.1408	17.2738 (90)
Living area fraction												FLA = Living area / (4) = 0.2039 (91)
MIT	17.5972	18.0364	18.6782	19.4532	19.9885	20.2750	20.3593	20.3450	20.1330	19.3778	18.3602	17.5314 (92)
Temperature adjustment												0.0000
adjusted MIT	17.5972	18.0364	18.6782	19.4532	19.9885	20.2750	20.3593	20.3450	20.1330	19.3778	18.3602	17.5314 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	900.7655	1053.9318	1167.5123	1224.3660	1111.2111	831.2193	575.5775	595.0733	819.1305	915.3292	878.1704	858.9997 (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	2162.7049	2131.4749	1971.3923	1689.5701	1324.2305	897.8894	594.7964	623.0396	958.1314	1402.4094	1806.6023	2148.2827 (97)
Space heating kWh	938.8829	724.1090	598.0867	334.9470	158.4865	0.0000	0.0000	0.0000	0.0000	362.3877	668.4710	959.2266 (98a)
Space heating requirement - total per year (kWh/year)												4744.5973
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	938.8829	724.1090	598.0867	334.9470	158.4865	0.0000	0.0000	0.0000	0.0000	362.3877	668.4710	959.2266 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4744.5973
Space heating per m2												(98c) / (4) = 24.5770 (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	938.8829	724.1090	598.0867	334.9470	158.4865	0.0000	0.0000	0.0000	0.0000	362.3877	668.4710	959.2266 (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)	1017.2080	784.5168	647.9813	362.8894	171.7080	0.0000	0.0000	0.0000	0.0000	392.6194	724.2372	1039.2487 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	254.2429	224.6264	238.3284	209.0811	202.3051	181.9144	179.3741	186.7814	189.1235	211.3222	225.1948	251.4290 (64)
Efficiency of water heater (217)m	86.7160	86.4905	86.0352	85.1109	83.5183	79.8000	79.8000	79.8000	79.8000	85.2582	86.3461	79.8000 (216)
Fuel for water heating, kWh/month	293.1904	259.7124	277.0128	245.6572	242.2284	227.9629	224.7796	234.0620	236.9969	247.8615	260.8049	289.7726 (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	39.4610	31.6571	28.5037	20.8830	16.1307	13.1789	14.7149	19.1270	24.8441	32.5968	36.8180	40.5578 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-50.6055	-72.4885	-105.8014	-120.7733	-131.6575	-123.2597	-121.6089	-114.0429	-101.0270	-83.5836	-55.9914	-43.6081 (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	-25.2106	-53.3910	-106.8275	-161.5328	-214.7168	-216.2789	-213.8679	-180.6775	-131.8062	-76.8659	-33.8136	-19.9198 (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												5140.4088 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.8000
Water heating fuel used												3040.0416 (219)

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Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	318.4732 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2559.3562 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	6025.5673 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	5140.4088	0.2100	1079.4858 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3040.0416	0.2100	638.4087 (264)
Space and water heating			1717.8946 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	318.4732	0.1443	45.9655 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1124.4477	0.1343	-151.0019
PV Unit electricity exported	-1434.9086	0.1257	-180.3427
Total			-331.3445 (269)
Total CO2, kg/year			1444.4448 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			7.4800 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	5140.4088	1.1300	5808.6619 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3040.0416	1.1300	3435.2470 (278)
Space and water heating			9243.9089 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	318.4732	1.5338	488.4848 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1124.4477	1.4963	-1682.5067
PV Unit electricity exported	-1434.9086	0.4613	-661.9651
Total			-2344.4718 (283)
Total Primary energy kWh/year			7518.0227 (286)
Target Primary Energy Rate (TPER)			38.9400 (287)

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Property Reference	1 Condor Cottages		Issued on Date	14/04/2024	
Assessment Reference	New Build	Prop Type Ref			
Property	Buddock Water, 1 Condor Cottages, Falmouth, TR11 5DY				
SAP Rating	84 B	DER	3.00	TER	7.48
Environmental	97 A	% DER < TER			59.89
CO ₂ Emissions (t/year)	0.54	DFEE	27.50	TFEE	29.27
Compliance Check	See BREL	% DFEE < TFEE			6.04
% DPER < TPER	19.01	DPER	31.54	TPER	38.94
Assessor Details	Mr. Chris Law			Assessor ID	AX42-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Basement floor	51.7800 (1a)	x 2.5900 (2a)	= 134.1102 (1a) - (3a)
Ground floor	51.7800 (1b)	x 2.3000 (2b)	= 119.0940 (1b) - (3b)
First floor	64.4100 (1c)	x 2.3000 (2c)	= 148.1430 (1c) - (3c)
Second floor	25.0800 (1d)	x 1.6800 (2d)	= 42.1344 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	193.0500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	443.4816 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	6 * 10 = 60.0000 (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 60.0000 / (5) = 0.1353 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3853 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4176	0.4094	0.4012	0.3602	0.3521	0.3111	0.3111	0.3029	0.3275	0.3521	0.3684	0.3848 (22b)
Effective ac	0.5872	0.5838	0.5805	0.5649	0.5620	0.5484	0.5484	0.5459	0.5536	0.5620	0.5679	0.5740 (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
Rear (Uw = 1.20)			8.7000	1.1450	9.9618		(27)
Rear (Uw = 1.20)			14.9700	1.1450	17.1412		(27)
Front (Uw = 1.20)			6.7500	1.1450	7.7290		(27)
Side (Uw = 1.20)			0.7200	1.1450	0.8244		(27)
Side (Uw = 1.20)			1.3400	1.1450	1.5344		(27)
Front			2.2100	1.0000	2.2100		(26a)
Ground Floor			51.7800	0.1300	6.7314	110.0000	5695.8000 (28)
Basement Wall	53.6400	24.3900	29.2500	0.1800	5.2650	70.0000	2047.5000 (29a)
External Wall	116.9100	10.3000	106.6100	0.1800	19.1898	70.0000	7462.7000 (29a)
Dwarf Wall	8.5400		8.5400	0.1800	1.5372	9.0000	76.8600 (29a)
Warm Roof	56.0600		56.0600	0.1100	6.1666	9.0000	504.5400 (30)
Flat Roof	11.2000		11.2000	0.1100	1.2320	9.0000	100.8000 (30)
Total net area of external elements Aum (A, m ²)			298.1300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	79.5228		(33)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	15888.2000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							82.3010 (35)

