

Building Regulations England Part L (BREL) Compliance Report

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

Date: Wed 01 May 2024 16:23:01

Project Information			
Assessed By	Mark Scotson	Building Type	House, Mid-terrace
OCDEA Registration	EES/027465	Assessment Date	2024-05-01

Dwelling Details			
Assessment Type	As designed	Total Floor Area	145 m ²
Site Reference	plot 2, Richard Burch Street	Plot Reference	Plot 2
Address	Plot 2, 6 Richard Burch Street, Bury , BL9 6DU		

Client Details	
Name	Client
Company	-
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	8.11 kgCO ₂ /m ²	
Dwelling carbon dioxide emission rate	1.2 kgCO ₂ /m ²	OK

1b Target primary energy rate and dwelling primary energy		
Target primary energy	42.37 kWh _{PE} /m ²	
Dwelling primary energy	14.03 kWh _{PE} /m ²	OK

1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	30.5 kWh/m ²	
Dwelling fabric energy efficiency	27.1 kWh/m ²	OK

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.18	Walls (1) (0.18)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	0.13	Ground Floor (0.13)	OK
Roofs	0.16	0.12	Roof (1) (0.15)	OK
Windows, doors, and roof windows	1.6	1.2	Door (1.2)	OK
Rooflights	2.2	1.2	RL, South (1.2)	OK

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	Net area [m ²]	U-Value [W/m ² K]
Exposed wall: Walls (1)	82.7	0.18
Exposed wall: Walls (2)	10.26	0.18
Sheltered wall: Walls (3)	6.27	0.17
Party wall: Party Wall (1)	81.26	0 (!)
Ground floor: Ground Floor , Ground Floor	59.84	0.13
Exposed roof: Roof (1)	11.11	0.15
Exposed roof: Roof (2)	30.5	0.1 (!)
Exposed roof: Roof (3)	18.51	0.15

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
Door, Door	1.89	South	N/A	1.2
Door, Door 2	1.89	West	N/A	1.2
Window, Window	4.84	South	0.7	1.2
Window, Window	2.88	North	0.7	1.2
Dormer Window , Window	1.09	West	0.7	1.2
RL, Roof Window	0.84	South	0.7	1.2

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

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E1: Steel lintel with perforated steel base plate	Calculated by person with suitable expertise	0.088	
External wall	E3: Sill	Calculated by person with suitable expertise	0.047	
External wall	E4: Jamb	Calculated by person with suitable expertise	0.04	
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.033 (!)	
External wall	E11: Eaves (insulation at rafter level)	Calculated by person with suitable expertise	0.033 (!)	
External wall	E13: Gable (insulation at rafter level)	Calculated by person with suitable expertise	0.079	
External wall	E14: Flat roof	Calculated by person with suitable expertise	0.049	
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.035 (!)	
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.023 (!)	
External wall	E10: Eaves (insulation at ceiling level)	Calculated by person with suitable expertise	0.03 (!)	
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.021 (!)	
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	0.01 (!)	

3 Air permeability (better than typically expected values are flagged with a subsequent (!))

Maximum permitted air permeability at 50Pa	8 m ³ /hm ²	
Dwelling air permeability at 50Pa	3 m ³ /hm ² , Design value (!)	OK
Air permeability test certificate reference	5151151	

4 Space heating

Main heating system 1: Heat pump with radiators or underfloor heating - Electricity		
Efficiency	319.9%	
Emitter type	Both radiators and underfloor	
Flow temperature	35°C	
System type	Heat Pump	
Manufacturer	Mitsubishi Electric Europe B.V.	
Model	ECODAN 5kW	
Commissioning		
Secondary heating system: N/A		
Fuel	N/A	
Efficiency	N/A	
Commissioning		

5 Hot water

Cylinder/store - type: Cylinder		
Capacity	150 litres	
Declared heat loss	1.45 kWh/day	
Primary pipework insulated	Yes	
Manufacturer		
Model		
Commissioning		
Waste water heat recovery system 1 - type: N/A		
Efficiency		
Manufacturer		
Model		

6 Controls

Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services		
Function		
Ecodesign class		
Manufacturer		
Model		

Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		
7 Lighting		
Minimum permitted light source efficacy	75 lm/W	
Lowest light source efficacy	114 lm/W	OK
External lights control	N/A	
8 Mechanical ventilation		
System type: N/A		
Maximum permitted specific fan power	N/A	
Specific fan power	N/A	N/A
Minimum permitted heat recovery efficiency	N/A	
Heat recovery efficiency	N/A	N/A
Manufacturer/Model		
Commissioning		
9 Local generation		
Technology type: Photovoltaic system (1)		
Peak power	4 kWp	
Orientation	South	
Pitch	30°	
Overshading	None or very little	
Manufacturer		
MCS certificate		
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	plot 2, Richard Burch Street		Issued on Date	01/05/2024
Assessment Reference	Plot 2	Prop Type Ref	1	
Property	Plot 2, 6 Richard Burch Street, Bury , BL9 6DU			

SAP Rating	94 A	DER	1.20	TER	8.11
Environmental	99 A	% DER < TER			85.20
CO ₂ Emissions (t/year)	0.19	DFEE	27.13	TFEE	30.53
Compliance Check	See BREL	% DFEE < TFEE			11.12
% DPER < TPER	66.88	DPER	14.03	TPER	42.37

Assessor Details	Mr. Mark Scotson	Assessor ID	AX66-0001
Client			

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

Orientation	South	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	House, Mid-Terrace	
Which Floor	0	
2.0 Number of Storeys	3	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Very little	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m²K
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 ²	0.00 m
Ground floor:	25.12 m	59.84 m ²	2.95 m
1st Storey:	23.60 m	57.96 m ²	2.25 m
2nd Storey:	15.34 m	27.46 m ²	2.10 m
3rd Storey:	0.00 m	0.00 m ²	0.00 m
4th Storey:	0.00 m	0.00 m ²	0.00 m
5th Storey:	0.00 m	0.00 m ²	0.00 m
6th Storey:	0.00 m	0.00 m ²	0.00 m
7th Storey:	0.00 m	0.00 m ²	0.00 m

8.0 Living Area	12.92	m ²
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9.0 External Walls										
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area (m ²)	Shelter Res	Shelter	Openings	Area Calculation Type
External Wall	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.18	60.00	91.32	82.70	0.00	None	8.62	Enter Gross Area
Dormer Wall	Timber Frame	Timber framed wall (one layer of plasterboard)	0.18	9.00	14.23	10.26	0.00	None	3.97	Enter Gross Area
Stud Wall	Timber Frame	Timber framed wall (one layer of plasterboard)	0.19	9.00	6.27	6.27	0.50	None	0.00	Enter Gross Area

9.1 Party Walls									
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)	Shelter Res	Shelter		
Party Wall 1	Filled Cavity with Edge Sealing	Dense plaster both sides, dense blocks, cavity or cavity fill	0.00	180.00	81.26	0.00	None		

9.2 Internal Walls									
Description	Construction	Kappa (kJ/m ² K)	Area (m ²)						
Internal Wall 2	Plasterboard on timber frame	9.00	97.90						

10.0 External Roofs									
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Summary for Input Data



Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Sloping Ceiling	External Slope Roof	Plasterboard, insulated slope	0.15	9.00	11.95	11.11	None	0.00	Enter Gross Area	0.84
Residual Ceiling	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	9.00	30.50	30.50	None	0.00	Enter Gross Area	0.00
Dormer Roof	External Flat Roof	Plasterboard, insulated flat roof	0.15	9.00	18.51	18.51	None	0.00	Enter Gross Area	0.00

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Lowest occupied	Slab on ground, screed over insulation	0.13	None	0.00	110.00	59.84

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1		Plasterboard ceiling, carpeted chipboard floor	9.00	40.00

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Door	Manufacturer	Solid Door			Air Filled	0.00	Wood	1.00	1.20
Door 2	Manufacturer	Half Glazed Door	Double glazed		Air Filled	0.76	Wood	0.70	1.20
Window	Manufacturer	Window	Double glazed		Air Filled	0.76	PVC	0.70	1.20
Opening	Manufacturer	Window	Double glazed		Air Filled	0.76	PVC	0.70	1.20
Roof Window	Manufacturer	Roof Light	Double glazed		Air Filled	0.76	Wood	0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Door	External Wall	South	1.89	0
Door 2	Door 2	External Wall	West	1.89	0
Window	Window	External Wall	South	4.84	0
Window	Window	Dormer Wall	North	2.88	0
Dormer Window	Window	Dormer Wall	West	1.09	0
RL	Roof Window	Sloping Ceiling	South	0.84	30

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E1 Steel lintel with perforated steel base plate	Independently assessed	12.45	0.09	0.09	No
E3 Sill	Independently assessed	10.65	0.05	0.05	No
E4 Jamb	Independently assessed	38.18	0.04	0.04	No
E5 Ground floor (normal)	Independently assessed	25.12	0.03	0.03	No
E11 Eaves (insulation at rafter level)	Independently assessed	0.00	0.03	0.03	No
E13 Gable (insulation at rafter level)	Independently assessed	2.09	0.08	0.08	No
E14 Flat roof	Independently assessed	8.66	0.05	0.05	No
E16 Corner (normal)	Independently assessed	19.81	0.04	0.04	No
E6 Intermediate floor within a dwelling	Independently assessed	38.94	0.02	0.02	No
E10 Eaves (insulation at ceiling level)	Independently assessed	5.40	0.03	0.03	No
E12 Gable (insulation at ceiling level)	Independently assessed	3.10	0.02	0.02	No
E17 Corner (inverted – internal area greater than external area)	Independently assessed	5.90	0.01	0.01	No

Y-value W/m²K

18.0 Pressure Testing

Designed AP₅₀ m³/(h.m²) @ 50 Pa

Property Tested?

