

# Building Regulations England Part L (BREL) Compliance Report

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

Date: Wed 27 Mar 2024 09:47:44

Project Information			
Assessed By	Cory Skrzypkowski	Building Type	House, Mid-terrace
OCDEA Registration	EES/027193	Assessment Date	2024-03-27

Dwelling Details			
Assessment Type	As designed	Total Floor Area	185 m <sup>2</sup>
Site Reference	Unit 6	Plot Reference	CEPCN4621
Address	6 Burrill Development Cowling Road, Burrill , DL8 1RG		

Client Details	
Name	Andrew Burningham
Company	Array
Address	

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	8.82 kgCO <sub>2</sub> /m <sup>2</sup>	
Dwelling carbon dioxide emission rate	4.34 kgCO <sub>2</sub> /m <sup>2</sup>	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	46.33 kWh <sub>PE</sub> /m <sup>2</sup>	
Dwelling primary energy	45.11 kWh <sub>PE</sub> /m <sup>2</sup>	OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	42.5 kWh/m <sup>2</sup>	
Dwelling fabric energy efficiency	73.8 kWh/m <sup>2</sup>	FAIL

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m <sup>2</sup> K]	Dwelling average U-Value [W/m <sup>2</sup> K]	Element with highest individual U-Value	
External walls	0.26	0.18	Walls (1) (0.18)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	0.11	Ground Floor (0.11)	OK
Roofs	0.16	0.1	Roof (1) (0.1)	OK
Windows, doors, and roof windows	1.6	1.4	FGD1 (1.4)	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 <sup>2</sup> ]	U-Value [W/m <sup>2</sup> K]
Exposed wall: Walls (1)	135.1306	0.18
Party wall: Party Wall (1)	107.82	0 (!)
Ground floor: Ground Floor, Ground Floor	92.52	0.11
Exposed roof: Roof (1)	92.52	0.1 (!)

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m <sup>2</sup> ]	Orientation	Frame factor	U-Value [W/m <sup>2</sup> K]
FGD1, Fully Glazed Door	6.86	South	0.7	1.4
FGD2, Fully Glazed Door	12.24	West	0.7	1.4
W1, Window	1.4725	South	0.7	1.4
W2, Window	0.455	West	0.7	1.4
W3, Window	1.8744	West	0.7	1.4
W4, Window	0.6175	West	0.7	1.4
W5, Window	1.14	East	0.7	1.4
W6, Window	0.95	East	0.7	1.4
FGD3, Fully Glazed Door	12.24	East	0.7	1.4

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))
Building part 1 - Main Dwelling: SAP default y-value (0.2 W/m <sup>2</sup> K) used for thermal bridging

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	8 m <sup>3</sup> /hm <sup>2</sup>	
Dwelling air permeability at 50Pa	15 m <sup>3</sup> /hm <sup>2</sup> , Assumed value	FAIL
Air permeability test certificate reference		
4 Space heating		
<b>Main heating system 1:</b> Heat pump with radiators or underfloor heating - Electricity		
Efficiency	444.3%	
Emitter type	Underfloor	
Flow temperature	35°C	
System type	Heat Pump	
Manufacturer	Mitsubishi Electric Europe B.V.	
Model	Ecodan 8.5 kW	
Commissioning		
<b>Secondary heating system:</b> N/A		
Fuel	N/A	
Efficiency	N/A	
Commissioning		
5 Hot water		
<b>Cylinder/store</b> - type: Cylinder		
Capacity	180 litres	
Declared heat loss	1.5 kWh/day	
Primary pipework insulated	Yes	
Manufacturer		
Model		
Commissioning		
<b>Waste water heat recovery system 1</b> - type: N/A		
Efficiency		
Manufacturer		
Model		
6 Controls		
<b>Main heating 1</b> - type: Time and temperature zone control by arrangement of plumbing and electrical services		
Function		
Ecodesign class		
Manufacturer		
Model		
<b>Water heating</b> - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		
7 Lighting		
Minimum permitted light source efficacy	75 lm/W	
Lowest light source efficacy	100 lm/W	OK
External lights control	N/A	
8 Mechanical ventilation		
<b>System type:</b> 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**

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.

Signed:

Assessor ID:

Name:

Date:

**b. Client Declaration**

N/A

# Summary for Input Data



Property Reference	Unit 6		Issued on Date	27/03/2024	
Assessment Reference	CEPCN4621	Prop Type Ref	CEPCN4621		
Property	Burrill Development, 6, Cowling Road, Burrill , Bedale, DL8 1RG				
SAP Rating	78 C	DER	4.34	TER	8.82
Environmental	95 A	% DER < TER			50.79
CO <sub>2</sub> Emissions (t/year)	0.87	DFEE	73.81	TFEE	42.54
Compliance Check	See BREL	% DFEE < TFEE			-73.51
% DPER < TPER	2.63	DPER	45.11	TPER	46.33
Assessor Details	Mr. Cory Skrzypkowski			Assessor ID	AU69-0001
Client					

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

Orientation	East	
Property Tenure	ND	
Transaction Type	2	
Terrain Type	Rural	
1.0 Property Type	House, Mid-Terrace	
Position of Flat	Ground-floor flat	
Which Floor	0	
2.0 Number of Storeys	2	
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 <sup>2</sup> K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

## 7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m <sup>2</sup>	0.00 m
Ground floor:	28.00 m	92.52 m <sup>2</sup>	3.20 m
1st Storey:	28.00 m	92.52 m <sup>2</sup>	2.80 m
2nd Storey:	0.00 m	0.00 m <sup>2</sup>	0.00 m
3rd Storey:	0.00 m	0.00 m <sup>2</sup>	0.00 m
4th Storey:	0.00 m	0.00 m <sup>2</sup>	0.00 m
5th Storey:	0.00 m	0.00 m <sup>2</sup>	0.00 m
6th Storey:	0.00 m	0.00 m <sup>2</sup>	0.00 m
7th Storey:	0.00 m	0.00 m <sup>2</sup>	0.00 m

## 8.0 Living Area

44.10 m<sup>2</sup>

## 9.0 External Walls

Description	Type	Construction	U-Value (W/m <sup>2</sup> K)	Kappa (kJ/m <sup>2</sup> K)	Gross Area(m <sup>2</sup> )	Nett Area (m <sup>2</sup> )	Shelter Res	Shelter	Openings	Area Calculation Type
External Walls	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.18	60.00	172.98	135.13	0.00	None	37.85	Enter Gross Area

## 9.1 Party Walls

Description	Type	Construction	U-Value (W/m <sup>2</sup> K)	Kappa (kJ/m <sup>2</sup> K)	Area (m <sup>2</sup> )	Shelter Res	Shelter
Party Walls	Solid Wall	Single plasterboard on dabs on both sides, dense blocks, cavity or cavity fill	0.00	70.00	107.82	0.00	None

## 9.2 Internal Walls

Description	Construction	Kappa (kJ/m <sup>2</sup> K)	Area (m <sup>2</sup> )
Block	Dense block, plasterboard on dabs	75.00	248.08

## 10.0 External Roofs

# Summary for Input Data



Description	Type	Construction	U-Value (W/m <sup>2</sup> K)	Kappa (kJ/m <sup>2</sup> K)	Gross Area (m <sup>2</sup> )	Nett Area (m <sup>2</sup> )	Shelter Code	Shelter Factor	Calculation Type	Openings Area
Roof at Joist	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	9.00	92.52	92.52	None	0.00	Enter Gross Area	0.00

## 10.2 Internal Ceilings

Description	Storey	Construction	Area (m <sup>2</sup> )
GF	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	92.52

## 11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m <sup>2</sup> K)	Shelter Code	Shelter Factor	Kappa (kJ/m <sup>2</sup> K)	Area (m <sup>2</sup> )
Ground Floor	Ground Floor - Solid	Lowest occupied	Slab on ground, screed over insulation	0.11	None	0.00	110.00	92.52

## 11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m <sup>2</sup> K)	Area (m <sup>2</sup> )
FF		Plasterboard ceiling, carpeted chipboard floor	9.00	92.52

## 12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m <sup>2</sup> K)
Fully Glazed Door	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.40
Window	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.40

## 13.0 Openings

Name	Opening Type	Location	Orientation	Area (m <sup>2</sup> )	Pitch
FGD1	Fully Glazed Door	External Walls	South	6.86	0
FGD2	Fully Glazed Door	External Walls	West	12.24	0
W1	Window	External Walls	South	1.47	0
W2	Window	External Walls	West	0.45	0
W3	Window	External Walls	West	1.87	0
W4	Window	External Walls	West	0.62	0
W5	Window	External Walls	East	1.14	0
W6	Window	External Walls	East	0.95	0
FGD3	Fully Glazed Door	External Walls	East	12.24	0

## 14.0 Conservatory

## 15.0 Draught Proofing

 %

## 16.0 Draught Lobby

## 17.0 Thermal Bridging

Y-value

 W/m<sup>2</sup>K

## 18.0 Pressure Testing

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
LED	100.00	5	500	15

## 24.0 Main Heating 1

Percentage of Heat

 %

Database Ref. No.