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List of Thermal Bridges													
K1 Element													
Thermal bridges (Sum(L x Psi) calculated using Appendix K)													
												Length	
												Psi-value	
												Total	
Point Thermal bridges												(36a) =	0.0000 (36)
Total fabric heat loss												(33) + (36) + (36a) =	79.5228 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	85.9330	85.4376	84.9519	82.6710	82.2442	80.2576	80.2576	79.8897	81.0228	82.2442	83.1076	84.0101 (38)	
Average = Sum(39)m / 12 =	165.4558	164.9604	164.4748	162.1938	161.7671	159.7805	159.7805	159.4126	160.5457	161.7671	162.6304	163.5330 (39)	
												162.1918	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.8571	0.8545	0.8520	0.8402	0.8380	0.8277	0.8277	0.8258	0.8316	0.8380	0.8424	0.8471 (40)	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.9929 (42)
Hot water usage for mixer showers												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths												
	85.8312	84.5565	82.7614	79.4516	76.9733	74.2252	72.7409	74.5234	76.4642	79.4047	82.7827	85.5410 (42b)
Hot water usage for other uses												
	45.2800	43.6334	41.9869	40.3404	38.6938	37.0473	37.0473	38.6938	40.3404	41.9869	43.6334	45.2800 (42c)
Average daily hot water use (litres/day)												120.7427 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	131.1112	128.1899	124.7483	119.7920	115.6671	111.2725	109.7881	113.2172	116.8046	121.3916	126.4161	130.8210 (44)
Energy content (annual)	207.6480	182.5407	191.7335	163.9892	155.7102	136.8225	132.7792	140.1865	144.0317	164.7273	180.1029	204.8341 (45)
Distribution loss (46)m = 0.15 x (45)m	31.1472	27.3811	28.7600	24.5984	23.3565	20.5234	19.9169	21.0280	21.6048	24.7091	27.0154	30.7251 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.5000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.3500 (55)
Total storage loss												
	41.8500	37.8000	41.8500	40.5000	41.8500	40.5000	41.8500	41.8500	40.5000	41.8500	40.5000	41.8500 (56)
If cylinder contains dedicated solar storage												
	41.8500	37.8000	41.8500	40.5000	41.8500	40.5000	41.8500	41.8500	40.5000	41.8500	40.5000	41.8500 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	272.7604	241.3519	256.8459	227.0012	220.8226	199.8345	197.8916	205.2989	207.0437	229.8397	243.1149	269.9465 (62)
WVHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	272.7604	241.3519	256.8459	227.0012	220.8226	199.8345	197.8916	205.2989	207.0437	229.8397	243.1149	269.9465 (64)
Total per year (kWh/year) = Sum(64)m =												2771.7520 (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												
	121.1329	107.7438	115.8413	104.9360	103.8636	95.9031	96.2390	98.7019	98.3001	106.8617	110.2938	120.1973 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	179.5723	179.5723	179.5723	179.5723	179.5723	179.5723	179.5723	179.5723	179.5723	179.5723	179.5723	179.5723 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	53.6126	47.6183	38.7258	29.3179	21.9155	18.5020	19.9920	25.9864	34.8789	44.2868	51.6892	55.1027 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	543.8677	549.5114	535.2896	505.0130	466.7943	430.8742	406.8773	401.2336	415.4554	445.7320	483.9507	519.8708 (68)
Pumps, fans	55.9501	55.9501	55.9501	55.9501	55.9501	55.9501	55.9501	55.9501	55.9501	55.9501	55.9501	55.9501 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148 (71)
Total internal gains	162.8130	160.3330	155.7007	145.7445	139.6015	133.1987	129.3535	132.6639	136.5280	143.6314	153.1859	161.5554 (72)
	876.1009	873.2701	845.5235	795.8829	744.1189	698.3824	672.0303	675.6914	702.6698	749.4576	804.6332	852.3365 (73)

6. Solar gains												
[Jan]	Area		Solar flux		g		FF		Access		Gains	
	m2		Table 6a	W/m2	Specific data	or Table 6b	Specific data	or Table 6c	factor	Table 6d	W	
East	8.7000		19.6403		0.7000		0.0000		0.7700			92.0991 (76)
East	14.9700		19.6403		0.7000		0.0000		0.7700			158.4739 (76)
West	6.7500		19.6403		0.7000		0.0000		0.7700			71.4562 (80)
North	0.7200		10.6334		0.7000		0.0000		0.7700			4.1266 (74)
North	1.3400		10.6334		0.7000		0.0000		0.7700			7.6801 (74)
Solar gains	333.8359	652.5207	1075.7906	1574.6438	1937.2709	1987.0283	1890.0966	1618.1247	1252.6951	774.3561	416.0977	274.6638 (83)
Total gains	1209.9368	1525.7908	1921.3141	2370.5267	2681.3898	2685.4107	2562.1270	2293.8162	1955.3649	1523.8138	1220.7309	1127.0003 (84)

7. Mean internal temperature (heating season)

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Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	26.6741	26.7542	26.8332	27.2106	27.2824	27.6216	27.6216	27.6853	27.4899	27.2824	27.1375	26.9878
alpha	2.7783	2.7836	2.7889	2.8140	2.8188	2.8414	2.8414	2.8457	2.8327	2.8188	2.8092	2.7992
util living area	0.9407	0.8963	0.8097	0.6648	0.5068	0.3652	0.2693	0.3111	0.5111	0.7735	0.9099	0.9496 (86)
Living	19.2643	19.5998	20.0589	20.5014	20.7444	20.8497	20.8789	20.8723	20.7822	20.3831	19.7333	19.2055
Non living	18.1357	18.5569	19.1241	19.6601	19.9368	20.0556	20.0823	20.0792	19.9895	19.5377	18.7383	18.0678
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	31	28	31	30	31	30	31	31	30	31	30	31
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000 (87)
Th 2	20.2042	20.2064	20.2085	20.2187	20.2206	20.2294	20.2294	20.2311	20.2260	20.2206	20.2167	20.2127 (88)
util rest of house	0.9341	0.8856	0.7918	0.6378	0.4725	0.3248	0.2238	0.2617	0.4645	0.7459	0.8988	0.9439 (89)
MIT 2	20.2042	20.2064	20.2085	20.2187	20.2206	20.2294	20.2294	20.2311	20.2260	20.2206	20.2167	20.2127 (90)
Living area fraction												FLA = Living area / (4) = 0.2039 (91)
MIT	20.3664	20.3682	20.3699	20.3780	20.3795	20.3865	20.3865	20.3878	20.3838	20.3795	20.3764	20.3732 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3664	20.3682	20.3699	20.3780	20.3795	20.3865	20.3865	20.3878	20.3838	20.3795	20.3764	20.3732 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9355	0.8879	0.7956	0.6435	0.4796	0.3332	0.2331	0.2719	0.4743	0.7518	0.9012	0.9452 (94)
Useful gains	1131.9370	1354.7581	1528.6696	1525.4175	1286.1135	894.7788	597.3336	623.7015	927.4781	1145.6146	1100.0785	1065.1913 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	14.1000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	2658.2815	2551.6345	2281.2457	1861.6547	1404.0535	924.5747	605.0137	635.7117	1008.8389	1581.9973	2159.1486	2644.8541 (97)
Space heating kWh	1135.6003	804.3009	559.9166	242.0908	87.7474	0.0000	0.0000	0.0000	0.0000	324.6687	762.5305	1175.2691 (98a)
Space heating requirement - total per year (kWh/year)												5092.1243
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	1135.6003	804.3009	559.9166	242.0908	87.7474	0.0000	0.0000	0.0000	0.0000	324.6687	762.5305	1175.2691 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5092.1243
Space heating per m2												(98c) / (4) = 26.3772 (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 %)												355.8164 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												32.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1135.6003	804.3009	559.9166	242.0908	87.7474	0.0000	0.0000	0.0000	0.0000	324.6687	762.5305	1175.2691 (98)
Space heating efficiency (main heating system 1)	355.8164	355.8164	355.8164	355.8164	355.8164	0.0000	0.0000	0.0000	0.0000	355.8164	355.8164	355.8164 (210)
Space heating fuel (main heating system)	319.1535	226.0438	157.3611	68.0381	24.6609	0.0000	0.0000	0.0000	0.0000	91.2461	214.3045	330.3021 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	272.7604	241.3519	256.8459	227.0012	220.8226	199.8345	197.8916	205.2989	207.0437	229.8397	243.1149	269.9465 (64)
Efficiency of water heater	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550 (216)
Fuel for water heating, kWh/month	203.7731	180.3085	191.8837	169.5874	164.9715	149.2918	147.8403	153.3741	154.6776	171.7080	181.6256	201.6708 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	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	46.9268	37.6464	33.8964	24.8340	19.1825	15.6723	17.4989	22.7457	29.5445	38.7639	43.7838	48.2311 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1431.1101 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												133.8550
Water heating fuel used												2070.7123 (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)												378.7263 (232)