Test Method

As Built AP₅₀ m³/(h.m²) @ 50 Pa

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
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Summary for Input Data

Lighting 1 114.00 5 570 20

24.0 Main Heating 1

Database	
Description	ASHP
Percentage of Heat	100.00 %
Database Ref. No.	100053
Fuel Type	Electricity
SAP Code	0
In Winter	0.00
In Summer	0.00
Model Name	ECODAN 5kW
Manufacturer	Mitsubishi Electric Europe B.V.
System Type	Heat Pump
Controls SAP Code	2207
Delayed Start Stat	No
Burner Control	Modulating
HETAS approved System	No
Oil Pump Inside	No
FI Case	0.00
Flue Type	None or Unknown
Smoke Control Area	No
Fan Assisted Flue	No
Is MHS Pumped	Pump in heated space
Heating Pump Age	2013 or later
Heat Emitter	Radiators and Underfloor
Underfloor Heating	Yes - Pipes in thin screed
Flow Temperature	Enter value
Flow Temperature Value	35.00
Boiler Interlock	No
Combi boiler type	Standard Combi
Combi keep hot type	Gas/Oil, time clock

25.0 Main Heating 2

None

26.0 Heat Networks

None

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

28.0 Water Heating

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
Immersion Heater	Dual
Summer Immersion	No

Summary for Input Data

Cold Water Source	From mains
Bath Count	1
Supplementary Immersion	No
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Instantaneous electric shower	4.00	9.50	No	Instantaneous System 1

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder

Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	150.00	L
Loss	1.45	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	

31.0 Thermal Store

	None
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32.0 Photovoltaic Unit

One Dwelling	One Dwelling
Export Capable Meter?	Yes
Connected To Dwelling	Yes
Diverter	Yes
Battery Capacity [kWh]	0.00

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

34.0 Small-scale Hydro

Electricity Generated	0.00	kWh/Year
Apportioned	0.00	
Connected to dwelling's electricity meter	Yes	
Electricity Generation	Annual	

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

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout



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Environmental	99 A	% DER < TER			85.20
CO ₂ Emissions (t/year)	0.19	DFEE	27.13	TFEE	30.53
Compliance Check	See BREL	% DFEE < TFEE			11.12
% DPER < TPER	66.88	DPER	14.03	TPER	42.37
Assessor Details	Mr. Mark Scotson			Assessor ID	AX66-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	59.8400 (1b)	x 2.9500 (2b)	= 176.5280 (1b) - (3b)
First floor	57.9600 (1c)	x 2.2500 (2c)	= 130.4100 (1c) - (3c)
Second floor	27.4600 (1d)	x 2.1000 (2d)	= 57.6660 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	145.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	364.6040 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.0823 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2323 (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) = 0.1974 (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	0.2517	0.2468	0.2419	0.2172	0.2122	0.1876	0.1876	0.1826	0.1974	0.2122	0.2221	0.2320 (22b)
Effective ac	0.5317	0.5305	0.5292	0.5236	0.5225	0.5176	0.5176	0.5167	0.5195	0.5225	0.5247	0.5269 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.2000	2.2680		(26)
Door 2			1.8900	1.2000	2.2680		(26a)
Window (Uw = 1.20)			8.8100	1.1450	10.0878		(27)
RL			0.8400	1.1450	0.9618		(27a)
Ground Floor			59.8400	0.1300	7.7792	110.0000	6582.4000 (28a)
External Wall	91.3200	8.6200	82.7000	0.1800	14.8860	60.0000	4962.0000 (29a)
Dormer Wall	14.2300	3.9700	10.2600	0.1800	1.8468	9.0000	92.3400 (29a)
Stud Wall	6.2700		6.2700	0.1700	1.0659	9.0000	56.4300 (29a)
Sloping Ceiling	11.9500	0.8400	11.1100	0.1500	1.6665	9.0000	99.9900 (30)
Residual Ceiling	30.5000		30.5000	0.1000	3.0500	9.0000	274.5000 (30)
Dormer Roof	18.5100		18.5100	0.1500	2.7765	9.0000	166.5900 (30)
Total net area of external elements Aum (A, m ²)			232.6200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	48.6565		(33)
Party Wall 1			81.2600	0.0000	0.0000	180.0000	14626.8000 (32)
Internal Wall 2			97.9000			9.0000	881.1000 (32c)
Internal Floor 1			40.0000			18.0000	720.0000 (32d)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	28462.1500 (34)

Full SAP Calculation Printout



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

195.9394 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	12.4500	0.0880	1.0956
E3 Sill	10.6500	0.0470	0.5006
E4 Jamb	38.1800	0.0400	1.5272
E5 Ground floor (normal)	25.1200	0.0330	0.8290
E11 Eaves (insulation at rafter level)	0.0000	0.0330	0.0000
E13 Gable (insulation at rafter level)	2.0900	0.0790	0.1651
E14 Flat roof	8.6600	0.0490	0.4243
E16 Corner (normal)	19.8100	0.0350	0.6934
E6 Intermediate floor within a dwelling	38.9400	0.0230	0.8956
E10 Eaves (insulation at ceiling level)	5.4000	0.0300	0.1620
E12 Gable (insulation at ceiling level)	3.1000	0.0210	0.0651
E17 Corner (inverted - internal area greater than external area)	5.9000	0.0100	0.0590

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

Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	55.0733 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	63.9720	63.8240	63.6789	62.9973	62.8698	62.2762	62.2762	62.1662	62.5048	62.8698	63.1277	63.3974	(38)
Heat transfer coeff	119.0453	118.8973	118.7522	118.0706	117.9431	117.3495	117.3495	117.2396	117.5782	117.9431	118.2011	118.4708	(39)
Average = Sum(39)m / 12 =												118.0700	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8195	0.8185	0.8175	0.8128	0.8119	0.8079	0.8079	0.8071	0.8094	0.8119	0.8137	0.8156	(40)
HLP (average)												0.8128	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9265 (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	31.6393	31.1694	30.5077	29.2877	28.3741	27.3611	26.8139	27.4710	28.1864	29.2704	30.5156	31.5323	(42b)
Hot water usage for other uses	44.6003	42.9785	41.3566	39.7348	38.1130	36.4912	36.4912	38.1130	39.7348	41.3566	42.9785	44.6003	(42c)
Average daily hot water use (litres/day)												69.8803	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	76.2396	74.1479	71.8644	69.0225	66.4871	63.8522	63.3051	65.5840	67.9212	70.6270	73.4940	76.1326	(44)
Energy conte	120.7449	105.5856	110.4528	94.4883	89.5044	78.5138	76.5620	81.2067	83.7537	95.8402	104.7057	119.2053	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m	18.1117	15.8378	16.5679	14.1732	13.4257	11.7771	11.4843	12.1810	12.5631	14.3760	15.7059	17.8808	(46)
Water storage loss:													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.4500 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.7830 (55)
Total storage loss	24.2730	21.9240	24.2730	23.4900	24.2730	23.4900	24.2730	24.2730	23.4900	24.2730	23.4900	24.2730	(56)
If cylinder contains dedicated solar storage	24.2730	21.9240	24.2730	23.4900	24.2730	23.4900	24.2730	24.2730	23.4900	24.2730	23.4900	24.2730	(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	168.2803	148.5208	157.9882	140.4903	137.0398	124.5158	124.0974	128.7421	129.7557	143.3756	150.7077	166.7407	(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	-23.9992	-51.3369	-103.8369	-158.9105	-212.2472	-213.9555	-210.6828	-176.0796	-127.1110	-73.3932	-32.0533	-18.8423	(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	144.2811	97.1839	54.1513	0.0000	0.0000	0.0000	0.0000	0.0000	2.6446	69.9824	118.6544	147.8984	(64)
12Total per year (kWh/year)													
Electric shower(s)	59.9534	53.4189	58.3314	55.6650	56.7095	54.0954	55.8985	56.7095	55.6650	58.3314	57.2346	59.9534	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												681.9660	(64a)
Heat gains from water heating, kWh/month	93.1643	82.8101	89.3367	82.1352	81.9659	76.4313	77.4598	79.2069	78.5659	84.4780	85.9249	92.6524	(65)

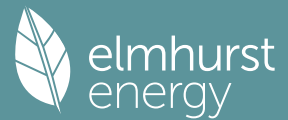
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	197.7424	218.9290	197.7424	204.3338	197.7424	204.3338	197.7424	197.7424	204.3338	197.7424	204.3338	197.7424	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	315.3174	318.5894	310.3440	292.7906	270.6326	249.8073	235.8946	232.6226	240.8680	258.4213	280.5793	301.4047	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	(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)	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	(71)
Water heating gains (Table 5)	125.2209	123.2293	120.0763	114.0767	110.1692	106.1545	104.1127	106.4609	109.1194	113.5458	119.3401	124.5328	(72)
Total internal gains	705.1781	727.6453	695.0602	678.0986	645.4417	627.1931	604.6472	603.7234	621.2186	636.6070	671.1508	690.5774	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
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North			2.8800		10.6334		0.7600		0.7000		0.7700		11.2904 (74)
South			4.8400		46.7521		0.7600		0.7000		0.7700		83.4240 (78)
West			1.0900		19.6403		0.7600		0.7000		0.7700		7.8926 (80)
South			0.8400		42.0754		0.7600		0.7000		1.0000		16.9224 (82)