Fuel Type

SAP Code

In Winter

In Summer

Model Name

Manufacturer

# Summary for Input Data

System Type	Heat Pump
Controls SAP Code	2207
Delayed Start Stat	No
HETAS approved System	No
Oil Pump Inside	No
FI Case	0.00
Flue Type	None or Unknown
Fan Assisted Flue	No
Is MHS Pumped	Pump in heated space
Heating Pump Age	2013 or later
Heat Emitter	Underfloor
Underfloor Heating	Yes - Pipes in thin screed
Flow Temperature	Enter value
Flow Temperature Value	35.00
Boiler Interlock	No
Combi boiler type	No Combi
Combi keep hot type	None

<b>26.0 Heat Networks</b>	None
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<b>28.0 Water Heating</b>	
Water Heating	Main Heating 1
SAP Code	901
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
Summer Immersion	No
Cold Water Source	From mains
Bath Count	0
Supplementary Immersion	No
Immersion Only Heating Hot Water	Yes

<b>28.1 Showers</b>	Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
	Shower 1	Combi boiler or unvented hot water system	11.00		No	
	Shower 2	Combi boiler or unvented hot water system	11.00		No	
	Shower 3	Combi boiler or unvented hot water system	11.00		No	

## 28.3 Waste Water Heat Recovery System

<b>29.0 Hot Water Cylinder</b>	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	180.00	L
Loss	1.50	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	

<b>31.0 Thermal Store</b>	None
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**Recommendations**

**Lower cost measures**

None

**Further measures to achieve even higher standards**

None

# Full SAP Calculation Printout



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Assessor Details	Mr. Cory Skrzypkowski			Assessor ID	AU69-0001
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 <sup>2</sup> )	Storey height (m)	Volume (m <sup>3</sup> )
Ground floor	92.5200 (1b)	x 3.2000 (2b)	= 296.0640 (1b) - (3b)
First floor	92.5200 (1c)	x 2.8000 (2c)	= 259.0560 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	185.0400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 555.1200 (5)

### 2. Ventilation rate

	m <sup>3</sup> 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	6 * 10 = 60.0000 (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) =	60.0000 / (5) = 0.1081 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8581 (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) = 0.7294 (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	0.9299	0.9117	0.8935	0.8023	0.7841	0.6929	0.6929	0.6747	0.7294	0.7841	0.8205	0.8570 (22b)
Effective ac	0.9324	0.9156	0.8992	0.8219	0.8074	0.7401	0.7401	0.7276	0.7660	0.8074	0.8366	0.8672 (25)

### 3. Heat losses and heat loss parameter

Element	Gross m <sup>2</sup>	Openings m <sup>2</sup>	NetArea m <sup>2</sup>	U-value W/m <sup>2</sup> K	A x U W/K	K-value kJ/m <sup>2</sup> K	A x K kJ/K
Fully Glazed Door (Uw = 1.40)			31.3400	1.3258	41.5492		(27)
Window (Uw = 1.40)			6.5100	1.3258	8.6307		(27)
Ground Floor			92.5200	0.1100	10.1772	110.0000	10177.2000 (28a)
External Walls	172.9800	37.8500	135.1300	0.1800	24.3234	60.0000	8107.8000 (29a)
Roof at Joist	92.5200		92.5200	0.1000	9.2520	9.0000	832.6800 (30)
Total net area of external elements Aum(A, m <sup>2</sup> )			358.0200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	93.9325		(33)
Party Walls			107.8200	0.0000	0.0000	70.0000	7547.4000 (32)
Block			248.0800			75.0000	18606.0000 (32c)
FF			92.5200			18.0000	1665.3600 (32d)
GF			92.5200			9.0000	832.6800 (32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		47769.1200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m <sup>2</sup> K							258.1556 (35)
Thermal bridges (Default value 0.200 * total exposed area)							71.6040 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	165.5365 (37)

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



# Full SAP Calculation Printout



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	170.8065	167.7306	164.7156	150.5544	147.9049	135.5709	135.5709	133.2868	140.3217	147.9049	153.2648	158.8684	(38)
Heat transfer coeff	336.3430	333.2671	330.2522	316.0909	313.4414	301.1074	301.1074	298.8233	305.8583	313.4414	318.8013	324.4049	(39)
Average = Sum(39)m / 12 =												316.0782	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8177	1.8011	1.7848	1.7082	1.6939	1.6273	1.6273	1.6149	1.6529	1.6939	1.7229	1.7532	(40)
HLP (average)												1.7082	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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

Assumed occupancy													2.9824	(42)
Hot water usage for mixer showers														
131.1451	129.1742	126.3023	120.8074	116.7523	112.2301	109.6597	112.5098	115.6342	120.4897	126.1026	130.6426	130.6426	(42a)	
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)	
Hot water usage for other uses	45.1729	43.5303	41.8876	40.2450	38.6023	36.9597	36.9597	38.6023	40.2450	41.8876	43.5303	45.1729	(42c)	
Average daily hot water use (litres/day)													161.9777	(43)
Daily hot water use	176.3180	172.7045	168.1899	161.0524	155.3546	149.1898	146.6193	151.1122	155.8792	162.3773	169.6329	175.8155	(44)	
Energy conte	279.2446	245.9289	258.5017	220.4727	209.1372	183.4462	177.3234	187.1084	192.2146	220.3445	241.6731	275.2847	(45)	
Energy content (annual)													2690.6799	
Distribution loss (46)m = 0.15 x (45)m	41.8867	36.8893	38.7752	33.0709	31.3706	27.5169	26.5985	28.0663	28.8322	33.0517	36.2510	41.2927	(46)	
Water storage loss:													180.0000	(47)
Store volume													1.5000	(48)
a) If manufacturer declared loss factor is known (kWh/day):													0.5400	(49)
Temperature factor from Table 2b													0.8100	(55)
Enter (49) or (54) in (55)														
Total storage loss	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	(56)	
If cylinder contains dedicated solar storage	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	(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	327.6170	289.6201	306.8741	267.2847	257.5096	230.2582	225.6958	235.4808	239.0266	268.7169	288.4851	323.6571	(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	327.6170	289.6201	306.8741	267.2847	257.5096	230.2582	225.6958	235.4808	239.0266	268.7169	288.4851	323.6571	(64)	
12Total per year (kWh/year)													3260.2259	(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	131.5468	116.7243	124.6497	110.7568	108.2360	98.4455	97.6579	100.9115	101.3610	111.9625	117.8059	130.2301	(65)	

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	149.1209	149.1209	149.1209	149.1209	149.1209	149.1209	149.1209	149.1209	149.1209	149.1209	149.1209	149.1209	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	180.7341	200.0984	180.7341	186.7585	180.7341	186.7585	180.7341	180.7341	186.7585	180.7341	186.7585	180.7341	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	356.5957	360.2960	350.9713	331.1200	306.0613	282.5096	266.7757	263.0753	272.4001	292.2514	317.3101	340.8617	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.9121	37.9121	37.9121	37.9121	37.9121	37.9121	37.9121	37.9121	37.9121	37.9121	37.9121	37.9121	(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)	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967	(71)
Water heating gains (Table 5)	176.8102	173.6969	167.5400	153.8288	145.4785	136.7298	131.2607	135.6337	140.7791	150.4872	163.6193	175.0404	(72)
Total internal gains	781.8762	801.8276	766.9816	739.4436	700.0101	673.7342	646.5067	647.1794	667.6740	691.2089	735.4242	764.3725	(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	12.2400	19.6403	0.6300	0.7000	0.7700	73.4684	(76)						
South	6.8600	46.7521	0.6300	0.7000	0.7700	98.0159	(78)						
West	12.2400	19.6403	0.6300	0.7000	0.7700	73.4684	(80)						
East	2.0900	19.6403	0.6300	0.7000	0.7700	12.5448	(76)						
South	1.4700	46.7521	0.6300	0.7000	0.7700	21.0034	(78)						
West	2.9500	19.6403	0.6300	0.7000	0.7700	17.7068	(80)						
Solar gains	296.2078	541.5413	819.1283	1113.1528	1312.7218	1325.8740	1269.3275	1121.1726	923.2759	621.5346	362.0117	248.5549	(83)
Total gains	1078.0840	1343.3689	1586.1099	1852.5964	2012.7319	1999.6083	1915.8342	1768.3519	1590.9499	1312.7434	1097.4360	1012.9274	(84)

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

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)														
tau	39.4514	39.8155	40.1790	41.9791	42.3339	44.0680	44.0680	44.4048	43.3835	42.3339	41.6222	40.9032		

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alpha	3.6301	3.6544	3.6786	3.7986	3.8223	3.9379	3.9379	3.9603	3.8922	3.8223	3.7748	3.7269
util living area	0.9980	0.9952	0.9885	0.9661	0.9097	0.7825	0.6320	0.6878	0.8906	0.9813	0.9961	0.9985 (86)
Living	19.1955	19.3861	19.6901	20.1346	20.5006	20.7801	20.8771	20.8601	20.6510	20.1577	19.6349	19.2191
Non living	17.3938	17.6456	18.0412	18.6392	19.0845	19.4123	19.4802	19.4821	19.2848	18.6831	18.0039	17.4558
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	8	23	24	0	0	0	0	0	0	0	0	0
16 / 9	23	24	0	0	0	0	0	0	0	0	0	31
MIT	20.2417	19.9859	19.6901	20.1346	20.5006	20.7801	20.8771	20.8601	20.6510	20.1577	19.6349	19.9913 (87)
Th 2	19.4577	19.4693	19.4807	19.5349	19.5452	19.5934	19.5934	19.6024	19.5748	19.5452	19.5245	19.5030 (88)
util rest of house	0.9972	0.9934	0.9836	0.9505	0.8637	0.6716	0.4574	0.5182	0.8154	0.9700	0.9943	0.9979 (89)
MIT 2	18.7818	18.5188	18.0412	18.6392	19.0845	19.4123	19.4802	19.4821	19.2848	18.6831	18.0039	18.5994 (90)
Living area fraction									fLA = Living area / (4) =			0.2383 (91)
MIT	19.1297	18.8685	18.4342	18.9956	19.4220	19.7383	19.8131	19.8105	19.6104	19.0345	18.3926	18.9311 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1297	18.8685	18.4342	18.9956	19.4220	19.7383	19.8131	19.8105	19.6104	19.0345	18.3926	18.9311 (93)