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

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PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3880.5487	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1431.1101	16.4900	235.9901	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2070.7123	16.4900	341.4605	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	378.7263	16.4900	62.4520	(250)
Additional standing charges			0.0000	(251)
Total energy cost			639.9025	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.9677	(257)
SAP value		84.3133	
SAP rating (Section 12)		84	(258)
SAP band		B	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1431.1101	0.1564	223.8587	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2070.7123	0.1408	291.4738	(264)
Space and water heating			515.3324	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	378.7263	0.1443	54.6619	(268)
Total CO2, kg/year			569.9943	(272)
CO2 emissions per m2			2.9500	(273)
EI value			96.7915	
EI rating			97	(274)
EI band			A	

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Basement floor	51.7800 (1a)	x 2.5900 (2a)	= 134.1102 (1a)	- (3a)
Ground floor	51.7800 (1b)	x 2.3000 (2b)	= 119.0940 (1b)	- (3b)
First floor	64.4100 (1c)	x 2.3000 (2c)	= 148.1430 (1c)	- (3c)
Second floor	25.0800 (1d)	x 1.6800 (2d)	= 42.1344 (1d)	- (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	193.0500		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	443.4816 (5)	

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	6 * 10 =	60.0000	(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) =	60.0000 / (5) =	0.1353 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3853	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3275	(21)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	7.0000	6.5000	6.4000	5.8000	5.7000	5.0000	4.9000	4.8000	5.5000	6.2000	6.3000	6.9000 (22)
Wind factor	1.7500	1.6250	1.6000	1.4500	1.4250	1.2500	1.2250	1.2000	1.3750	1.5500	1.5750	1.7250 (22a)
Adj infilt rate												
Effective ac	0.5731	0.5322	0.5240	0.4749	0.4667	0.4094	0.4012	0.3930	0.4503	0.5076	0.5158	0.5649 (22b)
	0.6642	0.6416	0.6373	0.6128	0.6089	0.5838	0.5805	0.5772	0.6014	0.6288	0.6330	0.6596 (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					
Rear (Uw = 1.20)			8.7000	1.1450	9.9618		(27)					
Rear (Uw = 1.20)			14.9700	1.1450	17.1412		(27)					
Front (Uw = 1.20)			6.7500	1.1450	7.7290		(27)					
Side (Uw = 1.20)			0.7200	1.1450	0.8244		(27)					
Side (Uw = 1.20)			1.3400	1.1450	1.5344		(27)					
Front			2.2100	1.0000	2.2100		(26a)					
Ground Floor			51.7800	0.1300	6.7314	110.0000	5695.8000 (28)					
Basement Wall	53.6400	24.3900	29.2500	0.1800	5.2650	70.0000	2047.5000 (29a)					
External Wall	116.9100	10.3000	106.6100	0.1800	19.1898	70.0000	7462.7000 (29a)					
Dwarf Wall	8.5400		8.5400	0.1800	1.5372	9.0000	76.8600 (29a)					
Warm Roof	56.0600		56.0600	0.1100	6.1666	9.0000	504.5400 (30)					
Flat Roof	11.2000		11.2000	0.1100	1.2320	9.0000	100.8000 (30)					
Total net area of external elements Aum(A, m2)			298.1300				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	79.5228	(33)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =	15888.2000	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K						82.3010	(35)					
List of Thermal Bridges												
K1 Element				Length	Psi-value	Total						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)						0.0000	(36)					
Point Thermal bridges						(36a) =	0.0000					
Total fabric heat loss						(33) + (36) + (36a) =	79.5228 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	97.2101	93.8991	93.2663	89.6757	89.1116	85.4376	84.9519	84.4761	88.0128	92.0302	92.6433	96.5283 (38)
Heat transfer coeff	176.7330	173.4219	172.7891	169.1985	168.6344	164.9604	164.4748	163.9990	167.5356	171.5530	172.1662	176.0511 (39)
Average = Sum(39)m / 12 =												170.1264
HLP	0.9155	0.8983	0.8950	0.8764	0.8735	0.8545	0.8520	0.8495	0.8678	0.8886	0.8918	0.9119 (40)
HLP (average)												0.8813
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9929 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	85.8312	84.5565	82.7614	79.4516	76.9733	74.2252	72.7409	74.5234	76.4642	79.4047	82.7827	85.5410 (42b)
Hot water usage for other uses	45.2800	43.6334	41.9869	40.3404	38.6938	37.0473	37.0473	38.6938	40.3404	41.9869	43.6334	45.2800 (42c)
Average daily hot water use (litres/day)												120.7427 (43)
Daily hot water use	131.1112	128.1899	124.7483	119.7920	115.6671	111.2725	109.7881	113.2172	116.8046	121.3916	126.4161	130.8210 (44)
Energy conte	207.6480	182.5407	191.7335	163.9892	155.7102	136.8225	132.7792	140.1865	144.0317	164.7273	180.1029	204.8341 (45)
Energy content (annual)										Total = Sum(45)m =		2005.1060
Distribution loss (46)m = 0.15 x (45)m	31.1472	27.3811	28.7600	24.5984	23.3565	20.5234	19.9169	21.0280	21.6048	24.7091	27.0154	30.7251 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.5000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.3500 (55)
Total storage loss	41.8500	37.8000	41.8500	40.5000	41.8500	40.5000	41.8500	41.8500	40.5000	41.8500	40.5000	41.8500 (56)
If cylinder contains dedicated solar storage	41.8500	37.8000	41.8500	40.5000	41.8500	40.5000	41.8500	41.8500	40.5000	41.8500	40.5000	41.8500 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	272.7604	241.3519	256.8459	227.0012	220.8226	199.8345	197.8916	205.2989	207.0437	229.8397	243.1149	269.9465 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	272.7604	241.3519	256.8459	227.0012	220.8226	199.8345	197.8916	205.2989	207.0437	229.8397	243.1149	269.9465 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Heat gains from water heating, kWh/month	121.1329	107.7438	115.8413	104.9360	103.8636	95.9031	96.2390	98.7019	98.3001	106.8617	110.2938	120.1973 (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	179.5723	179.5723	179.5723	179.5723	179.5723	179.5723	179.5723	179.5723	179.5723	179.5723	179.5723	179.5723 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.6126	47.6183	38.7258	29.3179	21.9155	18.5020	19.9920	25.9864	34.8789	44.2868	51.6892	55.1027 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	543.8677	549.5114	535.2896	505.0130	466.7943	430.8742	406.8773	401.2336	415.4554	445.7320	483.9507	519.8708 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.9501	55.9501	55.9501	55.9501	55.9501	55.9501	55.9501	55.9501	55.9501	55.9501	55.9501	55.9501 (69)

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Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation	(negative values)	(negative values)	(negative values)	(negative values)	(negative values)	(negative values)	(negative values)	(negative values)	(negative values)	(negative values)	(negative values)	(negative values)	(negative values) (71)
Water heating gains (Table 5)	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148 (71)
Total internal gains	162.8130	160.3330	155.7007	145.7445	139.6015	133.1987	129.3535	132.6639	136.5280	143.6314	153.1859	161.5554	(72)
	876.1009	873.2701	845.5235	795.8829	744.1189	698.3824	672.0303	675.6914	702.6698	749.4576	804.6332	852.3365	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
East	8.7000	26.4917	0.7000	0.0000	0.7700	124.2276 (76)
East	14.9700	26.4917	0.7000	0.0000	0.7700	213.7571 (76)
West	6.7500	26.4917	0.7000	0.0000	0.7700	96.3835 (80)
North	0.7200	14.1336	0.7000	0.0000	0.7700	5.4849 (74)
North	1.3400	14.1336	0.7000	0.0000	0.7700	10.2081 (74)