Solar gains	119.5293	204.9072	284.2226	359.2795	409.3827	409.6082	393.5710	355.6223	310.0831	227.4687	143.3966	102.1499 (83)
Total gains	824.7075	932.5525	979.2828	1037.3781	1054.8245	1036.8013	998.2182	959.3457	931.3018	864.0757	814.5474	792.7273 (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	66.4130	66.4956	66.5769	66.9612	67.0336	67.3727	67.3727	67.4359	67.2417	67.0336	66.8873	66.7350	
alpha	5.4275	5.4330	5.4385	5.4641	5.4689	5.4915	5.4915	5.4957	5.4828	5.4689	5.4592	5.4490	
util living area	0.9950	0.9896	0.9794	0.9455	0.8614	0.6856	0.5105	0.5515	0.7820	0.9515	0.9889	0.9960 (86)	
Living	20.1025	20.2291	20.3936	20.6203	20.8076	20.9145	20.9386	20.9362	20.8835	20.6516	20.3395	20.0779	
Non living	19.1678	19.3297	19.5389	19.8239	20.0435	20.1540	20.1719	20.1712	20.1264	19.8659	19.4745	19.1392	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	31	28	31	30	31	30	31	31	30	31	30	31	
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0	
MIT	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000 (87)	
Th 2	20.2364	20.2373	20.2382	20.2422	20.2430	20.2465	20.2465	20.2472	20.2452	20.2430	20.2415	20.2399 (88)	
util rest of house	0.9938	0.9870	0.9741	0.9309	0.8254	0.6182	0.4263	0.4662	0.7222	0.9357	0.9858	0.9950 (89)	
MIT 2	20.2364	20.2373	20.2382	20.2422	20.2430	20.2465	20.2465	20.2472	20.2452	20.2430	20.2415	20.2399 (90)	
Living area fraction									fLA = Living area / (4) =			0.0889 (91)	
MIT	20.3044	20.3052	20.3059	20.3096	20.3103	20.3135	20.3135	20.3141	20.3123	20.3103	20.3089	20.3075 (92)	
Temperature adjustment												0.0000	
adjusted MIT	20.3044	20.3052	20.3059	20.3096	20.3103	20.3135	20.3135	20.3141	20.3123	20.3103	20.3089	20.3075 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9939	0.9873	0.9747	0.9324	0.8289	0.6245	0.4340	0.4740	0.7280	0.9373	0.9861	0.9951 (94)	
Useful gains	819.7156	920.7073	954.4640	967.2010	874.3689	647.4997	433.1800	454.6982	677.9934	809.8681	803.2091	788.8493 (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	1905.2435	1831.6312	1639.4856	1347.1426	1015.5285	670.4817	435.7826	458.8923	730.4313	1145.2660	1561.3094	1908.2638 (97)	
Space heating kWh	807.6328	612.1408	509.6561	273.5580	105.0228	0.0000	0.0000	0.0000	0.0000	249.5360	545.8322	832.8444 (98a)	
Space heating requirement - total per year (kWh/year)												3936.2230	
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	807.6328	612.1408	509.6561	273.5580	105.0228	0.0000	0.0000	0.0000	0.0000	249.5360	545.8322	832.8444 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												3936.2230	
Space heating per m2										(98c) / (4) =		27.0978 (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 %)													319.9311 (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	807.6328	612.1408	509.6561	273.5580	105.0228	0.0000	0.0000	0.0000	0.0000	249.5360	545.8322	832.8444 (98)	
Space heating efficiency (main heating system 1)	319.9311	319.9311	319.9311	319.9311	319.9311	0.0000	0.0000	0.0000	0.0000	319.9311	319.9311	319.9311 (210)	
Space heating fuel (main heating system)	252.4396	191.3352	159.3018	85.5053	32.8267	0.0000	0.0000	0.0000	0.0000	77.9968	170.6093	260.3199 (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	144.2811	97.1839	54.1513	0.0000	0.0000	0.0000	0.0000	0.0000	2.6446	69.9824	118.6544	147.8984 (64)	
Efficiency of water heater (217)m	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000 (216)	
Fuel for water heating, kWh/month	128.2499	86.3857	48.1345	0.0000	0.0000	0.0000	0.0000	0.0000	2.3508	62.2066	105.4706	131.4652 (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	41.9506	33.6544	30.3020	22.2006	17.1484	14.0104	15.6433	20.3338	26.4115	34.6534	39.1409	43.1166 (232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-71.0059	-102.0309	-145.8628	-155.3993	-159.7788	-142.7318	-141.3828	-133.9777	-120.4930	-112.6419	-78.2693	-61.1890 (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	-2.5014	-8.0881	-23.4554	-49.5776	-75.7565	-82.9673	-81.8282	-69.9263	-51.1987	-19.5019	-4.9355	-1.7028 (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)	

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Annual totals kWh/year	
Space heating fuel - main system 1	1230.3345 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	112.5000
Water heating fuel used	564.2633 (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)	338.5658 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1896.2028 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	918.9268 (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	1230.3345	0.1556	191.4965 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	564.2633	0.1563	88.1928 (264)
Energy for instantaneous electric shower(s)	681.9660	0.1391	94.8766 (264a)
Space and water heating			279.6894 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	338.5658	0.1443	48.8655 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1424.7632	0.1356	-193.1675
PV Unit electricity exported	-471.4396	0.1184	-55.8082
Total			-248.9757 (269)
Total CO2, kg/year			174.4557 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.2000 (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	1230.3345	1.5762	1939.2964 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	564.2633	1.5785	890.7021 (278)
Energy for instantaneous electric shower(s)	681.9660	1.5143	1032.7244 (278a)
Space and water heating			2829.9985 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	338.5658	1.5338	519.3035 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1424.7632	1.5012	-2138.7868
PV Unit electricity exported	-471.4396	0.4342	-204.6869
Total			-2343.4737 (283)
Total Primary energy kWh/year			2038.5526 (286)
Dwelling Primary energy Rate (DPER)			14.0300 (287)

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

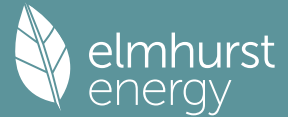
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	59.8400 (1b)	x 2.9500 (2b)	= 176.5280 (1b) - (3b)
First floor	57.9600 (1c)	x 2.2500 (2c)	= 130.4100 (1c) - (3c)
Second floor	27.4600 (1d)	x 2.1000 (2d)	= 57.6660 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	145.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	364.6040 (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) = 0.1097 (8)
Pressure test	Yes

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Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered

Blower Door
5.0000 (17)
0.3597 (18)
2 (19)

Shelter factor

Infiltration rate adjusted to include shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.8500 (20)$$
$$(21) = (18) \times (20) = 0.3058 (21)$$

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infiltr rate													
Effective ac	0.3898	0.3822	0.3745	0.3363	0.3287	0.2905	0.2905	0.2828	0.3058	0.3287	0.3440	0.3593	(22b)
	0.5760	0.5730	0.5701	0.5566	0.5540	0.5422	0.5422	0.5400	0.5467	0.5540	0.5592	0.5645	(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 Opaque door			1.8900	1.0000	1.8900			(26)
TER Semi-glazed door			1.8900	1.0000	1.8900			(26a)
TER Opening Type (Uw = 1.20)			8.8100	1.1450	10.0878			(27)
RL			0.8400	2.0221	1.6985			(27a)
Ground Floor			59.8400	0.1300	7.7792			(28a)
External Wall	91.3200	8.6200	82.7000	0.1800	14.8860			(29a)
Dormer Wall	14.2300	3.9700	10.2600	0.1800	1.8468			(29a)
Stud Wall	6.2700		6.2700	0.1800	1.1286			(29a)
Sloping Ceiling	11.9500	0.8400	11.1100	0.1100	1.2221			(30)
Residual Ceiling	30.5000		30.5000	0.1100	3.3550			(30)
Dormer Roof	18.5100		18.5100	0.1100	2.0361			(30)
Total net area of external elements Aum(A, m2)			232.6200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.8201			(33)
Party Wall 1			81.2600	0.0000	0.0000			(32)

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

195.9394 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate	12.4500	0.0500	0.6225	
E3 Sill	10.6500	0.0500	0.5325	
E4 Jamb	38.1800	0.0500	1.9090	
E5 Ground floor (normal)	25.1200	0.1600	4.0192	
E11 Eaves (insulation at rafter level)	0.0000	0.0400	0.0000	
E13 Gable (insulation at rafter level)	2.0900	0.0800	0.1672	
E14 Flat roof	8.6600	0.0800	0.6928	
E16 Corner (normal)	19.8100	0.0900	1.7829	
E6 Intermediate floor within a dwelling	38.9400	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	5.4000	0.0600	0.3240	
E12 Gable (insulation at ceiling level)	3.1000	0.0600	0.1860	
E17 Corner (inverted - internal area greater than external area)	5.9000	-0.0900	-0.5310	

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

9.7051 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 57.5252 (37)

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

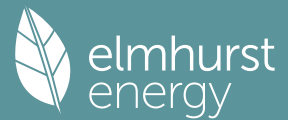
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	69.3021	68.9471	68.5991	66.9647	66.6589	65.2353	65.2353	64.9717	65.7836	66.6589	67.2775	67.9243	(38)
Heat transfer coeff	126.8274	126.4723	126.1244	124.4899	124.1841	122.7605	122.7605	122.4969	123.3089	124.1841	124.8027	125.4495	(39)
Average = Sum(39)m / 12 =												124.4884	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.8731	0.8707	0.8683	0.8570	0.8549	0.8451	0.8451	0.8433	0.8489	0.8549	0.8592	0.8636	(40)
HLP (average)												0.8570	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9265 (42)
Hot water usage for mixer showers													
	73.2876	72.1863	70.5814	67.5106	65.2445	62.7174	61.2810	62.8737	64.6197	67.3331	70.4698	73.0068	(42a)
Hot water usage for baths													
	31.6393	31.1694	30.5077	29.2877	28.3741	27.3611	26.8139	27.4710	28.1864	29.2704	30.5156	31.5323	(42b)
Hot water usage for other uses													
	44.6003	42.9785	41.3566	39.7348	38.1130	36.4912	36.4912	38.1130	39.7348	41.3566	42.9785	44.6003	(42c)
Average daily hot water use (litres/day)													137.4491 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	149.5272	146.3342	142.4457	136.5331	131.7316	126.5696	124.5860	128.4577	132.5409	137.9601	143.9638	149.1395	(44)
Energy conte	236.8146	208.3779	218.9338	186.9070	177.3361	155.6321	150.6760	159.0575	163.4362	187.2105	205.1028	233.5164	(45)
Energy content (annual)										Total = Sum(45)m =		2283.0009	
Distribution loss (46)m = 0.15 x (45)m													
	35.5222	31.2567	32.8401	28.0361	26.6004	23.3448	22.6014	23.8586	24.5154	28.0816	30.7654	35.0275	(46)
Water storage loss:													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.3938 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.7527 (55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	283.4095	250.4636	265.5287	231.9988	223.9310	200.7240	197.2709	205.6524	208.5281	233.8054	250.1946	280.1113	(62)
WWHRS	-33.5040	-29.6313	-31.0281	-25.6925	-23.9445	-20.4895	-19.2056	-20.4233	-21.1992	-24.9915	-28.3124	-32.8836	(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													
	249.9055	220.8323	234.5005	206.3063	199.9865	180.2345	178.0653	185.2291	187.3289	208.8139	221.8823	247.2277	(64)
Total per year (kWh/year) = Sum(64)m =													2520.3127 (64)