## 8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9970	0.9924	0.9787	0.9426	0.8587	0.6850	0.4874	0.5469	0.8179	0.9641	0.9921	0.9976 (94)
Useful gains	1074.8310	1333.1541	1552.3240	1746.2877	1728.3824	1369.6834	933.8499	967.0630	1301.2005	1265.6311	1088.7981	1010.4645 (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	4987.8823	4655.2317	3941.2918	3191.1172	2420.3819	1547.1802	967.5018	1019.1344	1685.4079	2643.7274	3600.0976	4778.8555 (97)
Space heating kWh	2911.3101	2232.4362	1777.3921	1040.2773	514.8476	0.0000	0.0000	0.0000	0.0000	1025.3036	1808.1356	2803.6829 (98a)
Space heating requirement - total per year (kWh/year)												14113.3854
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	2911.3101	2232.4362	1777.3921	1040.2773	514.8476	0.0000	0.0000	0.0000	0.0000	1025.3036	1808.1356	2803.6829 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												14113.3854
Space heating per m2										(98c) / (4) =		76.2721 (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 %)												444.3067 (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	2911.3101	2232.4362	1777.3921	1040.2773	514.8476	0.0000	0.0000	0.0000	0.0000	1025.3036	1808.1356	2803.6829 (98)
Space heating efficiency (main heating system 1)	444.3067	444.3067	444.3067	444.3067	444.3067	0.0000	0.0000	0.0000	0.0000	444.3067	444.3067	444.3067 (210)
Space heating fuel (main heating system)	655.2479	502.4539	400.0372	234.1350	115.8766	0.0000	0.0000	0.0000	0.0000	230.7649	406.9567	631.0243 (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	327.6170	289.6201	306.8741	267.2847	257.5096	230.2582	225.6958	235.4808	239.0266	268.7169	288.4851	323.6571 (64)
Efficiency of water heater (217)m	178.0914	178.0914	178.0914	178.0914	178.0914	178.0914	178.0914	178.0914	178.0914	178.0914	178.0914	178.0914 (216)
Fuel for water heating, kWh/month	183.9601	162.6245	172.3127	150.0829	144.5941	129.2922	126.7303	132.2247	134.2157	150.8871	161.9871	181.7365 (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	45.2601	36.3093	32.6925	23.9519	18.5012	15.1156	16.8774	21.9379	28.4951	37.3871	42.2287	46.5180 (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												3176.4965 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												178.0914
Water heating fuel used												1830.6479 (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)												365.2747 (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												

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Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	5372.4191 (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	3176.4965	0.1552	492.8722 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1830.6479	0.1411	258.2869 (264)
Space and water heating			751.1591 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	365.2747	0.1443	52.7204 (268)
Total CO2, kg/year			803.8795 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.3400 (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	3176.4965	1.5744	5001.1816 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1830.6479	1.5217	2785.7167 (278)
Space and water heating			7786.8983 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	365.2747	1.5338	560.2706 (282)
Total Primary energy kWh/year			8347.1689 (286)
Dwelling Primary energy Rate (DPER)			45.1100 (287)

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

### 1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	92.5200 (1b)	x 3.2000 (2b)	= 296.0640 (1b) - (3b)
First floor	92.5200 (1c)	x 2.8000 (2c)	= 259.0560 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	185.0400		(4)
Dwelling volume			(3a) + (3b) + (3c) + (3d) + (3e) ... (3n) = 555.1200 (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) = 0.0721 (8)
Pressure Test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3221 (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) = 0.2737 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.3490	0.3422	0.3353	0.3011	0.2943	0.2601	0.2601	0.2532	0.2737	0.2943	0.3080	0.3217 (22b)
	0.5609	0.5585	0.5562	0.5453	0.5433	0.5338	0.5338	0.5321	0.5375	0.5433	0.5474	0.5517 (25)

### 3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opening Type (Uw = 1.20)			37.8500	1.1450	43.3397		(27)
Ground Floor			92.5200	0.1300	12.0276		(28a)
External Walls	172.9800	37.8500	135.1300	0.1800	24.3234		(29a)
Roof at Joist	92.5200		92.5200	0.1100	10.1772		(30)
Total net area of external elements Aum(A, m2)			358.0200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	89.8679		(33)
Party Walls			107.8200	0.0000	0.0000		(32)

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Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 258.1556 (35)  
 Thermal bridges (User defined value 0.050 \* total exposed area) 17.9010 (36)  
 Point Thermal bridges 0.0000 (36a) =  
 Total fabric heat loss (33) + (36) + (36a) = 107.7689 (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	102.7530	102.3197	101.8950	99.9002	99.5269	97.7895	97.7895	97.4677	98.4587	99.5269	100.2820	101.0713 (38)
Average = Sum(39)m / 12 =	210.5219	210.0886	209.6639	207.6690	207.2958	205.5584	205.5584	205.2366	206.2276	207.2958	208.0509	208.8402 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1377	1.1354	1.1331	1.1223	1.1203	1.1109	1.1109	1.1091	1.1145	1.1203	1.1244	1.1286 (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 2.9824 (42)

Hot water usage for mixer showers 95.3782 93.9449 91.8562 87.8599 84.9108 81.6219 79.7525 81.8253 84.0976 87.6288 91.7110 95.0128 (42a)

Hot water usage for baths 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (42b)

Hot water usage for other uses 45.1729 43.5303 41.8876 40.2450 38.6023 36.9597 36.9597 38.6023 40.2450 41.8876 43.5303 45.1729 (42c)

Average daily hot water use (litres/day) 129.0019 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	140.5512	137.4752	133.7439	128.1049	123.5131	118.5816	116.7122	120.4277	124.3426	129.5165	135.2413	140.1857 (44)
Energy content (annual)	222.5987	195.7628	205.5593	175.3692	166.2724	145.8099	141.1532	149.1146	153.3268	175.7526	192.6760	219.4970 (45)
Distribution loss (46)m = 0.15 x (45)m	33.3898	29.3644	30.8339	26.3054	24.9409	21.8715	21.1730	22.3672	22.9990	26.3629	28.9014	32.9246 (46)
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8381 (55)
Total storage loss	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (56)
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	271.8414	240.2401	254.8020	223.0234	215.5150	193.4641	190.3959	198.3573	200.9810	224.9953	240.3302	268.7397 (62)
WWHRS	-43.6029	-38.5628	-40.3807	-33.4369	-31.1619	-26.6655	-24.9947	-26.5793	-27.5892	-32.5246	-36.8464	-42.7955 (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	228.2384	201.6773	214.4212	189.5866	184.3531	166.7986	165.4013	171.7780	173.3919	192.4707	203.4838	225.9442 (64)
12Total per year (kWh/year)												2317.5449 (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	113.4082	100.6729	107.7426	96.4336	94.6797	86.6051	86.3276	88.9747	89.1045	97.8319	102.1881	112.3769 (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	180.7341	200.0984	180.7341	186.7585	180.7341	186.7585	180.7341	180.7341	186.7585	180.7341	186.7585	180.7341 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	356.5957	360.2960	350.9713	331.1200	306.0613	282.5096	266.7757	263.0753	272.4001	292.2514	317.3101	340.8617 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.9121	37.9121	37.9121	37.9121	37.9121	37.9121	37.9121	37.9121	37.9121	37.9121	37.9121	37.9121 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967 (71)
Water heating gains (Table 5)	152.4304	149.8109	144.8153	133.9356	127.2577	120.2849	116.0317	119.5897	123.7563	131.4945	141.9279	151.0442 (72)
Total internal gains	760.4964	780.9416	747.2569	722.5504	684.7893	657.2893	631.2777	631.1354	650.6512	675.2162	716.7328	743.3763 (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	14.3300	19.6403	0.6300	0.7000	0.7700	86.0132 (76)
South	8.3300	46.7521	0.6300	0.7000	0.7700	119.0194 (78)
West	15.1900	19.6403	0.6300	0.7000	0.7700	91.1752 (80)

Solar gains	296.2078	541.5413	819.1283	1113.1528	1312.7218	1325.8740	1269.3275	1121.1726	923.2759	621.5346	362.0117	248.5549 (83)
Total gains	1056.7042	1322.4830	1566.3852	1835.7031	1997.5110	1983.1634	1900.6052	1752.3079	1573.9271	1296.7508	1078.7446	991.9311 (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	63.0300	63.1600	63.2880	63.8959	64.0109	64.5520	64.5520	64.6532	64.3425	64.0109	63.7786	63.5376
alpha	5.2020	5.2107	5.2192	5.2597	5.2674	5.3035	5.3035	5.3102	5.2895	5.2674	5.2519	5.2358
util living area	0.9987	0.9954	0.9845	0.9399	0.8252	0.6360	0.4710	0.5293	0.7958	0.9714	0.9965	0.9990 (86)
MIT	19.6074	19.8302	20.1515	20.5531	20.8413	20.9691	20.9947	20.9905	20.9031	20.4912	19.9692	19.5728 (87)
Th 2	19.9702	19.9721	19.9739	19.9827	19.9843	19.9920	19.9920	19.9934	19.9890	19.9843	19.9810	19.9775 (88)
util rest of house	0.9982	0.9938	0.9789	0.9186	0.7709	0.5473	0.3657	0.4184	0.7160	0.9573	0.9950	0.9987 (89)
MIT 2	18.3403	18.6263	19.0351	19.5347	19.8550	19.9752	19.9904	19.9902	19.9252	19.4714	18.8114	18.3012 (90)
Living area fraction	fLA = Living area / (4) =											0.2383 (91)
MIT	18.6423	18.9132	19.3012	19.7774	20.0901	20.2121	20.2297	20.2286	20.1582	19.7145	19.0873	18.6043 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.6423	18.9132	19.3012	19.7774	20.0901	20.2121	20.2297	20.2286	20.1582	19.7145	19.0873	18.6043 (93)