Solar gains	450.0612	766.3879	1240.2870	1838.6983	2122.6549	2378.8001	2066.3498	1909.7168	1517.8114	939.9815	552.7717	369.1227	(83)
Total gains	1326.1621	1639.6581	2085.8106	2634.5812	2866.7738	3077.1825	2738.3802	2585.4083	2220.4813	1689.4391	1357.4049	1221.4592	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, nil,m (see Table 9a)	24.9721	25.4489	25.5420	26.0841	26.1713	26.7542	26.8332	26.9111	26.3430	25.7261	25.6345	25.0688	21.0000 (85)
tau	2.6648	2.6966	2.7028	2.7389	2.7448	2.7836	2.7889	2.7941	2.7562	2.7151	2.7090	2.6713	
util living area	0.9072	0.8565	0.7643	0.6248	0.4984	0.3503	0.2984	0.3025	0.4585	0.7014	0.8544	0.9163	(86)
Living	19.5763	19.8467	20.1940	20.5405	20.7331	20.8459	20.8683	20.8688	20.8016	20.5160	20.0449	19.5711	
Non living	18.4955	18.8380	19.2588	19.6760	19.8948	20.0277	20.0518	20.0547	19.9775	19.6562	19.0950	18.4931	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	31	28	31	30	31	30	31	31	30	31	30	31	
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0	
MIT	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	(87)
Th 2	20.1544	20.1689	20.1717	20.1876	20.1901	20.2064	20.2085	20.2106	20.1949	20.1772	20.1745	20.1574	(88)
util rest of house	0.8957	0.8407	0.7417	0.5959	0.4637	0.3125	0.2543	0.2562	0.4109	0.6646	0.8348	0.9054	(89)
MIT 2	20.1544	20.1689	20.1717	20.1876	20.1901	20.2064	20.2085	20.2106	20.1949	20.1772	20.1745	20.1574	(90)
Living area fraction									fLA = Living area / (4) =				0.2039 (91)
MIT	20.3268	20.3384	20.3406	20.3532	20.3552	20.3682	20.3699	20.3716	20.3591	20.3449	20.3428	20.3292	(92)
Temperature adjustment													0.0000
adjusted MIT	20.3268	20.3384	20.3406	20.3532	20.3552	20.3682	20.3699	20.3716	20.3591	20.3449	20.3428	20.3292	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8982	0.8441	0.7465	0.6020	0.4709	0.3203	0.2634	0.2658	0.4209	0.6725	0.8390	0.9078	(94)
Useful gains	1191.1527	1384.0091	1557.1022	1585.9484	1350.0281	985.7359	721.3508	687.1438	934.4965	1136.1754	1138.9161	1108.8404	(95)
Ext temp.	6.6000	6.8000	7.7000	9.2000	11.6000	14.2000	15.9000	16.1000	14.4000	11.9000	9.3000	7.0000	(96)
Heat loss rate W	2425.9738	2347.8496	2184.1562	1887.1062	1476.4272	1017.5028	735.1829	700.5324	998.3564	1448.7527	1901.1921	2346.6137	(97)
Space heating kWh	918.7069	647.7008	466.5281	216.8336	94.0409	0.0000	0.0000	0.0000	0.0000	232.5575	548.8387	920.9034	(98a)
Space heating requirement - total per year (kWh/year)													4046.1100
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	918.7069	647.7008	466.5281	216.8336	94.0409	0.0000	0.0000	0.0000	0.0000	232.5575	548.8387	920.9034	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)													4046.1100
Space heating per m2										(98c) / (4) =			20.9589 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from main system(s)													0.0000 (201)
Efficiency of main space heating system 1 (in %)													1.0000 (202)
Efficiency of main space heating system 2 (in %)													329.9956 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (207)
													32.0000 (208)
Space heating requirement	918.7069	647.7008	466.5281	216.8336	94.0409	0.0000	0.0000	0.0000	0.0000	232.5575	548.8387	920.9034	(98)
Space heating efficiency (main heating system 1)	329.9956	329.9956	329.9956	329.9956	329.9956	0.0000	0.0000	0.0000	0.0000	329.9956	329.9956	329.9956	(210)
Space heating fuel (main heating system)	278.3997	196.2756	141.3740	65.7080	28.4976	0.0000	0.0000	0.0000	0.0000	70.4729	166.3170	279.0653	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	272.7604	241.3519	256.8459	227.0012	220.8226	199.8345	197.8916	205.2989	207.0437	229.8397	243.1149	269.9465	(64)
Efficiency of water heater (217)m	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	(216)
Fuel for water heating, kWh/month	203.7731	180.3085	191.8837	169.5874	164.9715	149.2918	147.8403	153.3741	154.6776	171.7080	181.6256	201.6708	(219)
Space cooling fuel requirement													

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(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	46.9268	37.6464	33.8964	24.8340	19.1825	15.6723	17.4989	22.7457	29.5445	38.7639	43.7838	48.2311	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1226.1102	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												133.8550	
Water heating fuel used												2070.7123	(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)												378.7263	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												3675.5487	(238)

10a. Fuel costs - using BEDF prices (540)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1226.1102	25.1600	308.4893 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2070.7123	25.1600	520.9912 (247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	378.7263	25.1600	95.2875 (250)
Additional standing charges			0.0000 (251)
Total energy cost			924.7681 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1226.1102	0.1564	191.7572 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2070.7123	0.1408	291.4738 (264)
Space and water heating			483.2310 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	378.7263	0.1443	54.6619 (268)
Total CO2, kg/year			537.8929 (272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1226.1102	1.5790	1935.9809 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2070.7123	1.5205	3148.4620 (278)
Space and water heating			5084.4429 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	378.7263	1.5338	580.9030 (282)
Total Primary energy kWh/year			5665.3459 (286)

SAP 10 EPC IMPROVEMENTS

New Build

Current energy efficiency rating: B 84
 Current environmental impact rating: A 97

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

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

Typical annual savings Energy Environmental efficiency impact

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Recommended measures
(none)

Total Savings £0 0.00 kg/m²

Potential energy efficiency rating: B 84
Potential environmental impact rating: A 97

Fuel prices for cost data on this page from database revision number 540 TEST (28 Mar 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current £925	Potential £925	Saving £0
Electricity			
Space heating	£308	£308	£0
Water heating	£521	£521	£0
Lighting	£95	£95	£0
Total cost of fuels	£925	£925	£0
Total cost of uses	£924	£924	£0
Delivered energy	19 kWh/m ²	19 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.5 tonnes	0.5 tonnes	0.0 tonnes
CO2 emissions per m ²	3 kg/m ²	3 kg/m ²	0 kg/m ²
Primary energy	29 kWh/m ²	29 kWh/m ²	0 kWh/m ²

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Basement floor	51.7800 (1a)	x 2.5900 (2a)	= 134.1102 (1a) - (3a)
Ground floor	51.7800 (1b)	x 2.3000 (2b)	= 119.0940 (1b) - (3b)
First floor	64.4100 (1c)	x 2.3000 (2c)	= 148.1430 (1c) - (3c)
Second floor	25.0800 (1d)	x 1.6800 (2d)	= 42.1344 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	193.0500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	443.4816 (5)