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12Total per year (kWh/year)	2520 (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 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)											
Heat gains from water heating, kWh/month	116.0168	102.9542	110.0714	98.2201	96.2402	87.8212	87.3757	90.1625	90.4160	99.5234	104.2702 114.9201 (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	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	197.7424	218.9290	197.7424	204.3338	197.7424	204.3338	197.7424	197.7424	204.3338	197.7424	204.3338	197.7424 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	315.3174	318.5894	310.3440	292.7906	270.6326	249.8073	235.8946	232.6226	240.8680	258.4213	280.5793	301.4047 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325 (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)	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600 (71)
Water heating gains (Table 5)	155.9365	153.2057	147.9454	136.4167	129.3551	121.9738	117.4405	121.1862	125.5778	133.7680	144.8197	154.4625 (72)
Total internal gains	738.8938	760.6216	725.9293	703.4387	667.6276	643.0124	617.9750	618.4487	637.6771	659.8293	699.6303	723.5071 (73)

6. Solar gains

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

North				2.8800	10.6334	0.6300	0.7000	0.7700	9.3591 (74)			
South				4.8400	46.7521	0.6300	0.7000	0.7700	69.1541 (78)			
West				1.0900	19.6403	0.6300	0.7000	0.7700	6.5425 (80)			
South				0.8400	42.0754	0.6300	0.7000	1.0000	14.0278 (82)			

Solar gains	99.0835	169.8573	235.6056	297.8238	339.3567	339.5437	326.2497	294.7922	257.0426	188.5596	118.8682	84.6769 (83)
Total gains	837.9773	930.4789	961.5349	1001.2625	1006.9843	982.5560	944.2246	913.2408	894.7197	848.3888	818.4985	808.1840 (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	62.3379	62.5129	62.6854	63.5084	63.6648	64.4031	64.4031	64.5417	64.1167	63.6648	63.3492	63.0226
alpha	5.1559	5.1675	5.1790	5.2339	5.2443	5.2935	5.2935	5.3028	5.2744	5.2443	5.2233	5.2015
util living area	0.9949	0.9904	0.9827	0.9571	0.8915	0.7347	0.5589	0.5978	0.8188	0.9592	0.9895	0.9958 (86)
MIT	19.7828	19.9430	20.1613	20.4786	20.7552	20.9391	20.9882	20.9833	20.8873	20.5452	20.1205	19.7625 (87)
Th 2	20.1904	20.1925	20.1946	20.2042	20.2060	20.2144	20.2144	20.2160	20.2112	20.2060	20.2023	20.1985 (88)
util rest of house	0.9936	0.9880	0.9781	0.9448	0.8592	0.6656	0.4653	0.5046	0.7608	0.9451	0.9864	0.9947 (89)
MIT 2	18.7520	18.9577	19.2366	19.6411	19.9726	20.1712	20.2091	20.2078	20.1220	19.7283	19.1922	18.7321 (90)
Living area fraction	18.8437	19.0453	19.3189	19.7156	20.0422	20.2395	20.2784	20.2768	20.1901	19.8010	19.2748	18.8237 (92)
MIT	18.8437	19.0453	19.3189	19.7156	20.0422	20.2395	20.2784	20.2768	20.1901	19.8010	19.2748	18.8237 (93)
Temperature adjustment												0.0000
adjusted MIT	18.8437	19.0453	19.3189	19.7156	20.0422	20.2395	20.2784	20.2768	20.1901	19.8010	19.2748	18.8237 (93)

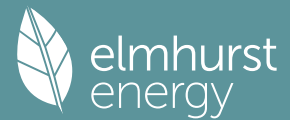
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9906	0.9833	0.9714	0.9354	0.8515	0.6679	0.4732	0.5121	0.7590	0.9360	0.9814	0.9921 (94)
Useful gains	830.0907	914.9712	934.0074	936.5915	857.4760	656.2854	446.7666	467.6685	679.1250	794.0870	803.2567	801.7843 (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	1844.5409	1788.9930	1616.7699	1346.4316	1035.9718	692.3104	451.5590	474.8965	750.9615	1142.6164	1519.4454	1834.5399 (97)
Space heating kWh	754.7509	587.3427	507.9754	295.0849	132.8009	0.0000	0.0000	0.0000	0.0000	259.3059	515.6559	768.3702 (98a)
Space heating requirement - total per year (kWh/year)												3821.2866
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	754.7509	587.3427	507.9754	295.0849	132.8009	0.0000	0.0000	0.0000	0.0000	259.3059	515.6559	768.3702 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3821.2866
Space heating per m2										(98c) / (4) =		26.3065 (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	754.7509	587.3427	507.9754	295.0849	132.8009	0.0000	0.0000	0.0000	0.0000	259.3059	515.6559	768.3702 (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)	817.7150	636.3409	550.3525	319.7019	143.8796	0.0000	0.0000	0.0000	0.0000	280.9381	558.6737	832.4704 (211)

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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	249.9055	220.8323	234.5005	206.3063	199.9865	180.2345	178.0653	185.2291	187.3289	208.8139	221.8823	247.2277	(64)
Efficiency of water heater	86.3768	86.1452	85.7457	84.8619	83.1635	79.8000	79.8000	79.8000	79.8000	84.5466	85.8859	79.8000	(216)
Fuel for water heating, kWh/month	289.3202	256.3489	273.4837	243.1083	240.4737	225.8578	223.1395	232.1167	234.7479	246.9809	258.3453	286.0532	(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	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	41.0870	32.9615	29.6782	21.7435	16.7953	13.7219	15.3212	19.9151	25.8678	33.9399	38.3351	42.2289	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-55.1618	-77.2997	-110.3571	-123.0986	-131.7817	-122.5414	-120.9837	-114.7177	-103.4690	-87.9536	-60.4674	-47.7420	(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	-32.4557	-68.1741	-135.3693	-203.1509	-268.5087	-269.8493	-266.7130	-225.8785	-165.6066	-97.4712	-43.3165	-25.6745	(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												4140.0722	(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												3009.9761	(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)												331.5953	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2957.7419	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												4609.9017	(238)

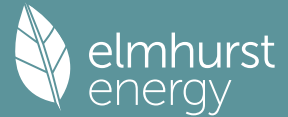
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4140.0722	0.2100	869.4152 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3009.9761	0.2100	632.0950 (264)
Space and water heating			1501.5101 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	331.5953	0.1443	47.8594 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1155.5736	0.1348	-155.7222
PV Unit electricity exported	-1802.1683	0.1259	-226.9182
Total			-382.6404 (269)
Total CO2, kg/year			1178.6585 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.1100 (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	4140.0722	1.1300	4678.2816 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3009.9761	1.1300	3401.2730 (278)
Space and water heating			8079.5546 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	331.5953	1.5338	508.6119 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1155.5736	1.4981	-1731.1082
PV Unit electricity exported	-1802.1683	0.4622	-832.9458
Total			-2564.0540 (283)
Total Primary energy kWh/year			6154.2134 (286)
Target Primary Energy Rate (TPER)			42.3700 (287)

Full SAP Calculation Printout



Property Reference	plot 2, Richard Burch Street			Issued on Date	01/05/2024
Assessment Reference	Plot 2	Prop Type Ref	1		
Property	Plot 2, 6 Richard Burch Street, Bury , BL9 6DU				
SAP Rating	94 A	DER	1.20	TER	8.11
Environmental	99 A	% DER < TER			85.20
CO ₂ Emissions (t/year)	0.19	DFEE	27.13	TFEE	30.53
Compliance Check	See BREL	% DFEE < TFEE			11.12
% DPER < TPER	66.88	DPER	14.03	TPER	42.37
Assessor Details	Mr. Mark Scotson			Assessor ID	AX66-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	59.8400 (1b)	x 2.9500 (2b)	= 176.5280 (1b) - (3b)
First floor	57.9600 (1c)	x 2.2500 (2c)	= 130.4100 (1c) - (3c)
Second floor	27.4600 (1d)	x 2.1000 (2d)	= 57.6660 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	145.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	364.6040 (5)

2. Ventilation rate

											m3 per hour			
Number of open chimneys													0 * 80 =	0.0000 (6a)
Number of open flues													0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire													0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler													0 * 20 =	0.0000 (6d)
Number of flues attached to other heater													0 * 35 =	0.0000 (6e)
Number of blocked chimneys													0 * 20 =	0.0000 (6f)
Number of intermittent extract fans													4 * 10 =	40.0000 (7a)
Number of passive vents													0 * 10 =	0.0000 (7b)
Number of flueless gas fires													0 * 40 =	0.0000 (7c)
													Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											40.0000	/ (5) =	0.1097 (8)	
Pressure test													Yes	
Pressure Test Method													Blower Door	
Measured/design AP50													3.0000 (17)	
Infiltration rate													0.2597 (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) =		0.2208 (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	0.2815	0.2759	0.2704	0.2428	0.2373	0.2097	0.2097	0.2042	0.2208	0.2373	0.2483	0.2594	(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	0.5396	0.5381	0.5366	0.5295	0.5282	0.5220	0.5220	0.5208	0.5244	0.5282	0.5308	0.5336	(25)	

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.2000	2.2680		(26)
Door 2			1.8900	1.2000	2.2680		(26a)
Window (Uw = 1.20)			8.8100	1.1450	10.0878		(27)
RL			0.8400	1.1450	0.9618		(27a)
Ground Floor			59.8400	0.1300	7.7792	110.0000	6582.4000 (28a)
External Wall	91.3200	8.6200	82.7000	0.1800	14.8860	60.0000	4962.0000 (29a)
Dormer Wall	14.2300	3.9700	10.2600	0.1800	1.8468	9.0000	92.3400 (29a)
Stud Wall	6.2700		6.2700	0.1700	1.0659	9.0000	56.4300 (29a)
Sloping Ceiling	11.9500	0.8400	11.1100	0.1500	1.6665	9.0000	99.9900 (30)
Residual Ceiling	30.5000		30.5000	0.1000	3.0500	9.0000	274.5000 (30)
Dormer Roof	18.5100		18.5100	0.1500	2.7765	9.0000	166.5900 (30)
Total net area of external elements Aum(A, m ²)			232.6200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	48.6565		(33)
Party Wall 1			81.2600	0.0000	0.0000	180.0000	14626.8000 (32)
Internal Wall 2			97.9000			9.0000	881.1000 (32c)
Internal Floor 1			40.0000			18.0000	720.0000 (32d)