## 8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9972	0.9914	0.9740	0.9135	0.7771	0.5675	0.3909	0.4449	0.7308	0.9523	0.9930	0.9980 (94)
Useful gains	1053.7827	1311.1477	1525.7144	1676.8503	1552.2854	1125.4179	742.9308	779.6048	1150.2318	1234.8911	1071.2004	989.9341 (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	3019.3675	2944.0209	2683.9405	2258.8954	1739.2235	1153.6123	746.1213	785.7714	1249.3776	1889.3908	2493.9726	3008.1945 (97)
Space heating kWh	1462.3951	1097.2908	861.7202	419.0724	139.0820	0.0000	0.0000	0.0000	0.0000	486.9478	1024.3959	1501.5858 (98a)
Space heating requirement - total per year (kWh/year)												6992.4900
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	1462.3951	1097.2908	861.7202	419.0724	139.0820	0.0000	0.0000	0.0000	0.0000	486.9478	1024.3959	1501.5858 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6992.4900
Space heating per m2												(98c) / (4) = 37.7891 (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	1462.3951	1097.2908	861.7202	419.0724	139.0820	0.0000	0.0000	0.0000	0.0000	486.9478	1024.3959	1501.5858 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	92.3000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	1584.3933	1188.8307	933.6080	454.0330	150.6847	0.0000	0.0000	0.0000	0.0000	527.5708	1109.8547	1626.8535 (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	228.2384	201.6773	214.4212	189.5866	184.3531	166.7986	165.4013	171.7780	173.3919	192.4707	203.4838	225.9442 (64)
Efficiency of water heater (217)m	87.4682	87.2718	86.8484	85.7864	83.4364	79.8000	79.8000	79.8000	79.8000	86.0507	87.1708	79.8000 (216)
Fuel for water heating, kWh/month	260.9387	231.0909	246.8915	220.9985	220.9505	209.0207	207.2697	215.2606	217.2830	223.6713	233.4312	258.1949 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	37.5530	30.1264	27.1255	19.8733	15.3507	12.5416	14.0034	18.2022	23.6428	31.0207	35.0378	38.5967 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-78.1428	-106.1339	-146.9807	-158.9222	-166.0608	-152.9392	-150.8054	-144.7519	-133.5919	-118.0311	-84.3561	-68.0203 (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	-57.3247	-118.7864	-232.9426	-345.4996	-452.8373	-453.7452	-448.6214	-381.8517	-282.4321	-168.6584	-76.1066	-45.4906 (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												7575.8288 (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												2745.0016 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												303.0740 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-4573.0328 (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)

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Energy used 0.0000 (237)  
 Total delivered energy for all uses 6136.8716 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	7575.8288	0.2100	1590.9240 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2745.0016	0.2100	576.4503 (264)
Space and water heating			2167.3744 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	303.0740	0.1443	43.7429 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1508.7363	0.1354	-204.3325
PV Unit electricity exported	-3064.2965	0.1263	-386.8959
Total			-591.2284 (269)
Total CO2, kg/year			1631.8182 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.8200 (273)

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 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	7575.8288	1.1300	8560.6865 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2745.0016	1.1300	3101.8519 (278)
Space and water heating			11662.5384 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	303.0740	1.5338	464.8650 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1508.7363	1.5006	-2263.9854
PV Unit electricity exported	-3064.2965	0.4635	-1420.2213
Total			-3684.2067 (283)
Total Primary energy kWh/year			8573.2975 (286)
Target Primary Energy Rate (TPER)			46.3300 (287)

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Property Reference	Unit 6		Issued on Date	27/03/2024	
Assessment Reference	CEPCN4621	Prop Type Ref	CEPCN4621		
Property	Burrill Development, 6, Cowling Road, Burrill, Bedale, DL8 1RG				
SAP Rating	78 C	DER	4.34	TER	8.82
Environmental	95 A	% DER < TER			50.79
CO <sub>2</sub> Emissions (t/year)	0.87	DFEE	73.81	TFEE	42.54
Compliance Check	See BREL	% DFEE < TFEE			-73.51
% DPER < TPER	2.63	DPER	45.11	TPER	46.33
Assessor Details	Mr. Cory Skrzypkowski			Assessor ID	AU69-0001
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 <sup>2</sup> )	Storey height (m)	Volume (m <sup>3</sup> )
Ground floor	92.5200 (1b)	3.2000 (2b)	296.0640 (1b) - (3b)
First floor	92.5200 (1c)	2.8000 (2c)	259.0560 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	185.0400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	555.1200 (5)

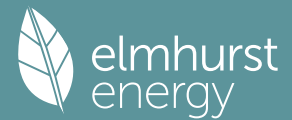
### 2. Ventilation rate

	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) =	0.0721 (8)										
Pressure test		No										
Pressure Test Method		Blower Door										
Measured/design AP50		15.0000 (17)										
Infiltration rate		0.8221 (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) =	0.6987 (21)										
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.8909	0.8734	0.8560	0.7686	0.7512	0.6638	0.6638	0.6463	0.6987	0.7512	0.7861	0.8210 (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	0.8969	0.8814	0.8663	0.7954	0.7821	0.7203	0.7203	0.7089	0.7441	0.7821	0.8090	0.8370 (25)

### 3. Heat losses and heat loss parameter

Element	Gross m <sup>2</sup>	Openings m <sup>2</sup>	NetArea m <sup>2</sup>	U-value W/m <sup>2</sup> K	A x U W/K	K-value kJ/m <sup>2</sup> K	A x K kJ/K
Fully Glazed Door (Uw = 1.40)			31.3400	1.3258	41.5492		(27)
Window (Uw = 1.40)			6.5100	1.3258	8.6307		(27)
Ground Floor			92.5200	0.1100	10.1772	110.0000	10177.2000 (28a)
External Walls	172.9800	37.8500	135.1300	0.1800	24.3234	60.0000	8107.8000 (29a)
Roof at Joist	92.5200		92.5200	0.1000	9.2520	9.0000	832.6800 (30)
Total net area of external elements Aum(A, m <sup>2</sup> )			358.0200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	93.9325		(33)
Party Walls			107.8200	0.0000	0.0000	70.0000	7547.4000 (32)
Block			248.0800			75.0000	18606.0000 (32c)
FF			92.5200			18.0000	1665.3600 (32d)
GF			92.5200			9.0000	832.6800 (32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		47769.1200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m <sup>2</sup> K							258.1556 (35)
Thermal bridges (Default value 0.200 * total exposed area)							71.6040 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss					(33) + (36) + (36a) =		165.5365 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	164.2945	161.4714	158.7043	145.7073	143.2756	131.9555	131.9555	129.8592	136.3159	143.2756	148.1949	153.3378	(38)
Heat transfer coeff	329.8310	327.0080	324.2409	311.2438	308.8121	297.4921	297.4921	295.3958	301.8524	308.8121	313.7314	318.8743	(39)
Average = Sum(39)m / 12 =													311.2321

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7825	1.7672	1.7523	1.6820	1.6689	1.6077	1.6077	1.5964	1.6313	1.6689	1.6955	1.7233	(40)
HLP (average)												1.6820	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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

Assumed occupancy													2.9824	(42)
Hot water usage for mixer showers														(42a)
Hot water usage for baths														(42b)
Hot water usage for other uses														(42c)
Average daily hot water use (litres/day)														(43)
Daily hot water use														(44)
Energy conte														(45)
Energy content (annual)														(45)
Distribution loss (46)m = 0.15 x (45)m														(46)
Water storage loss:														(46)
Total storage loss														(46)
If cylinder contains dedicated solar storage														(46)
Primary loss														(46)
Combi loss														(46)
Total heat required for water heating calculated for each month														(46)
WWHRS														(46)
FV diverter														(46)
Solar input														(46)
FGHRS														(46)
Output from w/h														(46)
12Total per year (kWh/year)														(46)
Electric shower(s)														(46)
Heat gains from water heating, kWh/month														(46)

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

Metabolic gains (Table 5), Watts														
(66)m	149.1209	149.1209	149.1209	149.1209	149.1209	149.1209	149.1209	149.1209	149.1209	149.1209	149.1209	149.1209	149.1209	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5														(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5														(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5														(69)
Pumps, fans														(70)
Losses e.g. evaporation (negative values) (Table 5)														(71)
Water heating gains (Table 5)														(72)
Total internal gains														(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	12.2400	19.6403	0.6300	0.7000	0.7700	73.4684 (76)							
South	6.8600	46.7521	0.6300	0.7000	0.7700	98.0159 (78)							
West	12.2400	19.6403	0.6300	0.7000	0.7700	73.4684 (80)							
East	2.0900	19.6403	0.6300	0.7000	0.7700	12.5448 (76)							
South	1.4700	46.7521	0.6300	0.7000	0.7700	21.0034 (78)							
West	2.9500	19.6403	0.6300	0.7000	0.7700	17.7068 (80)							
Solar gains	296.2078	541.5413	819.1283	1113.1528	1312.7218	1325.8740	1269.3275	1121.1726	923.2759	621.5346	362.0117	248.5549	(83)
Total gains	956.1760	1223.1913	1469.9545	1746.1749	1912.0377	1904.9704	1825.3438	1675.1023	1494.3694	1209.4138	984.8185	892.3437	(84)