2. Ventilation rate

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	6 * 10 =	60.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	60.0000 / (5) =	0.1353 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3853	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4176	0.4094	0.4012	0.3602	0.3521	0.3111	0.3111	0.3029	0.3275	0.3521	0.3684	0.3848 (22b)
Effective ac	0.5872	0.5838	0.5805	0.5649	0.5620	0.5484	0.5484	0.5459	0.5536	0.5620	0.5679	0.5740 (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
Rear (Uw = 1.20)			8.7000	1.1450	9.9618		(27)
Rear (Uw = 1.20)			14.9700	1.1450	17.1412		(27)
Front (Uw = 1.20)			6.7500	1.1450	7.7290		(27)
Side (Uw = 1.20)			0.7200	1.1450	0.8244		(27)
Side (Uw = 1.20)			1.3400	1.1450	1.5344		(27)
Front			2.2100	1.0000	2.2100		(26a)
Ground Floor			51.7800	0.1300	6.7314	110.0000	5695.8000 (28)
Basement Wall	53.6400	24.3900	29.2500	0.1800	5.2650	70.0000	2047.5000 (29a)
External Wall	116.9100	10.3000	106.6100	0.1800	19.1898	70.0000	7462.7000 (29a)
Dwarf Wall	8.5400		8.5400	0.1800	1.5372	9.0000	76.8600 (29a)
Warm Roof	56.0600		56.0600	0.1100	6.1666	9.0000	504.5400 (30)
Flat Roof	11.2000		11.2000	0.1100	1.2320	9.0000	100.8000 (30)
Total net area of external elements Aum(A, m ²)			298.1300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	79.5228		(33)

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Heat capacity Cm = Sum(A x k)
 Thermal mass parameter (TMP) = Cm / TFA) in kJ/m2K
 List of Thermal Bridges
 K1 Element
 Thermal bridges (Sum(L x Psi) calculated using Appendix K)
 Point Thermal bridges
 Total fabric heat loss

(28)...(30) + (32) + (32a)...(32e) = 15888.2000 (34)
 82.3010 (35)

	Length	Psi-value	Total	
			0.0000	(36)
			(36a) =	0.0000
			(33) + (36) + (36a) =	79.5228 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	85.9330	85.4376	84.9519	82.6710	82.2442	80.2576	80.2576	79.8897	81.0228	82.2442	83.1076	84.0101 (38)
Average = Sum(39)m / 12 =	165.4558	164.9604	164.4748	162.1938	161.7671	159.7805	159.7805	159.4126	160.5457	161.7671	162.6304	163.5330 (39)
												162.1918

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8571	0.8545	0.8520	0.8402	0.8380	0.8277	0.8277	0.8258	0.8316	0.8380	0.8424	0.8471 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9929 (42)	
Hot water usage for mixer showers														
Hot water usage for baths														
Hot water usage for other uses														
Average daily hot water use (litres/day)														
Daily hot water use														
Energy content (annual)														
Distribution loss (46)m = 0.15 x (45)m														
Water storage loss:														
Store volume														150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):														2.5000 (48)
Temperature factor from Table 2b														0.5400 (49)
Enter (49) or (54) in (55)														1.3500 (55)
Total storage loss														
If cylinder contains dedicated solar storage														
Primary loss														
Combi loss														
Total heat required for water heating calculated for each month														
WWHS														
PV diverter														
Solar input														
FGHS														
Output from w/h														
Electric shower(s)														
Heat gains from water heating, kWh/month														
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =														0.0000 (64a)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	179.5723	179.5723	179.5723	179.5723	179.5723	179.5723	179.5723	179.5723	179.5723	179.5723	179.5723	179.5723 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
Pumps, fans												
Losses e.g. evaporation (negative values) (Table 5)												
Water heating gains (Table 5)												
Total internal gains												

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
East	8.7000	19.6403	0.7000	0.0000	0.7700	92.0991 (76)						
East	14.9700	19.6403	0.7000	0.0000	0.7700	158.4739 (76)						
West	6.7500	19.6403	0.7000	0.0000	0.7700	71.4562 (80)						
North	0.7200	10.6334	0.7000	0.0000	0.7700	4.1266 (74)						
North	1.3400	10.6334	0.7000	0.0000	0.7700	7.6801 (74)						
Solar gains	333.8359	652.5207	1075.7906	1574.6438	1937.2709	1987.0283	1890.0966	1618.1247	1252.6951	774.3561	416.0977	274.6638 (83)
Total gains	1209.9368	1525.7908	1921.3141	2370.5267	2681.3898	2685.4107	2562.1270	2293.8162	1955.3649	1523.8138	1220.7309	1127.0003 (84)

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7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	26.6741	26.7542	26.8332	27.2106	27.2824	27.6216	27.6216	27.6853	27.4899	27.2824	27.1375	26.9878
alpha	2.7783	2.7836	2.7889	2.8140	2.8188	2.8414	2.8414	2.8457	2.8327	2.8188	2.8092	2.7992
util living area	0.9407	0.8963	0.8097	0.6648	0.5068	0.3652	0.2693	0.3111	0.5111	0.7735	0.9099	0.9496 (86)
Living	19.2643	19.5998	20.0589	20.5014	20.7444	20.8497	20.8789	20.8723	20.7822	20.3831	19.7333	19.2055
Non living	18.1357	18.5569	19.1241	19.6601	19.9368	20.0556	20.0823	20.0792	19.9895	19.5377	18.7383	18.0678
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	31	28	31	30	31	30	31	31	30	31	30	31
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000 (87)
Th 2	20.2042	20.2064	20.2085	20.2187	20.2206	20.2294	20.2294	20.2311	20.2260	20.2206	20.2167	20.2127 (88)
util rest of house	0.9341	0.8856	0.7918	0.6378	0.4725	0.3248	0.2238	0.2617	0.4645	0.7459	0.8988	0.9439 (89)
MIT 2	20.2042	20.2064	20.2085	20.2187	20.2206	20.2294	20.2294	20.2311	20.2260	20.2206	20.2167	20.2127 (90)
Living area fraction										flA = Living area / (4) =		0.2039 (91)
MIT	20.3664	20.3682	20.3699	20.3780	20.3795	20.3865	20.3865	20.3878	20.3838	20.3795	20.3764	20.3732 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3664	20.3682	20.3699	20.3780	20.3795	20.3865	20.3865	20.3878	20.3838	20.3795	20.3764	20.3732 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9355	0.8879	0.7956	0.6435	0.4796	0.3332	0.2331	0.2719	0.4743	0.7518	0.9012	0.9452 (94)
Useful gains	1131.9370	1354.7581	1528.6696	1525.4175	1286.1135	894.7788	597.3336	623.7015	927.4781	1145.6146	1100.0785	1065.1913 (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	2658.2815	2551.6345	2281.2457	1861.6547	1404.0535	924.5747	605.0137	635.7117	1008.8389	1581.9973	2159.1486	2644.8541 (97)
Space heating kWh	1135.6003	804.3009	559.9166	242.0908	87.7474	0.0000	0.0000	0.0000	0.0000	324.6687	762.5305	1175.2691 (98a)
Space heating requirement - total per year (kWh/year)												5092.1243
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	1135.6003	804.3009	559.9166	242.0908	87.7474	0.0000	0.0000	0.0000	0.0000	324.6687	762.5305	1175.2691 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5092.1243
Space heating per m2												(98c) / (4) = 26.3772 (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 %)												355.8164 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												32.0000 (208)
Space heating requirement	1135.6003	804.3009	559.9166	242.0908	87.7474	0.0000	0.0000	0.0000	0.0000	324.6687	762.5305	1175.2691 (98)
Space heating efficiency (main heating system 1)	355.8164	355.8164	355.8164	355.8164	355.8164	0.0000	0.0000	0.0000	0.0000	355.8164	355.8164	355.8164 (210)
Space heating fuel (main heating system)	319.1535	226.0438	157.3611	68.0381	24.6609	0.0000	0.0000	0.0000	0.0000	91.2461	214.3045	330.3021 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	272.7604	241.3519	256.8459	227.0012	220.8226	199.8345	197.8916	205.2989	207.0437	229.8397	243.1149	269.9465 (64)
Efficiency of water heater	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550 (216)
Fuel for water heating, kWh/month	203.7731	180.3085	191.8837	169.5874	164.9715	149.2918	147.8403	153.3741	154.6776	171.7080	181.6256	201.6708 (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	46.9268	37.6464	33.8964	24.8340	19.1825	15.6723	17.4989	22.7457	29.5445	38.7639	43.7838	48.2311 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1431.1101 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												133.8550
Water heating fuel used												2070.7123 (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)												378.7263 (232)