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Heat capacity $C_m = \text{Sum}(A \times k)$
 Thermal mass parameter (TMP = C_m / TFA) in $\text{kJ/m}^2\text{K}$
 List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	12.4500	0.0880	1.0956
E1 Steel lintel with perforated steel base plate	10.6500	0.0470	0.5006
E3 Sill	38.1800	0.0400	1.5272
E4 Jamb	25.1200	0.0330	0.8290
E5 Ground floor (normal)	0.0000	0.0330	0.0000
E11 Eaves (insulation at rafter level)	2.0900	0.0790	0.1651
E13 Gable (insulation at rafter level)	8.6600	0.0490	0.4243
E14 Flat roof	19.8100	0.0350	0.6934
E16 Corner (normal)	38.9400	0.0230	0.8956
E6 Intermediate floor within a dwelling	5.4000	0.0300	0.1620
E10 Eaves (insulation at ceiling level)	3.1000	0.0210	0.0651
E12 Gable (insulation at ceiling level)	5.9000	0.0100	0.0590
E17 Corner (inverted - internal area greater than external area)			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.4168 (36)
Point Thermal bridges			0.0000
Total fabric heat loss			55.0733 (37)

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	64.9254	64.7404	64.5590	63.7070	63.5476	62.8055	62.8055	62.6681	63.0913	63.5476	63.8700	64.2072	(38)
Heat transfer coeff	119.9988	119.8137	119.6323	118.7803	118.6209	117.8788	117.8788	117.7414	118.1647	118.6209	118.9434	119.2805	(39)
Average = Sum(39)m / 12 =												118.7796	
HLP	0.8261	0.8248	0.8236	0.8177	0.8166	0.8115	0.8115	0.8106	0.8135	0.8166	0.8188	0.8212	(40)
HLP (average)												0.8177	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9265 (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	31.6393	31.1694	30.5077	29.2877	28.3741	27.3611	26.8139	27.4710	28.1864	29.2704	30.5156	31.5323	(42b)
Hot water usage for other uses	44.6003	42.9785	41.3566	39.7348	38.1130	36.4912	36.4912	38.1130	39.7348	41.3566	42.9785	44.6003	(42c)
Average daily hot water use (litres/day)												69.8803	(43)
Daily hot water use	76.2396	74.1479	71.8644	69.0225	66.4871	63.8522	63.3051	65.5840	67.9212	70.6270	73.4940	76.1326	(44)
Energy conte	120.7449	105.5856	110.4528	94.4883	89.5044	78.5138	76.5620	81.2067	83.7537	95.8402	104.7057	119.2053	(45)
Energy content (annual)										Total = Sum(45)m =		1160.5634	
Distribution loss (46)m = $0.15 \times (45)\text{m}$	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	102.6332	89.7478	93.8849	80.3151	76.0787	66.7367	65.0777	69.0257	71.1906	81.4642	88.9999	101.3245	(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	102.6332	89.7478	93.8849	80.3151	76.0787	66.7367	65.0777	69.0257	71.1906	81.4642	88.9999	101.3245	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		986.4789	(64)
Electric shower(s)	58.6912	52.2943	57.1034	54.4931	55.5156	52.9565	54.7217	55.5156	54.4931	57.1034	56.0296	58.6912	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												667.6088	(64a)
Heat gains from water heating, kWh/month	40.3311	35.5105	37.7471	33.7020	32.8986	29.9233	29.9499	31.1353	31.4209	34.6419	36.2574	40.0039	(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	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	197.7424	218.9290	197.7424	204.3338	197.7424	204.3338	197.7424	197.7424	204.3338	197.7424	204.3338	197.7424	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	315.3174	318.5894	310.3440	292.7906	270.6326	249.8073	235.8946	232.6226	240.8680	258.4213	280.5793	301.4047	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	(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)	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	(71)
Water heating gains (Table 5)	54.2084	52.8430	50.7353	46.8084	44.2185	41.5602	40.2552	41.8486	43.6402	46.5617	50.3575	53.7687	(72)
Total internal gains	634.1657	657.2590	625.7192	610.8303	579.4911	562.5987	540.7897	539.1110	555.7394	569.6229	602.1681	619.8133	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	2.8800	10.6334	0.7600	0.7000	0.7700	11.2904 (74)
South	4.8400	46.7521	0.7600	0.7000	0.7700	83.4240 (78)

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West	1.0900	19.6403	0.7600	0.7000	0.7700	7.8926 (80)
South	0.8400	42.0754	0.7600	0.7000	1.0000	16.9224 (82)

Solar gains	119.5293	204.9072	284.2226	359.2795	409.3827	409.6082	393.5710	355.6223	310.0831	227.4687	143.3966	102.1499 (83)
Total gains	753.6950	862.1662	909.9418	970.1098	988.8738	972.2069	934.3607	894.7333	865.8226	797.0916	745.5647	721.9632 (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	65.8853	65.9870	66.0871	66.5611	66.6506	67.0702	67.0702	67.1484	66.9079	66.6506	66.4699	66.2820
alpha	5.3924	5.3991	5.4058	5.4374	5.4434	5.4713	5.4713	5.4766	5.4605	5.4434	5.4313	5.4188
util living area	0.9968	0.9928	0.9852	0.9583	0.8871	0.7222	0.5450	0.5894	0.8187	0.9651	0.9927	0.9975 (86)
MIT	19.7995	19.9714	20.1963	20.5126	20.7829	20.9497	20.9909	20.9863	20.8977	20.5539	20.1234	19.7683 (87)
Th 2	20.2308	20.2319	20.2329	20.2380	20.2390	20.2434	20.2434	20.2442	20.2417	20.2390	20.2370	20.2350 (88)
util rest of house	0.9960	0.9910	0.9813	0.9465	0.8548	0.6546	0.4561	0.4998	0.7622	0.9529	0.9905	0.9968 (89)
MIT 2	19.1181	19.2900	19.5138	19.8266	20.0779	20.2157	20.2402	20.2390	20.1784	19.8703	19.4460	19.0904 (90)
Living area fraction									fLA = Living area / (4) =			0.0889 (91)
MIT	19.1788	19.3506	19.5745	19.8876	20.1406	20.2809	20.3070	20.3055	20.2424	19.9311	19.5062	19.1507 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1788	19.3506	19.5745	19.8876	20.1406	20.2809	20.3070	20.3055	20.2424	19.9311	19.5062	19.1507 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9945	0.9882	0.9769	0.9399	0.8500	0.6582	0.4637	0.5073	0.7622	0.9467	0.9877	0.9956 (94)
Useful gains	749.5159	852.0153	888.9329	911.8493	840.5439	639.8900	433.3077	453.9187	659.9364	754.6188	736.4039	718.7539 (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	1785.4321	1731.3769	1564.1306	1305.1091	1001.2365	669.6634	436.9716	459.8333	725.8103	1106.8632	1475.6363	1783.3283 (97)
Space heating kWh	770.7217	590.9310	502.3471	283.1471	119.5553	0.0000	0.0000	0.0000	0.0000	262.0699	532.2473	792.0433 (98a)
Space heating requirement - total per year (kWh/year)												3853.0627
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	770.7217	590.9310	502.3471	283.1471	119.5553	0.0000	0.0000	0.0000	0.0000	262.0699	532.2473	792.0433 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3853.0627
Space heating per m2										(98c) / (4) =		26.5253 (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	1108.0610	872.3034	894.8347	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8042	0.8873	0.8621	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	891.0591	774.0287	771.4462	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1010.8289	972.0227	931.6295	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	86.2343	147.3075	119.1764	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	21.5586	36.8269	29.7941	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												88.1795 (107)
Energy for space heating												26.5253 (99)
Energy for space cooling												0.6070 (108)
Total												27.1323 (109)
Fabric Energy Efficiency (DFEE)												27.1 (109)

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

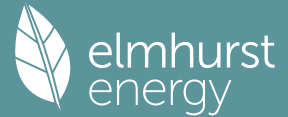
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	59.8400 (1b)	x 2.9500 (2b)	= 176.5280 (1b) - (3b)
First floor	57.9600 (1c)	x 2.2500 (2c)	= 130.4100 (1c) - (3c)
Second floor	27.4600 (1d)	x 2.1000 (2d)	= 57.6660 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	145.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	364.6040 (5)

2. Ventilation rate

m3 per hour

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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) =	0.1097 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3597	(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) =	0.3058	(21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
	0.3898	0.3822	0.3745	0.3363	0.3287	0.2905	0.2905	0.2828	0.3058	0.3287	0.3440	0.3593	(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	0.5760	0.5730	0.5701	0.5566	0.5540	0.5422	0.5422	0.5400	0.5467	0.5540	0.5592	0.5645	(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 Opaque door			1.8900	1.0000	1.8900			(26)
TER Semi-glazed door			1.8900	1.0000	1.8900			(26a)
TER Opening Type (Uw = 1.20)			8.8100	1.1450	10.0878			(27)
RL			0.8400	2.0221	1.6985			(27a)
Ground Floor			59.8400	0.1300	7.7792			(28a)
External Wall	91.3200	8.6200	82.7000	0.1800	14.8860			(29a)
Dormer Wall	14.2300	3.9700	10.2600	0.1800	1.8468			(29a)
Stud Wall	6.2700		6.2700	0.1800	1.1286			(29a)
Sloping Ceiling	11.9500	0.8400	11.1100	0.1100	1.2221			(30)
Residual Ceiling	30.5000		30.5000	0.1100	3.3550			(30)
Dormer Roof	18.5100		18.5100	0.1100	2.0361			(30)
Total net area of external elements Aum (A, m2)			232.6200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.8201			(33)
Party Wall 1			81.2600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 195.9394 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	12.4500	0.0500	0.6225
E3 Sill	10.6500	0.0500	0.5325
E4 Jamb	38.1800	0.0500	1.9090
E5 Ground floor (normal)	25.1200	0.1600	4.0192
E11 Eaves (insulation at rafter level)	0.0000	0.0400	0.0000
E13 Gable (insulation at rafter level)	2.0900	0.0800	0.1672
E14 Flat roof	8.6600	0.0800	0.6928
E16 Corner (normal)	19.8100	0.0900	1.7829
E6 Intermediate floor within a dwelling	38.9400	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	5.4000	0.0600	0.3240
E12 Gable (insulation at ceiling level)	3.1000	0.0600	0.1860
E17 Corner (inverted - internal area greater than external area)	5.9000	-0.0900	-0.5310