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

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)														
tau	40.2303	40.5776	40.9239	42.6328	42.9685	44.6035	44.6035	44.9201	43.9592	42.9685	42.2948	41.6126		
alpha	3.6820	3.7052	3.7283	3.8422	3.8646	3.9736	3.9736	3.9947	3.9306	3.8646	3.8197	3.7742		
util living area														



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	0.9987	0.9966	0.9910	0.9713	0.9195	0.7987	0.6502	0.7088	0.9049	0.9856	0.9974	0.9990 (86)
MIT	18.6882	18.9408	19.3445	19.9319	20.4240	20.8003	20.9362	20.9102	20.6199	19.9556	19.2604	18.7110 (87)
Th 2	19.4823	19.4930	19.5036	19.5537	19.5632	19.6077	19.6077	19.6160	19.5905	19.5632	19.5441	19.5242 (88)
util rest of house												
	0.9982	0.9952	0.9871	0.9578	0.8772	0.6911	0.4750	0.5401	0.8362	0.9766	0.9961	0.9987 (89)
MIT 2	17.4244	17.6838	18.0928	18.7057	19.1748	19.5172	19.5932	19.5923	19.3784	18.7427	18.0390	17.4763 (90)
Living area fraction									fLA = Living area / (4) =			0.2383 (91)
MIT	17.7256	17.9834	18.3911	18.9980	19.4726	19.8230	19.9133	19.9064	19.6743	19.0317	18.3301	17.7706 (92)
Temperature adjustment												0.0000
adjusted MIT	17.7256	17.9834	18.3911	18.9980	19.4726	19.8230	19.9133	19.9064	19.6743	19.0317	18.3301	17.7706 (93)

## 8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9972	0.9931	0.9828	0.9507	0.8738	0.7106	0.5175	0.5803	0.8415	0.9717	0.9945	0.9979 (94)
Useful gains	953.5205	1214.7260	1444.7170	1660.0450	1670.6978	1353.7042	944.5773	972.0583	1257.5711	1175.1484	979.3558	890.5132 (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												
	4428.1666	4278.3600	3855.5744	3142.9292	2400.2582	1553.7959	985.6824	1035.7669	1682.6007	2603.8212	3523.2353	4327.3003 (97)
Space heating kWh												
	2585.1368	2058.7621	1793.6779	1067.6767	542.7929	0.0000	0.0000	0.0000	0.0000	1062.9325	1831.5932	2556.9696 (98a)
Space heating requirement - total per year (kWh/year)												13499.5417
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												
	2585.1368	2058.7621	1793.6779	1067.6767	542.7929	0.0000	0.0000	0.0000	0.0000	1062.9325	1831.5932	2556.9696 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												13499.5417
Space heating per m2												(98c) / (4) = 72.9547 (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	2796.4255	2201.4413	2245.0079	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6820	0.7706	0.7242	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1907.1101	1696.3977	1625.7889	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2144.8098	2055.1848	1883.2310	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	171.1438	266.9376	191.5369	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	42.7860	66.7344	47.8842	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												157.4046 (107)
Energy for space heating												72.9547 (99)
Energy for space cooling												0.8507 (108)
Total												73.8054 (109)
Fabric Energy Efficiency (DFEE)												73.8 (109)

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

## 1. Overall dwelling characteristics

	Area (m <sup>2</sup> )	Storey height (m)	Volume (m <sup>3</sup> )
Ground floor	92.5200 (1b)	x 3.2000 (2b)	= 296.0640 (1b) - (3b)
First floor	92.5200 (1c)	x 2.8000 (2c)	= 259.0560 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	185.0400		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 555.1200 (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) = 0.0721 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3221 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)

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Infiltration rate adjusted to include shelter factor

(21) = (18) x (20) = 0.2737 (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	0.3490	0.3422	0.3353	0.3011	0.2943	0.2601	0.2601	0.2532	0.2737	0.2943	0.3080	0.3217 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.5609	0.5585	0.5562	0.5453	0.5433	0.5338	0.5338	0.5321	0.5375	0.5433	0.5474	0.5517 (25)

### 3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opening Type (Uw = 1.20)												
Ground Floor			37.8500	1.1450	43.3397		(27)					
External Walls	172.9800	37.8500	92.5200	0.1300	12.0276		(28a)					
Roof at Joist	92.5200		135.1300	0.1800	24.3234		(29a)					
Total net area of external elements Aum(A, m2)			92.5200	0.1100	10.1772		(30)					
Fabric heat loss, W/K = Sum (A x U)			358.0200				(31)					
Party Walls			107.8200	0.0000	0.0000	89.8679	(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												
Thermal bridges (User defined value 0.050 * total exposed area)												
Point Thermal bridges							258.1556 (35)					
Total fabric heat loss							17.9010 (36)					
(33) + (36) + (36a) = 0.0000												
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	102.7530	102.3197	101.8950	99.9002	99.5269	97.7895	97.7895	97.4677	98.4587	99.5269	100.2820	101.0713 (38)
Heat transfer coeff	210.5219	210.0886	209.6639	207.6690	207.2958	205.5584	205.5584	205.2366	206.2276	207.2958	208.0509	208.8402 (39)
Average = Sum(39)m / 12 =												207.6673
HLP	1.1377	1.1354	1.1331	1.1223	1.1203	1.1109	1.1109	1.1091	1.1145	1.1203	1.1244	1.1286 (40)
HLP (average)												1.1223
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

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

Assumed occupancy												2.9824 (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	32.0425	31.5666	30.8965	29.6609	28.7357	27.7098	27.1556	27.8211	28.5456	29.6434	30.9044	31.9342 (42b)
Hot water usage for other uses	45.1729	43.5303	41.8876	40.2450	38.6023	36.9597	36.9597	38.6023	40.2450	41.8876	43.5303	45.1729 (42c)
Average daily hot water use (litres/day)												70.7747 (43)
Daily hot water use	77.2154	75.0969	72.7841	69.9059	67.3380	64.6694	64.1153	66.4234	68.7906	71.5310	74.4347	77.1071 (44)
Energy conte	122.2904	106.9370	111.8665	95.6976	90.6499	79.5186	77.5419	82.2460	84.8257	97.0669	106.0459	120.7311 (45)
Energy content (annual)												Total = Sum(45)m = 1175.4174
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	103.9468	90.8964	95.0865	81.3430	77.0524	67.5908	65.9106	69.9091	72.1018	82.5069	90.1390	102.6214 (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	103.9468	90.8964	95.0865	81.3430	77.0524	67.5908	65.9106	69.9091	72.1018	82.5069	90.1390	102.6214 (64)
Total per year (kWh/year) = Sum(64)m =												999 (64)
12Total per year (kWh/year)												999 (64)
Electric shower(s)	59.4420	52.9633	57.8339	55.1902	56.2258	53.6340	55.4218	56.2258	55.1902	57.8339	56.7464	59.4420 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												676.1495 (64a)
Heat gains from water heating, kWh/month	40.8472	35.9649	38.2301	34.1333	33.3196	30.3062	30.3331	31.5337	31.8230	35.0852	36.7214	40.5159 (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	149.1209	149.1209	149.1209	149.1209	149.1209	149.1209	149.1209	149.1209	149.1209	149.1209	149.1209	149.1209 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	180.7341	200.0984	180.7341	186.7585	180.7341	186.7585	180.7341	180.7341	186.7585	180.7341	186.7585	180.7341 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	356.5957	360.2960	350.9713	331.1200	306.0613	282.5096	266.7757	263.0753	272.4001	292.2514	317.3101	340.8617 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.9121	37.9121	37.9121	37.9121	37.9121	37.9121	37.9121	37.9121	37.9121	37.9121	37.9121	37.9121 (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)	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967 (71)
Water heating gains (Table 5)	54.9022	53.5193	51.3846	47.4074	44.7844	42.0919	40.7703	42.3841	44.1986	47.1575	51.0019	54.4568 (72)
Total internal gains	659.9682	681.6500	650.8262	633.0221	599.3160	579.0964	556.0163	553.9297	571.0935	587.8792	622.8068	643.7889 (73)

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## 6. Solar gains

[Jan]			Area m <sup>2</sup>	Solar flux Table 6a W/m <sup>2</sup>	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W				
East			14.3300	19.6403	0.6300	0.7000	0.7700	86.0132 (76)				
South			8.3300	46.7521	0.6300	0.7000	0.7700	119.0194 (78)				
West			15.1900	19.6403	0.6300	0.7000	0.7700	91.1752 (80)				
Solar gains	296.2078	541.5413	819.1283	1113.1528	1312.7218	1325.8740	1269.3275	1121.1726	923.2759	621.5346	362.0117	248.5549 (83)
Total gains	956.1760	1223.1913	1469.9545	1746.1749	1912.0377	1904.9704	1825.3438	1675.1023	1494.3694	1209.4138	984.8185	892.3437 (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	63.0300	63.1600	63.2880	63.8959	64.0109	64.5520	64.5520	64.6532	64.3425	64.0109	63.7786	63.5376
alpha	5.2020	5.2107	5.2192	5.2597	5.2674	5.3035	5.3035	5.3102	5.2895	5.2674	5.2519	5.2358
util living area	0.9992	0.9968	0.9882	0.9499	0.8439	0.6574	0.4894	0.5516	0.8197	0.9785	0.9977	0.9994 (86)
MIT	19.5509	19.7752	20.1008	20.5152	20.8215	20.9640	20.9937	20.9885	20.8875	20.4479	19.9168	19.5166 (87)
Th 2	19.9702	19.9721	19.9739	19.9827	19.9843	19.9920	19.9920	19.9934	19.9890	19.9843	19.9810	19.9775 (88)
util rest of house	0.9989	0.9957	0.9839	0.9313	0.7921	0.5676	0.3805	0.4371	0.7430	0.9674	0.9967	0.9992 (89)
MIT 2	18.6436	18.8687	19.1929	19.5994	19.8692	19.9765	19.9905	19.9903	19.9298	19.5441	19.0175	18.6151 (90)
Living area fraction	fLA = Living area / (4) =											0.2383 (91)
MIT	18.8598	19.0848	19.4093	19.8177	20.0962	20.2119	20.2296	20.2282	20.1580	19.7595	19.2318	18.8299 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8598	19.0848	19.4093	19.8177	20.0962	20.2119	20.2296	20.2282	20.1580	19.7595	19.2318	18.8299 (93)