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

PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3880.5487	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1431.1101	16.4900	235.9901 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2070.7123	16.4900	341.4605 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	378.7263	16.4900	62.4520 (250)
Additional standing charges			0.0000 (251)
Total energy cost			639.9025 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.9677 (257)
SAP value		84.3133
SAP rating (Section 12)		84 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1431.1101	0.1564	223.8587 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2070.7123	0.1408	291.4738 (264)
Space and water heating			515.3324 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	378.7263	0.1443	54.6619 (268)
Total CO2, kg/year			569.9943 (272)
CO2 emissions per m2			2.9500 (273)
EI value			96.7915
EI rating			97 (274)
EI band			A

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Basement floor	51.7800 (1a)	x 2.5900 (2a)	= 134.1102 (1a) - (3a)
Ground floor	51.7800 (1b)	x 2.3000 (2b)	= 119.0940 (1b) - (3b)
First floor	64.4100 (1c)	x 2.3000 (2c)	= 148.1430 (1c) - (3c)
Second floor	25.0800 (1d)	x 1.6800 (2d)	= 42.1344 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	193.0500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	443.4816 (5)

2. Ventilation rate

		m3 per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	6 * 10 =	60.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	$= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =$	60.0000 / (5) = 0.1353 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3853 (18)
Number of sides sheltered		2 (19)
Shelter factor	$(20) = 1 - [0.075 \times (19)] =$	0.8500 (20)
Infiltration rate adjusted to include shelter factor	$(21) = (18) \times (20) =$	0.3275 (21)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	7.0000	6.5000	6.4000	5.8000	5.7000	5.0000	4.9000	4.8000	5.5000	6.2000	6.3000	6.9000	(22)
Wind factor	1.7500	1.6250	1.6000	1.4500	1.4250	1.2500	1.2250	1.2000	1.3750	1.5500	1.5750	1.7250	(22a)
Adj infilt rate													
Effective ac	0.5731	0.5322	0.5240	0.4749	0.4667	0.4094	0.4012	0.3930	0.4503	0.5076	0.5158	0.5649	(22b)
	0.6642	0.6416	0.6373	0.6128	0.6089	0.5838	0.5805	0.5772	0.6014	0.6288	0.6330	0.6596	(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	
Rear (Uw = 1.20)			8.7000	1.1450	9.9618			(27)
Rear (Uw = 1.20)			14.9700	1.1450	17.1412			(27)
Front (Uw = 1.20)			6.7500	1.1450	7.7290			(27)
Side (Uw = 1.20)			0.7200	1.1450	0.8244			(27)
Side (Uw = 1.20)			1.3400	1.1450	1.5344			(27)
Front			2.2100	1.0000	2.2100			(26a)
Ground Floor			51.7800	0.1300	6.7314	110.0000	5695.8000	(28)
Basement Wall	53.6400	24.3900	29.2500	0.1800	5.2650	70.0000	2047.5000	(29a)
External Wall	116.9100	10.3000	106.6100	0.1800	19.1898	70.0000	7462.7000	(29a)
Dwarf Wall	8.5400		8.5400	0.1800	1.5372	9.0000	76.8600	(29a)
Warm Roof	56.0600		56.0600	0.1100	6.1666	9.0000	504.5400	(30)
Flat Roof	11.2000		11.2000	0.1100	1.2320	9.0000	100.8000	(30)
Total net area of external elements Aum(A, m2)			298.1300					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	79.5228		(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15888.2000 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 82.3010 (35)

List of Thermal Bridges	Kl Element	Length	Psi-value	Total
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				0.0000 (36)
Point Thermal bridges				0.0000 (36a)
Total fabric heat loss				(33) + (36) + (36a) = 79.5228 (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	97.2101	93.8991	93.2663	89.6757	89.1116	85.4376	84.9519	84.4761	88.0128	92.0302	92.6433	96.5283	(38)
Heat transfer coeff	176.7330	173.4219	172.7891	169.1985	168.6344	164.9604	164.4748	163.9990	167.5356	171.5530	172.1662	176.0511	(39)
Average = Sum(39)m / 12 =												170.1264	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9155	0.8983	0.8950	0.8764	0.8735	0.8545	0.8520	0.8495	0.8678	0.8886	0.8918	0.9119	(40)
HLP (average)												0.8813	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	2.9929 (42)
Hot water usage for baths	85.8312	84.5565	82.7614	79.4516	76.9733	74.2252	72.7409	74.5234	76.4642	79.4047	82.7827	85.5410	(42b)
Hot water usage for other uses	45.2800	43.6334	41.9869	40.3404	38.6938	37.0473	37.0473	38.6938	40.3404	41.9869	43.6334	45.2800	(42c)
Average daily hot water use (litres/day)													120.7427 (43)
Daily hot water use	131.1112	128.1899	124.7483	119.7920	115.6671	111.2725	109.7881	113.2172	116.8046	121.3916	126.4161	130.8210	(44)
Energy conte	207.6480	182.5407	191.7335	163.9892	155.7102	136.8225	132.7792	140.1865	144.0317	164.7273	180.1029	204.8341	(45)
Energy content (annual)													Total = Sum(45)m = 2005.1060
Distribution loss (46)m = 0.15 x (45)m	31.1472	27.3811	28.7600	24.5984	23.3565	20.5234	19.9169	21.0280	21.6048	24.7091	27.0154	30.7251	(46)
Water storage loss:													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													2.5000 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.3500 (55)
Total storage loss	41.8500	37.8000	41.8500	40.5000	41.8500	40.5000	41.8500	41.8500	40.5000	41.8500	40.5000	41.8500	(56)
If cylinder contains dedicated solar storage	41.8500	37.8000	41.8500	40.5000	41.8500	40.5000	41.8500	41.8500	40.5000	41.8500	40.5000	41.8500	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	272.7604	241.3519	256.8459	227.0012	220.8226	199.8345	197.8916	205.2989	207.0437	229.8397	243.1149	269.9465	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	272.7604	241.3519	256.8459	227.0012	220.8226	199.8345	197.8916	205.2989	207.0437	229.8397	243.1149	269.9465	(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	121.1329	107.7438	115.8413	104.9360	103.8636	95.9031	96.2390	98.7019	98.3001	106.8617	110.2938	120.1973	(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	179.5723	179.5723	179.5723	179.5723	179.5723	179.5723	179.5723	179.5723	179.5723	179.5723	179.5723	179.5723	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.6126	47.6183	38.7258	29.3179	21.9155	18.5020	19.9920	25.9864	34.8789	44.2868	51.6892	55.1027	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	543.8677	549.5114	535.2896	505.0130	466.7943	430.8742	406.8773	401.2336	415.4554	445.7320	483.9507	519.8708	(68)