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.7051 (36)

Point Thermal bridges

Total fabric heat loss (33) + (36) + (36a) = 57.5252 (37)

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

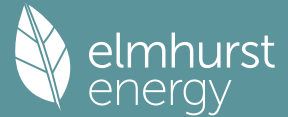
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	69.3021	68.9471	68.5991	66.9647	66.6589	65.2353	65.2353	64.9717	65.7836	66.6589	67.2775	67.9243	(38)
Average = Sum(39)m / 12 =	126.8274	126.4723	126.1244	124.4899	124.1841	122.7605	122.7605	122.4969	123.3089	124.1841	124.8027	125.4495	(39)
												124.4884	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.8731	0.8707	0.8683	0.8570	0.8549	0.8451	0.8451	0.8433	0.8489	0.8549	0.8592	0.8636	(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													2.9265 (42)
Hot water usage for mixer showers													
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	(42a)
Hot water usage for other uses	31.6393	31.1694	30.5077	29.2877	28.3741	27.3611	26.8139	27.4710	28.1864	29.2704	30.5156	31.5323	(42b)
Average daily hot water use (litres/day)	44.6003	42.9785	41.3566	39.7348	38.1130	36.4912	36.4912	38.1130	39.7348	41.3566	42.9785	44.6003	(42c)
												69.8803	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	76.2396	74.1479	71.8644	69.0225	66.4871	63.8522	63.3051	65.5840	67.9212	70.6270	73.4940	76.1326	(44)
Energy content (annual)	120.7449	105.5856	110.4528	94.4883	89.5044	78.5138	76.5620	81.2067	83.7537	95.8402	104.7057	119.2053	(45)
Distribution loss (46)m = 0.15 x (45)m												1160.5634	
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)

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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													
	102.6332	89.7478	93.8849	80.3151	76.0787	66.7367	65.0777	69.0257	71.1906	81.4642	88.9999	101.3245 (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	102.6332	89.7478	93.8849	80.3151	76.0787	66.7367	65.0777	69.0257	71.1906	81.4642	88.9999	101.3245 (64)	
											Total per year (kWh/year) = Sum(64)m =		986.4789 (64)
12Total per year (kWh/year)													
Electric shower(s)	58.6912	52.2943	57.1034	54.4931	55.5156	52.9565	54.7217	55.5156	54.4931	57.1034	56.0296	58.6912 (64a)	
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		667.6088 (64a)
Heat gains from water heating, kWh/month													
	40.3311	35.5105	37.7471	33.7020	32.8986	29.9233	29.9499	31.1353	31.4209	34.6419	36.2574	40.0039 (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	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	197.7424	218.9290	197.7424	204.3338	197.7424	204.3338	197.7424	197.7424	204.3338	197.7424	204.3338	197.7424 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	315.3174	318.5894	310.3440	292.7906	270.6326	249.8073	235.8946	232.6226	240.8680	258.4213	280.5793	301.4047 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325 (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)												
	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600 (71)
Water heating gains (Table 5)												
	54.2084	52.8430	50.7353	46.8084	44.2185	41.5602	40.2552	41.8486	43.6402	46.5617	50.3575	53.7687 (72)
Total internal gains												
	634.1657	657.2590	625.7192	610.8303	579.4911	562.5987	540.7897	539.1110	555.7394	569.6229	602.1681	619.8133 (73)

6. Solar gains

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

North					2.8800	10.6334	0.6300	0.7000	0.7700		9.3591 (74)	
South					4.8400	46.7521	0.6300	0.7000	0.7700		69.1541 (78)	
West					1.0900	19.6403	0.6300	0.7000	0.7700		6.5425 (80)	
South					0.8400	42.0754	0.6300	0.7000	1.0000		14.0278 (82)	

Solar gains	99.0835	169.8573	235.6056	297.8238	339.3567	339.5437	326.2497	294.7922	257.0426	188.5596	118.8682	84.6769 (83)
Total gains	733.2492	827.1163	861.3248	908.6541	918.8478	902.1424	867.0393	833.9032	812.7820	758.1825	721.0363	704.4902 (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	62.3379	62.5129	62.6854	63.5084	63.6648	64.4031	64.4031	64.5417	64.1167	63.6648	63.3492	63.0226
alpha	5.1559	5.1675	5.1790	5.2339	5.2443	5.2935	5.2935	5.3028	5.2744	5.2443	5.2233	5.2015
util living area												
	0.9972	0.9943	0.9892	0.9706	0.9189	0.7778	0.6028	0.6458	0.8592	0.9738	0.9940	0.9978 (86)
MIT												
	19.6856	19.8489	20.0732	20.4060	20.7044	20.9199	20.9833	20.9762	20.8547	20.4734	20.0320	19.6657 (87)
Th 2												
	20.1904	20.1925	20.1946	20.2042	20.2060	20.2144	20.2144	20.2160	20.2112	20.2060	20.2023	20.1985 (88)
util rest of house												
	0.9965	0.9929	0.9862	0.9616	0.8922	0.7109	0.5044	0.5488	0.8072	0.9640	0.9922	0.9972 (89)
MIT 2												
	18.9729	19.1371	19.3616	19.6966	19.9809	20.1687	20.2084	20.2066	20.1182	19.7663	19.3277	18.9594 (90)
Living area fraction												
	19.0363	19.2005	19.4249	19.7597	20.0453	20.2355	20.2773	20.2751	20.1837	19.8292	19.3904	19.0222 (92)
Temperature adjustment												
	19.0363	19.2005	19.4249	19.7597	20.0453	20.2355	20.2773	20.2751	20.1837	19.8292	19.3904	19.0222 (93)
adjusted MIT												

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9951	0.9904	0.9823	0.9553	0.8858	0.7128	0.5126	0.5565	0.8051	0.9581	0.9896	0.9960 (94)
Useful gains	729.6582	819.1768	846.1061	868.0010	813.9392	643.0794	444.4756	464.0753	654.3851	726.3844	713.5582	701.6741 (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	1868.9596	1808.6114	1630.1471	1351.9254	1036.3481	691.8167	451.4254	474.6834	750.1797	1146.1141	1533.8694	1859.4401 (97)
Space heating kWh	847.6402	664.9001	583.3266	348.4255	165.4722	0.0000	0.0000	0.0000	0.0000	312.2789	590.6241	861.3779 (98a)
Space heating requirement - total per year (kWh/year)												4374.0455
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	847.6402	664.9001	583.3266	348.4255	165.4722	0.0000	0.0000	0.0000	0.0000	312.2789	590.6241	861.3779 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4374.0455
Space heating per m2											(98c) / (4) =	30.1118 (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

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Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	1153.9488	908.4278	930.9764	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.7394	0.8350	0.8075	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	853.2683	758.5822	751.7828	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	931.2715	895.5664	862.4786	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	56.1623	101.9162	82.3577	0.0000	0.0000	0.0000	0.0000 (104)
Intermittency factor (Table 10b)									FC = cooled area / (4) =			1.0000 (105)
Space cooling kWh	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 requirement	0.0000	0.0000	0.0000	0.0000	0.0000	14.0406	25.4791	20.5894	0.0000	0.0000	0.0000	0.0000 (107)
Energy for space heating												60.1091 (107)
Energy for space cooling												30.1118 (99)
Total												0.4138 (108)
Fabric Energy Efficiency (TFEE)												30.5256 (109)
												30.5 (109)

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Property Reference	plot 2, Richard Burch Street			Issued on Date	01/05/2024
Assessment Reference	Plot 2	Prop Type Ref	1		
Property	Plot 2, 6 Richard Burch Street, Bury , BL9 6DU				
SAP Rating	94 A	DER	1.20	TER	8.11
Environmental	99 A	% DER < TER			85.20
CO ₂ Emissions (t/year)	0.19	DFEE	27.13	TFEE	30.53
Compliance Check	See BREL	% DFEE < TFEE			11.12
% DPER < TPER	66.88	DPER	14.03	TPER	42.37
Assessor Details	Mr. Mark Scotson			Assessor ID	AX66-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	59.8400 (1b)	x 2.9500 (2b)	= 176.5280 (1b) - (3b)
First floor	57.9600 (1c)	x 2.2500 (2c)	= 130.4100 (1c) - (3c)
Second floor	27.4600 (1d)	x 2.1000 (2d)	= 57.6660 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	145.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	364.6040 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.0823 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2323 (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) = 0.1974 (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	0.2517	0.2468	0.2419	0.2172	0.2122	0.1876	0.1876	0.1826	0.1974	0.2122	0.2221	0.2320 (22b)
Effective ac	0.5317	0.5305	0.5292	0.5236	0.5225	0.5176	0.5176	0.5167	0.5195	0.5225	0.5247	0.5269 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.2000	2.2680		(26)
Door 2			1.8900	1.2000	2.2680		(26a)
Window (Uw = 1.20)			8.8100	1.1450	10.0878		(27)
RL			0.8400	1.1450	0.9618		(27a)
Ground Floor			59.8400	0.1300	7.7792	110.0000	6582.4000 (28a)
External Wall	91.3200	8.6200	82.7000	0.1800	14.8860	60.0000	4962.0000 (29a)
Dormer Wall	14.2300	3.9700	10.2600	0.1800	1.8468	9.0000	92.3400 (29a)
Stud Wall	6.2700		6.2700	0.1700	1.0659	9.0000	56.4300 (29a)
Sloping Ceiling	11.9500	0.8400	11.1100	0.1500	1.6665	9.0000	99.9900 (30)
Residual Ceiling	30.5000		30.5000	0.1000	3.0500	9.0000	274.5000 (30)
Dormer Roof	18.5100		18.5100	0.1500	2.7765	9.0000	166.5900 (30)
Total net area of external elements Aum(A, m ²)			232.6200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	48.6565		(33)
Party Wall 1			81.2600	0.0000	0.0000	180.0000	14626.8000 (32)
Internal Wall 2			97.9000			9.0000	881.1000 (32c)
Internal Floor 1			40.0000			18.0000	720.0000 (32d)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	28462.1500 (34)