## 8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9984	0.9943	0.9807	0.9277	0.7985	0.5881	0.4066	0.4645	0.7574	0.9641	0.9956	0.9989 (94)
Useful gains	954.6389	1216.1991	1441.5580	1619.9412	1526.7139	1120.3417	742.2349	778.1428	1131.7841	1166.0416	980.5220	891.3390 (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	3065.1594	2980.0550	2706.6093	2267.2694	1740.4917	1153.5683	746.0846	785.6947	1249.3302	1898.7276	2524.0290	3055.3156 (97)
Space heating kWh	1570.2272	1185.3112	941.1981	466.0763	159.0507	0.0000	0.0000	0.0000	0.0000	545.1184	1111.3250	1609.9986 (98a)
Space heating requirement - total per year (kWh/year)												7588.3055
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	1570.2272	1185.3112	941.1981	466.0763	159.0507	0.0000	0.0000	0.0000	0.0000	545.1184	1111.3250	1609.9986 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7588.3055
Space heating per m <sup>2</sup>												(98c) / (4) = 41.0090 (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	1932.2489	1521.1321	1559.7985	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8818	0.9380	0.9092	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1703.8544	1426.8500	1418.1876	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2144.8098	2055.1848	1883.2310	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	317.4879	467.4811	345.9923	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	79.3720	116.8703	86.4981	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												282.7403 (107)
Energy for space heating												41.0090 (99)
Energy for space cooling												1.5280 (108)
Total												42.5370 (109)
Fabric Energy Efficiency (TFEE)												42.5 (109)

# Full SAP Calculation Printout



Property Reference	Unit 6		Issued on Date	27/03/2024	
Assessment Reference	CEPCN4621	Prop Type Ref	CEPCN4621		
Property	Burrill Development, 6, Cowling Road, Burrill, Bedale, DL8 1RG				
SAP Rating	78 C	DER	4.34	TER	8.82
Environmental	95 A	% DER < TER			50.79
CO <sub>2</sub> Emissions (t/year)	0.87	DFEE	73.81	TFEE	42.54
Compliance Check	See BREL	% DFEE < TFEE			-73.51
% DPER < TPER	2.63	DPER	45.11	TPER	46.33
Assessor Details	Mr. Cory Skrzypkowski			Assessor ID	AU69-0001
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 <sup>2</sup> )	Storey height (m)	Volume (m <sup>3</sup> )
Ground floor	92.5200 (1b)	3.2000 (2b)	296.0640 (1b) - (3b)
First floor	92.5200 (1c)	2.8000 (2c)	259.0560 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	185.0400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	555.1200 (5)

### 2. Ventilation rate

	m <sup>3</sup> 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	6 * 10 = 60.0000 (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) =	60.0000 / (5) = 0.1081 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8581 (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) = 0.7294 (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	0.9299	0.9117	0.8935	0.8023	0.7841	0.6929	0.6929	0.6747	0.7294	0.7841	0.8205	0.8570 (22b)
Effective ac	0.9324	0.9156	0.8992	0.8219	0.8074	0.7401	0.7401	0.7276	0.7660	0.8074	0.8366	0.8672 (25)

### 3. Heat losses and heat loss parameter

Element	Gross m <sup>2</sup>	Openings m <sup>2</sup>	NetArea m <sup>2</sup>	U-value W/m <sup>2</sup> K	A x U W/K	K-value kJ/m <sup>2</sup> K	A x K kJ/K
Fully Glazed Door (Uw = 1.40)			31.3400	1.3258	41.5492		(27)
Window (Uw = 1.40)			6.5100	1.3258	8.6307		(27)
Ground Floor			92.5200	0.1100	10.1772	110.0000	10177.2000 (28a)
External Walls	172.9800	37.8500	135.1300	0.1800	24.3234	60.0000	8107.8000 (29a)
Roof at Joist	92.5200		92.5200	0.1000	9.2520	9.0000	832.6800 (30)
Total net area of external elements Aum(A, m <sup>2</sup> )			358.0200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	93.9325		(33)
Party Walls			107.8200	0.0000	0.0000	70.0000	7547.4000 (32)
Block			248.0800			75.0000	18606.0000 (32c)
FF			92.5200			18.0000	1665.3600 (32d)
GF			92.5200			9.0000	832.6800 (32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		47769.1200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m <sup>2</sup> K							258.1556 (35)
Thermal bridges (Default value 0.200 * total exposed area)							71.6040 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	165.5365 (37)

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

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	170.8065	167.7306	164.7156	150.5544	147.9049	135.5709	135.5709	133.2868	140.3217	147.9049	153.2648	158.8684	(38)
Heat transfer coeff	336.3430	333.2671	330.2522	316.0909	313.4414	301.1074	301.1074	298.8233	305.8583	313.4414	318.8013	324.4049	(39)
Average = Sum(39)m / 12 =												316.0782	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8177	1.8011	1.7848	1.7082	1.6939	1.6273	1.6273	1.6149	1.6529	1.6939	1.7229	1.7532	(40)
HLP (average)												1.7082	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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

Assumed occupancy													2.9824	(42)
Hot water usage for mixer showers														
131.1451	129.1742	126.3023	120.8074	116.7523	112.2301	109.6597	112.5098	115.6342	120.4897	126.1026	130.6426	130.6426	(42a)	
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)	
Hot water usage for other uses	45.1729	43.5303	41.8876	40.2450	38.6023	36.9597	36.9597	38.6023	40.2450	41.8876	43.5303	45.1729	(42c)	
Average daily hot water use (litres/day)													161.9777	(43)
Daily hot water use	176.3180	172.7045	168.1899	161.0524	155.3546	149.1898	146.6193	151.1122	155.8792	162.3773	169.6329	175.8155	(44)	
Energy conte	279.2446	245.9289	258.5017	220.4727	209.1372	183.4462	177.3234	187.1084	192.2146	220.3445	241.6731	275.2847	(45)	
Energy content (annual)										Total = Sum(45)m =		2690.6799		
Distribution loss (46)m = 0.15 x (45)m	41.8867	36.8893	38.7752	33.0709	31.3706	27.5169	26.5985	28.0663	28.8322	33.0517	36.2510	41.2927	(46)	
Water storage loss:														
Store volume													180.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):													1.5000	(48)
Temperature factor from Table 2b													0.5400	(49)
Enter (49) or (54) in (55)													0.8100	(55)
Total storage loss	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	(56)	
If cylinder contains dedicated solar storage	25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	(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	327.6170	289.6201	306.8741	267.2847	257.5096	230.2582	225.6958	235.4808	239.0266	268.7169	288.4851	323.6571	(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	327.6170	289.6201	306.8741	267.2847	257.5096	230.2582	225.6958	235.4808	239.0266	268.7169	288.4851	323.6571	(64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		3260.2259	(64)	
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)	
												0.0000	(64a)	
Heat gains from water heating, kWh/month	131.5468	116.7243	124.6497	110.7568	108.2360	98.4455	97.6579	100.9115	101.3610	111.9625	117.8059	130.2301	(65)	

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	149.1209	149.1209	149.1209	149.1209	149.1209	149.1209	149.1209	149.1209	149.1209	149.1209	149.1209	149.1209	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	180.7341	200.0984	180.7341	186.7585	180.7341	186.7585	180.7341	180.7341	186.7585	180.7341	186.7585	180.7341	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	356.5957	360.2960	350.9713	331.1200	306.0613	282.5096	266.7757	263.0753	272.4001	292.2514	317.3101	340.8617	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.9121	37.9121	37.9121	37.9121	37.9121	37.9121	37.9121	37.9121	37.9121	37.9121	37.9121	37.9121	(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)	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967	(71)
Water heating gains (Table 5)	176.8102	173.6969	167.5400	153.8288	145.4785	136.7298	131.2607	135.6337	140.7791	150.4872	163.6193	175.0404	(72)
Total internal gains	781.8762	801.8276	766.9816	739.4436	700.0101	673.7342	646.5067	647.1794	667.6740	691.2089	735.4242	764.3725	(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	12.2400	19.6403	0.6300	0.7000	0.7700	73.4684	(76)						
South	6.8600	46.7521	0.6300	0.7000	0.7700	98.0159	(78)						
West	12.2400	19.6403	0.6300	0.7000	0.7700	73.4684	(80)						
East	2.0900	19.6403	0.6300	0.7000	0.7700	12.5448	(76)						
South	1.4700	46.7521	0.6300	0.7000	0.7700	21.0034	(78)						
West	2.9500	19.6403	0.6300	0.7000	0.7700	17.7068	(80)						
Solar gains	296.2078	541.5413	819.1283	1113.1528	1312.7218	1325.8740	1269.3275	1121.1726	923.2759	621.5346	362.0117	248.5549	(83)
Total gains	1078.0840	1343.3689	1586.1099	1852.5964	2012.7319	1999.6083	1915.8342	1768.3519	1590.9499	1312.7434	1097.4360	1012.9274	(84)

## 7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)														
tau	39.4514	39.8155	40.1790	41.9791	42.3339	44.0680	44.0680	44.4048	43.3835	42.3339	41.6222	40.9032		