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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.9501	55.9501	55.9501	55.9501	55.9501	55.9501	55.9501	55.9501	55.9501	55.9501	55.9501	55.9501 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148	-119.7148 (71)
Water heating gains (Table 5)	162.8130	160.3330	155.7007	145.7445	139.6015	133.1987	129.3535	132.6639	136.5280	143.6314	153.1859	161.5554 (72)
Total internal gains	876.1009	873.2701	845.5235	795.8829	744.1189	698.3824	672.0303	675.6914	702.6698	749.4576	804.6332	852.3365 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
East	8.7000	26.4917	0.7000	0.0000	0.7700	124.2276 (76)						
East	14.9700	26.4917	0.7000	0.0000	0.7700	213.7571 (76)						
West	6.7500	26.4917	0.7000	0.0000	0.7700	96.3835 (80)						
North	0.7200	14.1336	0.7000	0.0000	0.7700	5.4849 (74)						
North	1.3400	14.1336	0.7000	0.0000	0.7700	10.2081 (74)						
Solar gains	450.0612	766.3879	1240.2870	1838.6983	2122.6549	2378.8001	2066.3498	1909.7168	1517.8114	939.9815	552.7717	369.1227 (83)
Total gains	1326.1621	1639.6581	2085.8106	2634.5812	2866.7738	3077.1825	2738.3802	2585.4083	2220.4813	1689.4391	1357.4049	1221.4592 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	24.9721	25.4489	25.5420	26.0841	26.1713	26.7542	26.8332	26.9111	26.3430	25.7261	25.6345	25.0688
alpha	2.6648	2.6966	2.7028	2.7389	2.7448	2.7836	2.7889	2.7941	2.7562	2.7151	2.7090	2.6713
util living area	0.9072	0.8565	0.7643	0.6248	0.4984	0.3503	0.2984	0.3025	0.4585	0.7014	0.8544	0.9163 (86)
Living	19.5763	19.8467	20.1940	20.5405	20.7331	20.8459	20.8683	20.8688	20.8016	20.5160	20.0449	19.5711
Non living	18.4955	18.8380	19.2588	19.6760	19.8948	20.0277	20.0518	20.0547	19.9775	19.6562	19.0950	18.4931
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	31	28	31	30	31	30	31	31	30	31	30	31
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000 (87)
Th 2	20.1544	20.1689	20.1717	20.1876	20.1901	20.2064	20.2085	20.2106	20.1949	20.1772	20.1745	20.1574 (88)
util rest of house	0.8957	0.8407	0.7417	0.5959	0.4637	0.3125	0.2543	0.2562	0.4109	0.6646	0.8348	0.9054 (89)
MIT 2	20.1544	20.1689	20.1717	20.1876	20.1901	20.2064	20.2085	20.2106	20.1949	20.1772	20.1745	20.1574 (90)
Living area fraction	fLA = Living area / (4) =											0.2039 (91)
MIT	20.3268	20.3384	20.3406	20.3532	20.3552	20.3682	20.3699	20.3716	20.3591	20.3449	20.3428	20.3292 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3268	20.3384	20.3406	20.3532	20.3552	20.3682	20.3699	20.3716	20.3591	20.3449	20.3428	20.3292 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8982	0.8441	0.7465	0.6020	0.4709	0.3203	0.2634	0.2658	0.4209	0.6725	0.8390	0.9078 (94)
Useful gains	1191.1527	1384.0091	1557.1022	1585.9484	1350.0281	985.7359	721.3508	687.1438	934.4965	1136.1754	1138.9161	1108.8404 (95)
Ext temp.	6.6000	6.8000	7.7000	9.2000	11.6000	14.2000	15.9000	16.1000	14.4000	11.9000	9.3000	7.0000 (96)
Heat loss rate W	2425.9738	2347.8496	2184.1562	1887.1062	1476.4272	1017.5028	735.1829	700.5324	998.3564	1448.7527	1901.1921	2346.6137 (97)
Space heating kWh	918.7069	647.7008	466.5281	216.8336	94.0409	0.0000	0.0000	0.0000	0.0000	232.5575	548.8387	920.9034 (98a)
Space heating requirement - total per year (kWh/year)												4046.1100
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	918.7069	647.7008	466.5281	216.8336	94.0409	0.0000	0.0000	0.0000	0.0000	232.5575	548.8387	920.9034 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4046.1100
Space heating per m2												(98c) / (4) = 20.9589 (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 %)												329.9956 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												32.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	918.7069	647.7008	466.5281	216.8336	94.0409	0.0000	0.0000	0.0000	0.0000	232.5575	548.8387	920.9034 (98)
Space heating efficiency (main heating system 1)	329.9956	329.9956	329.9956	329.9956	329.9956	0.0000	0.0000	0.0000	0.0000	329.9956	329.9956	329.9956 (210)
Space heating fuel (main heating system)	278.3997	196.2756	141.3740	65.7080	28.4976	0.0000	0.0000	0.0000	0.0000	70.4729	166.3170	279.0653 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	272.7604	241.3519	256.8459	227.0012	220.8226	199.8345	197.8916	205.2989	207.0437	229.8397	243.1149	269.9465 (64)
Efficiency of water heater												133.8550 (216)
(217)m	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550 (217)
Fuel for water heating, kWh/month												

Full SAP Calculation Printout



	203.7731	180.3085	191.8837	169.5874	164.9715	149.2918	147.8403	153.3741	154.6776	171.7080	181.6256	201.6708	(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	46.9268	37.6464	33.8964	24.8340	19.1825	15.6723	17.4989	22.7457	29.5445	38.7639	43.7838	48.2311	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1226.1102	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												133.8550	
Water heating fuel used												2070.7123	(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)												378.7263	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												3675.5487	(238)

10a. Fuel costs - using BEDF prices (540)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1226.1102	25.1600	308.4893	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2070.7123	25.1600	520.9912	(247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	378.7263	25.1600	95.2875	(250)
Additional standing charges			0.0000	(251)
Total energy cost			924.7681	(255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1226.1102	0.1564	191.7572	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2070.7123	0.1408	291.4738	(264)
Space and water heating			483.2310	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	378.7263	0.1443	54.6619	(268)
Total CO2, kg/year			537.8929	(272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1226.1102	1.5790	1935.9809	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2070.7123	1.5205	3148.4620	(278)
Space and water heating			5084.4429	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	378.7263	1.5338	580.9030	(282)
Total Primary energy kWh/year			5665.3459	(286)