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

195.9394 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	12.4500	0.0880	1.0956
E3 Sill	10.6500	0.0470	0.5006
E4 Jamb	38.1800	0.0400	1.5272
E5 Ground floor (normal)	25.1200	0.0330	0.8290
E11 Eaves (insulation at rafter level)	0.0000	0.0330	0.0000
E13 Gable (insulation at rafter level)	2.0900	0.0790	0.1651
E14 Flat roof	8.6600	0.0490	0.4243
E16 Corner (normal)	19.8100	0.0350	0.6934
E6 Intermediate floor within a dwelling	38.9400	0.0230	0.8956
E10 Eaves (insulation at ceiling level)	5.4000	0.0300	0.1620
E12 Gable (insulation at ceiling level)	3.1000	0.0210	0.0651
E17 Corner (inverted - internal area greater than external area)	5.9000	0.0100	0.0590

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

Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	55.0733 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	63.9720	63.8240	63.6789	62.9973	62.8698	62.2762	62.2762	62.1662	62.5048	62.8698	63.1277	63.3974	(38)
Heat transfer coeff	119.0453	118.8973	118.7522	118.0706	117.9431	117.3495	117.3495	117.2396	117.5782	117.9431	118.2011	118.4708	(39)
Average = Sum(39)m / 12 =												118.0700	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8195	0.8185	0.8175	0.8128	0.8119	0.8079	0.8079	0.8071	0.8094	0.8119	0.8137	0.8156	(40)
HLP (average)												0.8128	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9265 (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	31.6393	31.1694	30.5077	29.2877	28.3741	27.3611	26.8139	27.4710	28.1864	29.2704	30.5156	31.5323	(42b)
Hot water usage for other uses	44.6003	42.9785	41.3566	39.7348	38.1130	36.4912	36.4912	38.1130	39.7348	41.3566	42.9785	44.6003	(42c)
Average daily hot water use (litres/day)												69.8803	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	76.2396	74.1479	71.8644	69.0225	66.4871	63.8522	63.3051	65.5840	67.9212	70.6270	73.4940	76.1326	(44)
Energy conte	120.7449	105.5856	110.4528	94.4883	89.5044	78.5138	76.5620	81.2067	83.7537	95.8402	104.7057	119.2053	(45)
Energy content (annual)												1160.5634	
Distribution loss (46)m = 0.15 x (45)m	18.1117	15.8378	16.5679	14.1732	13.4257	11.7771	11.4843	12.1810	12.5631	14.3760	15.7059	17.8808	(46)
Water storage loss:													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.4500 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.7830 (55)
Total storage loss	24.2730	21.9240	24.2730	23.4900	24.2730	23.4900	24.2730	24.2730	23.4900	24.2730	23.4900	24.2730	(56)
If cylinder contains dedicated solar storage	24.2730	21.9240	24.2730	23.4900	24.2730	23.4900	24.2730	24.2730	23.4900	24.2730	23.4900	24.2730	(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	168.2803	148.5208	157.9882	140.4903	137.0398	124.5158	124.0974	128.7421	129.7557	143.3756	150.7077	166.7407	(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	-23.9992	-51.3369	-103.8369	-158.9105	-212.2472	-213.9555	-210.6828	-176.0796	-127.1110	-73.3932	-32.0533	-18.8423	(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	144.2811	97.1839	54.1513	0.0000	0.0000	0.0000	0.0000	0.0000	2.6446	69.9824	118.6544	147.8984	(64)
Total per year (kWh/year)													634.7962 (64)
Electric shower(s)	59.9534	53.4189	58.3314	55.6650	56.7095	54.0954	55.8985	56.7095	55.6650	58.3314	57.2346	59.9534	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												681.9660	(64a)
Heat gains from water heating, kWh/month	93.1643	82.8101	89.3367	82.1352	81.9659	76.4313	77.4598	79.2069	78.5659	84.4780	85.9249	92.6524	(65)

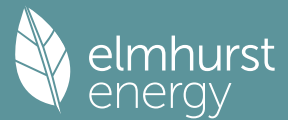
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	197.7424	218.9290	197.7424	204.3338	197.7424	204.3338	197.7424	197.7424	204.3338	197.7424	204.3338	197.7424	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	315.3174	318.5894	310.3440	292.7906	270.6326	249.8073	235.8946	232.6226	240.8680	258.4213	280.5793	301.4047	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	(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)	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	(71)
Water heating gains (Table 5)	125.2209	123.2293	120.0763	114.0767	110.1692	106.1545	104.1127	106.4609	109.1194	113.5458	119.3401	124.5328	(72)
Total internal gains	705.1781	727.6453	695.0602	678.0986	645.4417	627.1931	604.6472	603.7234	621.2186	636.6070	671.1508	690.5774	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
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North			2.8800		10.6334		0.7600		0.7000		0.7700		11.2904 (74)
South			4.8400		46.7521		0.7600		0.7000		0.7700		83.4240 (78)
West			1.0900		19.6403		0.7600		0.7000		0.7700		7.8926 (80)
South			0.8400		42.0754		0.7600		0.7000		1.0000		16.9224 (82)

Solar gains	119.5293	204.9072	284.2226	359.2795	409.3827	409.6082	393.5710	355.6223	310.0831	227.4687	143.3966	102.1499 (83)
Total gains	824.7075	932.5525	979.2828	1037.3781	1054.8245	1036.8013	998.2182	959.3457	931.3018	864.0757	814.5474	792.7273 (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	66.4130	66.4956	66.5769	66.9612	67.0336	67.3727	67.3727	67.4359	67.2417	67.0336	66.8873	66.7350
alpha	5.4275	5.4330	5.4385	5.4641	5.4689	5.4915	5.4915	5.4957	5.4828	5.4689	5.4592	5.4490
util living area	0.9950	0.9896	0.9794	0.9455	0.8614	0.6856	0.5105	0.5515	0.7820	0.9515	0.9889	0.9960 (86)
Living	20.1025	20.2291	20.3936	20.6203	20.8076	20.9145	20.9386	20.9362	20.8835	20.6516	20.3395	20.0779
Non living	19.1678	19.3297	19.5389	19.8239	20.0435	20.1540	20.1719	20.1712	20.1264	19.8659	19.4745	19.1392
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	31	28	31	30	31	30	31	31	30	31	30	31
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000 (87)
Th 2	20.2364	20.2373	20.2382	20.2422	20.2430	20.2465	20.2465	20.2472	20.2452	20.2430	20.2415	20.2399 (88)
util rest of house	0.9938	0.9870	0.9741	0.9309	0.8254	0.6182	0.4263	0.4662	0.7222	0.9357	0.9858	0.9950 (89)
MIT 2	20.2364	20.2373	20.2382	20.2422	20.2430	20.2465	20.2465	20.2472	20.2452	20.2430	20.2415	20.2399 (90)
Living area fraction									fLA = Living area / (4) =			0.0889 (91)
MIT	20.3044	20.3052	20.3059	20.3096	20.3103	20.3135	20.3135	20.3141	20.3123	20.3103	20.3089	20.3075 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3044	20.3052	20.3059	20.3096	20.3103	20.3135	20.3135	20.3141	20.3123	20.3103	20.3089	20.3075 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9939	0.9873	0.9747	0.9324	0.8289	0.6245	0.4340	0.4740	0.7280	0.9373	0.9861	0.9951 (94)
Useful gains	819.7156	920.7073	954.4640	967.2010	874.3689	647.4997	433.1800	454.6982	677.9934	809.8681	803.2091	788.8493 (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	1905.2435	1831.6312	1639.4856	1347.1426	1015.5285	670.4817	435.7826	458.8923	730.4313	1145.2660	1561.3094	1908.2638 (97)
Space heating kWh	807.6328	612.1408	509.6561	273.5580	105.0228	0.0000	0.0000	0.0000	0.0000	249.5360	545.8322	832.8444 (98a)
Space heating requirement - total per year (kWh/year)												3936.2230
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	807.6328	612.1408	509.6561	273.5580	105.0228	0.0000	0.0000	0.0000	0.0000	249.5360	545.8322	832.8444 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3936.2230
Space heating per m2										(98c) / (4) =		27.0978 (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 %)												319.9311 (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	807.6328	612.1408	509.6561	273.5580	105.0228	0.0000	0.0000	0.0000	0.0000	249.5360	545.8322	832.8444 (98)
Space heating efficiency (main heating system 1)	319.9311	319.9311	319.9311	319.9311	319.9311	0.0000	0.0000	0.0000	0.0000	319.9311	319.9311	319.9311 (210)
Space heating fuel (main heating system)	252.4396	191.3352	159.3018	85.5053	32.8267	0.0000	0.0000	0.0000	0.0000	77.9968	170.6093	260.3199 (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	144.2811	97.1839	54.1513	0.0000	0.0000	0.0000	0.0000	0.0000	2.6446	69.9824	118.6544	147.8984 (64)
Efficiency of water heater	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000 (216)
Fuel for water heating, kWh/month	128.2499	86.3857	48.1345	0.0000	0.0000	0.0000	0.0000	0.0000	2.3508	62.2066	105.4706	131.4652 (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	41.9506	33.6544	30.3020	22.2006	17.1484	14.0104	15.6433	20.3338	26.4115	34.6534	39.1409	43.1166 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-71.0059	-102.0309	-145.8628	-155.3993	-159.7788	-142.7318	-141.3828	-133.9777	-120.4930	-112.6419	-78.2693	-61.1890 (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)	-2.5014	-8.0881	-23.4554	-49.5776	-75.7565	-82.9673	-81.8282	-69.9263	-51.1987	-19.5019	-4.9355	-1.7028 (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)

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Annual totals kWh/year	
Space heating fuel - main system 1	1230.3345 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	112.5000
Water heating fuel used	564.2633 (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)	338.5658 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1896.2028 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	918.9268 (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	1230.3345	0.1556	191.4965 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	564.2633	0.1563	88.1928 (264)
Energy for instantaneous electric shower(s)	681.9660	0.1391	94.8766 (264a)
Space and water heating			279.6894 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	338.5658	0.1443	48.8655 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1424.7632	0.1356	-193.1675
PV Unit electricity exported	-471.4396	0.1184	-55.8082
Total			-248.9757 (269)
Total CO2, kg/year			174.4557 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.2000 (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	1230.3345	1.5762	1939.2964 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	564.2633	1.5785	890.7021 (278)
Energy for instantaneous electric shower(s)	681.9660	1.5143	1032.7244 (278a)
Space and water heating			2829.9985 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	338.5658	1.5338	519.3035 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1424.7632	1.5012	-2138.7868
PV Unit electricity exported	-471.4396	0.4342	-204.6869
Total			-2343.4737 (283)
Total Primary energy kWh/year			2038.5526 (286)
Dwelling Primary energy Rate (DPER)			14.0300 (287)