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alpha	3.6301	3.6544	3.6786	3.7986	3.8223	3.9379	3.9379	3.9603	3.8922	3.8223	3.7748	3.7269
util living area	0.9980	0.9952	0.9885	0.9661	0.9097	0.7825	0.6320	0.6878	0.8906	0.9813	0.9961	0.9985 (86)
Living	19.1955	19.3861	19.6901	20.1346	20.5006	20.7801	20.8771	20.8601	20.6510	20.1577	19.6349	19.2191
Non living	17.3938	17.6456	18.0412	18.6392	19.0845	19.4123	19.4802	19.4821	19.2848	18.6831	18.0039	17.4558
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	8	24	0	0	0	0	0	0	0	0	0	0
16 / 9	23	24	0	0	0	0	0	0	0	0	0	31
MIT	20.2417	19.9859	19.6901	20.1346	20.5006	20.7801	20.8771	20.8601	20.6510	20.1577	19.6349	19.9913 (87)
Th 2	19.4577	19.4693	19.4807	19.5349	19.5452	19.5934	19.5934	19.6024	19.5748	19.5452	19.5245	19.5030 (88)
util rest of house	0.9972	0.9934	0.9836	0.9505	0.8637	0.6716	0.4574	0.5182	0.8154	0.9700	0.9943	0.9979 (89)
MIT 2	18.7818	18.5188	18.0412	18.6392	19.0845	19.4123	19.4802	19.4821	19.2848	18.6831	18.0039	18.5994 (90)
Living area fraction									fLA = Living area / (4) =			0.2383 (91)
MIT	19.1297	18.8685	18.4342	18.9956	19.4220	19.7383	19.8131	19.8105	19.6104	19.0345	18.3926	18.9311 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1297	18.8685	18.4342	18.9956	19.4220	19.7383	19.8131	19.8105	19.6104	19.0345	18.3926	18.9311 (93)

## 8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9970	0.9924	0.9787	0.9426	0.8587	0.6850	0.4874	0.5469	0.8179	0.9641	0.9921	0.9976 (94)
Useful gains	1074.8310	1333.1541	1552.3240	1746.2877	1728.3824	1369.6834	933.8499	967.0630	1301.2005	1265.6311	1088.7981	1010.4645 (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	4987.8823	4655.2317	3941.2918	3191.1172	2420.3819	1547.1802	967.5018	1019.1344	1685.4079	2643.7274	3600.0976	4778.8555 (97)
Space heating kWh	2911.3101	2232.4362	1777.3921	1040.2773	514.8476	0.0000	0.0000	0.0000	0.0000	1025.3036	1808.1356	2803.6829 (98a)
Space heating requirement - total per year (kWh/year)												14113.3854
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	2911.3101	2232.4362	1777.3921	1040.2773	514.8476	0.0000	0.0000	0.0000	0.0000	1025.3036	1808.1356	2803.6829 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												14113.3854
Space heating per m2												(98c) / (4) = 76.2721 (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 %)												444.3067 (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	2911.3101	2232.4362	1777.3921	1040.2773	514.8476	0.0000	0.0000	0.0000	0.0000	1025.3036	1808.1356	2803.6829 (98)
Space heating efficiency (main heating system 1)	444.3067	444.3067	444.3067	444.3067	444.3067	0.0000	0.0000	0.0000	0.0000	444.3067	444.3067	444.3067 (210)
Space heating fuel (main heating system)	655.2479	502.4539	400.0372	234.1350	115.8766	0.0000	0.0000	0.0000	0.0000	230.7649	406.9567	631.0243 (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	327.6170	289.6201	306.8741	267.2847	257.5096	230.2582	225.6958	235.4808	239.0266	268.7169	288.4851	323.6571 (64)
Efficiency of water heater (217)m	178.0914	178.0914	178.0914	178.0914	178.0914	178.0914	178.0914	178.0914	178.0914	178.0914	178.0914	178.0914 (216)
Fuel for water heating, kWh/month	183.9601	162.6245	172.3127	150.0829	144.5941	129.2922	126.7303	132.2247	134.2157	150.8871	161.9871	181.7365 (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	45.2601	36.3093	32.6925	23.9519	18.5012	15.1156	16.8774	21.9379	28.4951	37.3871	42.2287	46.5180 (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												3176.4965 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												178.0914
Water heating fuel used												1830.6479 (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)												365.2747 (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												

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Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	5372.4191 (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	3176.4965	0.1552	492.8722 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1830.6479	0.1411	258.2869 (264)
Space and water heating			751.1591 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	365.2747	0.1443	52.7204 (268)
Total CO2, kg/year			803.8795 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.3400 (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	3176.4965	1.5744	5001.1816 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1830.6479	1.5217	2785.7167 (278)
Space and water heating			7786.8983 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	365.2747	1.5338	560.2706 (282)
Total Primary energy kWh/year			8347.1689 (286)
Dwelling Primary energy Rate (DPER)			45.1100 (287)

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

### 1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	92.5200 (1b)	x 3.2000 (2b)	= 296.0640 (1b) - (3b)
First floor	92.5200 (1c)	x 2.8000 (2c)	= 259.0560 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	185.0400		(4)
Dwelling volume		(3a) + (3b) + (3c) + (3d) + (3e) ... (3n) =	555.1200 (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) = 0.0721 (8)
Pressure Test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3221 (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) = 0.2737 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.3490	0.3422	0.3353	0.3011	0.2943	0.2601	0.2601	0.2532	0.2737	0.2943	0.3080	0.3217 (22b)
	0.5609	0.5585	0.5562	0.5453	0.5433	0.5338	0.5338	0.5321	0.5375	0.5433	0.5474	0.5517 (25)

### 3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opening Type (Uw = 1.20)			37.8500	1.1450	43.3397		(27)
Ground Floor			92.5200	0.1300	12.0276		(28a)
External Walls	172.9800	37.8500	135.1300	0.1800	24.3234		(29a)
Roof at Joist	92.5200		92.5200	0.1100	10.1772		(30)
Total net area of external elements Aum(A, m2)			358.0200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		89.8679		(33)
Party Walls			107.8200	0.0000	0.0000		(32)

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Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 258.1556 (35)  
 Thermal bridges (User defined value 0.050 \* total exposed area) 17.9010 (36)  
 Point Thermal bridges 0.0000 (36a) =  
 Total fabric heat loss (33) + (36) + (36a) = 107.7689 (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	102.7530	102.3197	101.8950	99.9002	99.5269	97.7895	97.7895	97.4677	98.4587	99.5269	100.2820	101.0713 (38)
Average = Sum(39)m / 12 =	210.5219	210.0886	209.6639	207.6690	207.2958	205.5584	205.5584	205.2366	206.2276	207.2958	208.0509	208.8402 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1377	1.1354	1.1331	1.1223	1.1203	1.1109	1.1109	1.1091	1.1145	1.1203	1.1244	1.1286 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	1.1223 (40)

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

Assumed occupancy 2.9824 (42)

Hot water usage for mixer showers 95.3782 93.9449 91.8562 87.8599 84.9108 81.6219 79.7525 81.8253 84.0976 87.6288 91.7110 95.0128 (42a)

Hot water usage for baths 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (42b)

Hot water usage for other uses 45.1729 43.5303 41.8876 40.2450 38.6023 36.9597 36.9597 38.6023 40.2450 41.8876 43.5303 45.1729 (42c)

Average daily hot water use (litres/day) 129.0019 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	140.5512	137.4752	133.7439	128.1049	123.5131	118.5816	116.7122	120.4277	124.3426	129.5165	135.2413	140.1857 (44)
Energy content (annual)	222.5987	195.7628	205.5593	175.3692	166.2724	145.8099	141.1532	149.1146	153.3268	175.7526	192.6760	219.4970 (45)
Distribution loss (46)m = 0.15 x (45)m	33.3898	29.3644	30.8339	26.3054	24.9409	21.8715	21.1730	22.3672	22.9990	26.3629	28.9014	32.9246 (46)
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8381 (55)
Total storage loss	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (56)
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	271.8414	240.2401	254.8020	223.0234	215.5150	193.4641	190.3959	198.3573	200.9810	224.9953	240.3302	268.7397 (62)
WWHRS	-43.6029	-38.5628	-40.3807	-33.4369	-31.1619	-26.6655	-24.9947	-26.5793	-27.5892	-32.5246	-36.8464	-42.7955 (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	228.2384	201.6773	214.4212	189.5866	184.3531	166.7986	165.4013	171.7780	173.3919	192.4707	203.4838	225.9442 (64)
12Total per year (kWh/year)												2317.5449 (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	113.4082	100.6729	107.7426	96.4336	94.6797	86.6051	86.3276	88.9747	89.1045	97.8319	102.1881	112.3769 (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	180.7341	200.0984	180.7341	186.7585	180.7341	186.7585	180.7341	180.7341	186.7585	180.7341	186.7585	180.7341 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	356.5957	360.2960	350.9713	331.1200	306.0613	282.5096	266.7757	263.0753	272.4001	292.2514	317.3101	340.8617 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.9121	37.9121	37.9121	37.9121	37.9121	37.9121	37.9121	37.9121	37.9121	37.9121	37.9121	37.9121 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967	-119.2967 (71)
Water heating gains (Table 5)	152.4304	149.8109	144.8153	133.9356	127.2577	120.2849	116.0317	119.5897	123.7563	131.4945	141.9279	151.0442 (72)
Total internal gains	760.4964	780.9416	747.2569	722.5504	684.7893	657.2893	631.2777	631.1354	650.6512	675.2162	716.7328	743.3763 (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	14.3300	19.6403	0.6300	0.7000	0.7700	86.0132 (76)
South	8.3300	46.7521	0.6300	0.7000	0.7700	119.0194 (78)
West	15.1900	19.6403	0.6300	0.7000	0.7700	91.1752 (80)