Predicted Energy Assessment



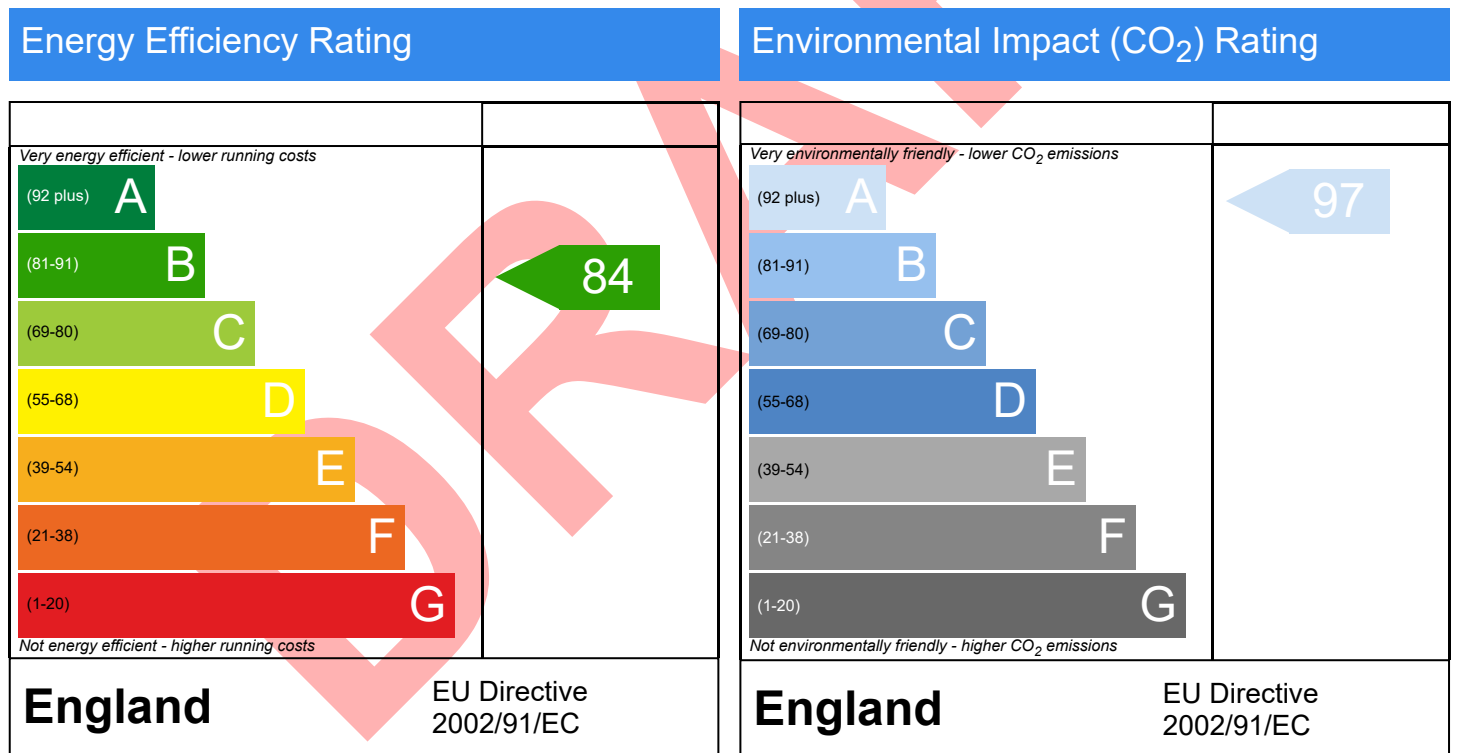
Buddock Water, 1 Condor Cottages, Falmouth, TR11 5DY

Dwelling type:
Date of assessment:
Produced by:
Total floor area:
DRRN:

House, End-Terrace
14/04/2024
Chris Law
193.05 m²

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

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



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

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

Thermal Bridging



Property Reference	1 Condor Cottages		Issued on Date	14/04/2024
Assessment Reference	New Build	Prop Type Ref	End-Terrace House	
Property	Buddock Water, 1 Condor Cottages, Falmouth, TR11 5DY			

SAP Rating	84 B	DER	3.00	TER	7.48
Environmental	97 A	% DER < TER			59.89
CO ₂ Emissions (t/year)	0.54	DFEE	27.50	TFEE	29.27
Compliance Check	See BREL	% DFEE < TFEE			6.04
% DPER < TPER	19.01	DPER	31.54	TPER	38.94

Assessor Details	Mr. Chris Law	Assessor ID	AX42-0001
Client			

	Junction details	Source Type	Psi (W/mK)	Length (m)	Result	Reference
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Total: W/mK:
 Y-Value: W/m²K:

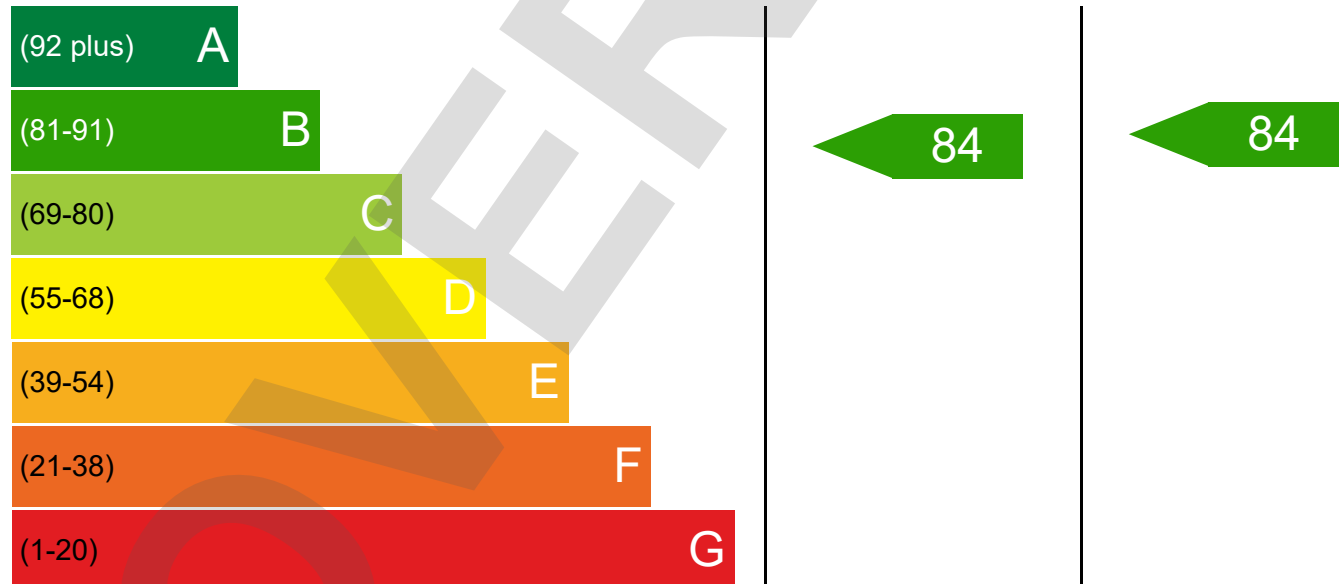
Dwelling Address	Buddock Water, 1 Condor Cottages, Falmouth, TR11 5DY
Report Date	14/04/2024
Property Type	House, End-Terrace
Floor Area [m ²]	193

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

Energy Rating

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

Most energy efficient - lower running costs



Least energy efficient - higher running costs

Breakdown of property's energy performance

Each feature is assessed as one of the following:



Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.18 W/m ² K	Very Good
Roof	Average thermal transmittance 0.11 W/m ² K	Very Good
Floor	Average thermal transmittance 0.13 W/m ² K	Very Good
Windows	High performance glazing	Very Good
Main heating	Air source heat pump, radiators and underfloor, electric	Very Good
Main heating controls	Time and temperature zone control	Very Good
Secondary heating	Room heaters, wood logs	
Hot water	From main system	Poor
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 5.0 m ³ /h.m ² (assumed)	Good

Primary Energy use

The primary energy use for this property per year is 29 kilowatt hour (kWh) per square metre

Estimated CO₂ emissions of the dwelling

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

The estimated CO emissions for this dwellings is: **0.5** per year

With the recommended measures the potential CO emissions could be: **1** per year

Recommendations

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

Recommended measure	Typical Yearly Saving	Potential Rating after measure installed	Cumulative savings (per year)	Cumulative Potential Rating
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Estimated energy use and potential savings

Estimated energy cost for this property over a year

£925

Over a year you could save

£0

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

Contacting the assessor and the accreditation scheme

Assessor contact details	
Assessor name	Mr. Chris Law
Assessor's accreditation number	EES/027443
Email Address	chris@epc4energy.co.uk

Accreditation scheme contact details

Accreditation scheme	Elmhurst Energy Systems Ltd
Telephone	07543 640 525
Email Address	chris@epc4energy.co.uk

Assessment details

Related party disclosure	No related party
Date of assessment	14/04/2024
Date of certificate	14/04/2024
Type of assessment	SAP, new dwelling

OVERVIEW