Solar gains	296.2078	541.5413	819.1283	1113.1528	1312.7218	1325.8740	1269.3275	1121.1726	923.2759	621.5346	362.0117	248.5549 (83)
Total gains	1056.7042	1322.4830	1566.3852	1835.7031	1997.5110	1983.1634	1900.6052	1752.3079	1573.9271	1296.7508	1078.7446	991.9311 (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	63.0300	63.1600	63.2880	63.8959	64.0109	64.5520	64.5520	64.6532	64.3425	64.0109	63.7786	63.5376
alpha	5.2020	5.2107	5.2192	5.2597	5.2674	5.3035	5.3035	5.3102	5.2895	5.2674	5.2519	5.2358
util living area	0.9987	0.9954	0.9845	0.9399	0.8252	0.6360	0.4710	0.5293	0.7958	0.9714	0.9965	0.9990 (86)
MIT	19.6074	19.8302	20.1515	20.5531	20.8413	20.9691	20.9947	20.9905	20.9031	20.4912	19.9692	19.5728 (87)
Th 2	19.9702	19.9721	19.9739	19.9827	19.9843	19.9920	19.9920	19.9934	19.9890	19.9843	19.9810	19.9775 (88)
util rest of house	0.9982	0.9938	0.9789	0.9186	0.7709	0.5473	0.3657	0.4184	0.7160	0.9573	0.9950	0.9987 (89)
MIT 2	18.3403	18.6263	19.0351	19.5347	19.8550	19.9752	19.9904	19.9902	19.9252	19.4714	18.8114	18.3012 (90)
Living area fraction									fLA = Living area / (4) =			0.2383 (91)
MIT	18.6423	18.9132	19.3012	19.7774	20.0901	20.2121	20.2297	20.2286	20.1582	19.7145	19.0873	18.6043 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6423	18.9132	19.3012	19.7774	20.0901	20.2121	20.2297	20.2286	20.1582	19.7145	19.0873	18.6043 (93)

## 8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9972	0.9914	0.9740	0.9135	0.7771	0.5675	0.3909	0.4449	0.7308	0.9523	0.9930	0.9980 (94)
Useful gains	1053.7827	1311.1477	1525.7144	1676.8503	1552.2854	1125.4179	742.9308	779.6048	1150.2318	1234.8911	1071.2004	989.9341 (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	3019.3675	2944.0209	2683.9405	2258.8954	1739.2235	1153.6123	746.1213	785.7714	1249.3776	1889.3908	2493.9726	3008.1945 (97)
Space heating kWh	1462.3951	1097.2908	861.7202	419.0724	139.0820	0.0000	0.0000	0.0000	0.0000	486.9478	1024.3959	1501.5858 (98a)
Space heating requirement - total per year (kWh/year)												6992.4900
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	1462.3951	1097.2908	861.7202	419.0724	139.0820	0.0000	0.0000	0.0000	0.0000	486.9478	1024.3959	1501.5858 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6992.4900
Space heating per m2												(98c) / (4) = 37.7891 (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)
Space heating requirement	1462.3951	1097.2908	861.7202	419.0724	139.0820	0.0000	0.0000	0.0000	0.0000	486.9478	1024.3959	1501.5858 (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)	1584.3933	1188.8307	933.6080	454.0330	150.6847	0.0000	0.0000	0.0000	0.0000	527.5708	1109.8547	1626.8535 (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	228.2384	201.6773	214.4212	189.5866	184.3531	166.7986	165.4013	171.7780	173.3919	192.4707	203.4838	225.9442 (64)
Efficiency of water heater (217)m	87.4682	87.2718	86.8484	85.7864	83.4364	79.8000	79.8000	79.8000	79.8000	86.0507	87.1708	79.8000 (216)
Fuel for water heating, kWh/month	260.9387	231.0909	246.8915	220.9985	220.9505	209.0207	207.2697	215.2606	217.2830	223.6713	233.4312	258.1949 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	37.5530	30.1264	27.1255	19.8733	15.3507	12.5416	14.0034	18.2022	23.6428	31.0207	35.0378	38.5967 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-78.1428	-106.1339	-146.9807	-158.9222	-166.0608	-152.9392	-150.8054	-144.7519	-133.5919	-118.0311	-84.3561	-68.0203 (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	-57.3247	-118.7864	-232.9426	-345.4996	-452.8373	-453.7452	-448.6214	-381.8517	-282.4321	-168.6584	-76.1066	-45.4906 (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												7575.8288 (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												2745.0016 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												303.0740 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-4573.0328 (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)

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Energy used 0.0000 (237)  
 Total delivered energy for all uses 6136.8716 (238)

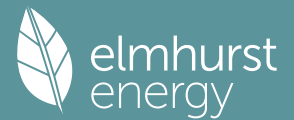
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 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP  
 -----

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	7575.8288	0.2100	1590.9240 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2745.0016	0.2100	576.4503 (264)
Space and water heating			2167.3744 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	303.0740	0.1443	43.7429 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1508.7363	0.1354	-204.3325
PV Unit electricity exported	-3064.2965	0.1263	-386.8959
Total			-591.2284 (269)
Total CO2, kg/year			1631.8182 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.8200 (273)

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 13a. Primary energy - Individual heating systems including micro-CHP  
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	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	7575.8288	1.1300	8560.6865 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2745.0016	1.1300	3101.8519 (278)
Space and water heating			11662.5384 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	303.0740	1.5338	464.8650 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1508.7363	1.5006	-2263.9854
PV Unit electricity exported	-3064.2965	0.4635	-1420.2213
Total			-3684.2067 (283)
Total Primary energy kWh/year			8573.2975 (286)
Target Primary Energy Rate (TPER)			46.3300 (287)

# Predicted Energy Assessment



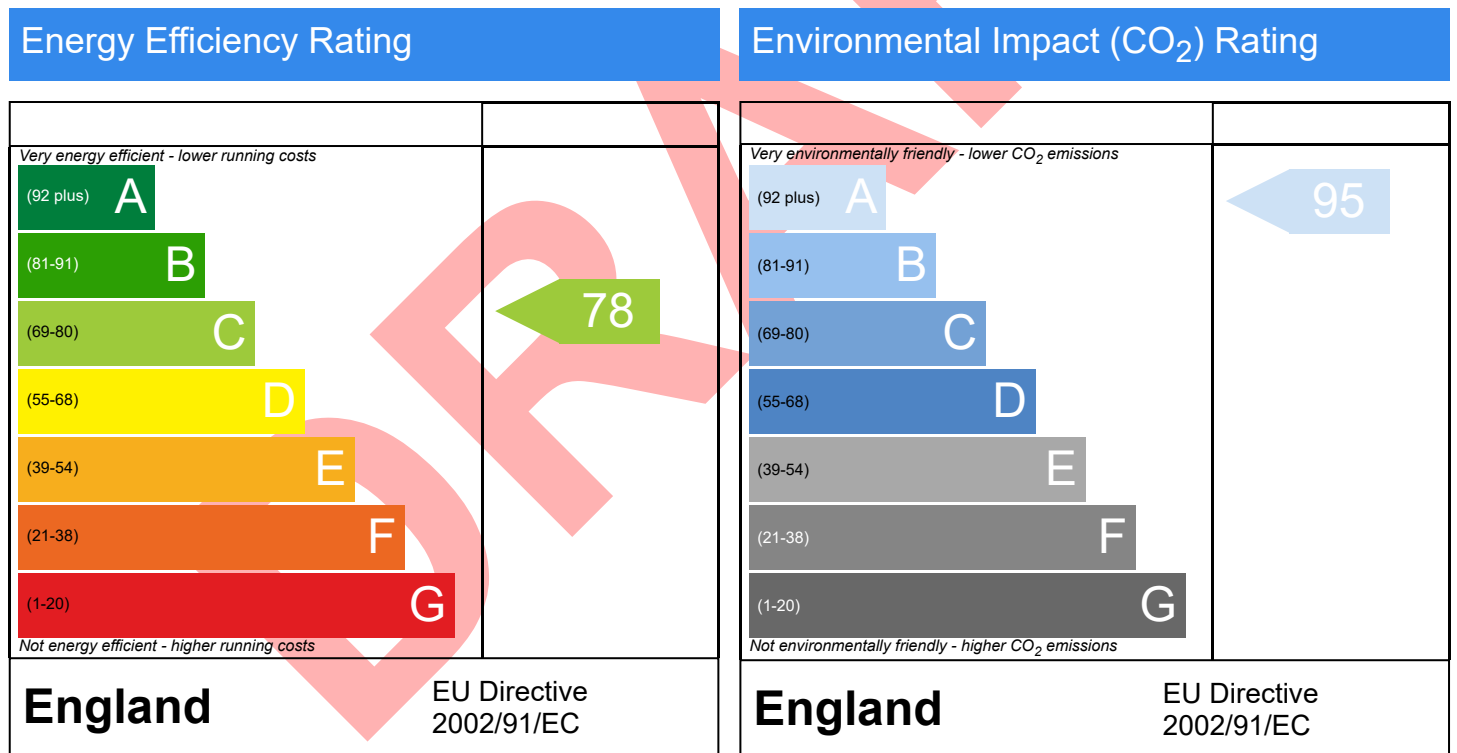
Burrill Development, 6, Cowling Road, Burrill , Bedale, DL8 1RG

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

House, Mid-Terrace  
27/03/2024  
Cory Skrzypkowski  
185.04 m<sup>2</sup>

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 (CO<sub>2</sub>) 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 (CO<sub>2</sub>) emissions. The higher the rating the less impact it has on the environment.