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

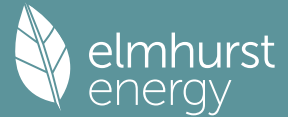
1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	59.8400 (1b)	x 2.9500 (2b)	= 176.5280 (1b) - (3b)
First floor	57.9600 (1c)	x 2.2500 (2c)	= 130.4100 (1c) - (3c)
Second floor	27.4600 (1d)	x 2.1000 (2d)	= 57.6660 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	145.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	364.6040 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1097 (8)
Pressure test	Yes

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Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered

Blower Door
5.0000 (17)
0.3597 (18)
2 (19)

Shelter factor

Infiltration rate adjusted to include shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.8500 (20)$$
$$(21) = (18) \times (20) = 0.3058 (21)$$

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infiltr rate													
Effective ac	0.3898	0.3822	0.3745	0.3363	0.3287	0.2905	0.2905	0.2828	0.3058	0.3287	0.3440	0.3593	(22b)
	0.5760	0.5730	0.5701	0.5566	0.5540	0.5422	0.5422	0.5400	0.5467	0.5540	0.5592	0.5645	(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 Opaque door			1.8900	1.0000	1.8900			(26)
TER Semi-glazed door			1.8900	1.0000	1.8900			(26a)
TER Opening Type (Uw = 1.20)			8.8100	1.1450	10.0878			(27)
RL			0.8400	2.0221	1.6985			(27a)
Ground Floor			59.8400	0.1300	7.7792			(28a)
External Wall	91.3200	8.6200	82.7000	0.1800	14.8860			(29a)
Dormer Wall	14.2300	3.9700	10.2600	0.1800	1.8468			(29a)
Stud Wall	6.2700		6.2700	0.1800	1.1286			(29a)
Sloping Ceiling	11.9500	0.8400	11.1100	0.1100	1.2221			(30)
Residual Ceiling	30.5000		30.5000	0.1100	3.3550			(30)
Dormer Roof	18.5100		18.5100	0.1100	2.0361			(30)
Total net area of external elements Aum(A, m2)			232.6200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.8201			(33)
Party Wall 1			81.2600	0.0000	0.0000			(32)

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

195.9394 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	12.4500	0.0500	0.6225
E3 Sill	10.6500	0.0500	0.5325
E4 Jamb	38.1800	0.0500	1.9090
E5 Ground floor (normal)	25.1200	0.1600	4.0192
E11 Eaves (insulation at rafter level)	0.0000	0.0400	0.0000
E13 Gable (insulation at rafter level)	2.0900	0.0800	0.1672
E14 Flat roof	8.6600	0.0800	0.6928
E16 Corner (normal)	19.8100	0.0900	1.7829
E6 Intermediate floor within a dwelling	38.9400	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	5.4000	0.0600	0.3240
E12 Gable (insulation at ceiling level)	3.1000	0.0600	0.1860
E17 Corner (inverted - internal area greater than external area)	5.9000	-0.0900	-0.5310

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

9.7051 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 57.5252 (37)

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

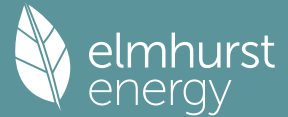
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	69.3021	68.9471	68.5991	66.9647	66.6589	65.2353	65.2353	64.9717	65.7836	66.6589	67.2775	67.9243	(38)
Heat transfer coeff	126.8274	126.4723	126.1244	124.4899	124.1841	122.7605	122.7605	122.4969	123.3089	124.1841	124.8027	125.4495	(39)
Average = Sum(39)m / 12 =												124.4884	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.8731	0.8707	0.8683	0.8570	0.8549	0.8451	0.8451	0.8433	0.8489	0.8549	0.8592	0.8636	(40)
HLP (average)												0.8570	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9265 (42)
Hot water usage for mixer showers													
	73.2876	72.1863	70.5814	67.5106	65.2445	62.7174	61.2810	62.8737	64.6197	67.3331	70.4698	73.0068	(42a)
Hot water usage for baths													
	31.6393	31.1694	30.5077	29.2877	28.3741	27.3611	26.8139	27.4710	28.1864	29.2704	30.5156	31.5323	(42b)
Hot water usage for other uses													
	44.6003	42.9785	41.3566	39.7348	38.1130	36.4912	36.4912	38.1130	39.7348	41.3566	42.9785	44.6003	(42c)
Average daily hot water use (litres/day)													137.4491 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	149.5272	146.3342	142.4457	136.5331	131.7316	126.5696	124.5860	128.4577	132.5409	137.9601	143.9638	149.1395	(44)
Energy conte	236.8146	208.3779	218.9338	186.9070	177.3361	155.6321	150.6760	159.0575	163.4362	187.2105	205.1028	233.5164	(45)
Energy content (annual)										Total = Sum(45)m =			2283.0009
Distribution loss (46)m = 0.15 x (45)m													
	35.5222	31.2567	32.8401	28.0361	26.6004	23.3448	22.6014	23.8586	24.5154	28.0816	30.7654	35.0275	(46)
Water storage loss:													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.3938 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.7527 (55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	283.4095	250.4636	265.5287	231.9988	223.9310	200.7240	197.2709	205.6524	208.5281	233.8054	250.1946	280.1113	(62)
WWHRS	-33.5040	-29.6313	-31.0281	-25.6925	-23.9445	-20.4895	-19.2056	-20.4233	-21.1992	-24.9915	-28.3124	-32.8836	(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													
	249.9055	220.8323	234.5005	206.3063	199.9865	180.2345	178.0653	185.2291	187.3289	208.8139	221.8823	247.2277	(64)
Total per year (kWh/year) = Sum(64)m =													2520.3127 (64)

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12Total per year (kWh/year)	2520 (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 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)											
Heat gains from water heating, kWh/month	116.0168	102.9542	110.0714	98.2201	96.2402	87.8212	87.3757	90.1625	90.4160	99.5234	104.2702 114.9201 (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	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250	146.3250 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	197.7424	218.9290	197.7424	204.3338	197.7424	204.3338	197.7424	197.7424	204.3338	197.7424	204.3338	197.7424 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	315.3174	318.5894	310.3440	292.7906	270.6326	249.8073	235.8946	232.6226	240.8680	258.4213	280.5793	301.4047 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325	37.6325 (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)	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600 (71)
Water heating gains (Table 5)	155.9365	153.2057	147.9454	136.4167	129.3551	121.9738	117.4405	121.1862	125.5778	133.7680	144.8197	154.4625 (72)
Total internal gains	738.8938	760.6216	725.9293	703.4387	667.6276	643.0124	617.9750	618.4487	637.6771	659.8293	699.6303	723.5071 (73)

6. Solar gains

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

North						2.8800	10.6334	0.6300	0.7000	0.7700		9.3591 (74)
South						4.8400	46.7521	0.6300	0.7000	0.7700		69.1541 (78)
West						1.0900	19.6403	0.6300	0.7000	0.7700		6.5425 (80)
South						0.8400	42.0754	0.6300	0.7000	1.0000		14.0278 (82)

Solar gains	99.0835	169.8573	235.6056	297.8238	339.3567	339.5437	326.2497	294.7922	257.0426	188.5596	118.8682	84.6769 (83)
Total gains	837.9773	930.4789	961.5349	1001.2625	1006.9843	982.5560	944.2246	913.2408	894.7197	848.3888	818.4985	808.1840 (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	62.3379	62.5129	62.6854	63.5084	63.6648	64.4031	64.4031	64.5417	64.1167	63.6648	63.3492	63.0226
alpha	5.1559	5.1675	5.1790	5.2339	5.2443	5.2935	5.2935	5.3028	5.2744	5.2443	5.2233	5.2015
util living area	0.9949	0.9904	0.9827	0.9571	0.8915	0.7347	0.5589	0.5978	0.8188	0.9592	0.9895	0.9958 (86)
MIT	19.7828	19.9430	20.1613	20.4786	20.7552	20.9391	20.9882	20.9833	20.8873	20.5452	20.1205	19.7625 (87)
Th 2	20.1904	20.1925	20.1946	20.2042	20.2060	20.2144	20.2144	20.2160	20.2112	20.2060	20.2023	20.1985 (88)
util rest of house	0.9936	0.9880	0.9781	0.9448	0.8592	0.6656	0.4653	0.5046	0.7608	0.9451	0.9864	0.9947 (89)
MIT 2	18.7520	18.9577	19.2366	19.6411	19.9726	20.1712	20.2091	20.2078	20.1220	19.7283	19.1922	18.7321 (90)
Living area fraction	18.8437	19.0453	19.3189	19.7156	20.0422	20.2395	20.2784	20.2768	20.1901	19.8010	19.2748	18.8237 (92)
MIT	18.8437	19.0453	19.3189	19.7156	20.0422	20.2395	20.2784	20.2768	20.1901	19.8010	19.2748	18.8237 (93)
Temperature adjustment												0.0000
adjusted MIT	18.8437	19.0453	19.3189	19.7156	20.0422	20.2395	20.2784	20.2768	20.1901	19.8010	19.2748	18.8237 (93)

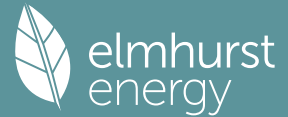
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9906	0.9833	0.9714	0.9354	0.8515	0.6679	0.4732	0.5121	0.7590	0.9360	0.9814	0.9921 (94)
Useful gains	830.0907	914.9712	934.0074	936.5915	857.4760	656.2854	446.7666	467.6685	679.1250	794.0870	803.2567	801.7843 (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	1844.5409	1788.9930	1616.7699	1346.4316	1035.9718	692.3104	451.5590	474.8965	750.9615	1142.6164	1519.4454	1834.5399 (97)
Space heating kWh	754.7509	587.3427	507.9754	295.0849	132.8009	0.0000	0.0000	0.0000	0.0000	259.3059	515.6559	768.3702 (98a)
Space heating requirement - total per year (kWh/year)												3821.2866
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	754.7509	587.3427	507.9754	295.0849	132.8009	0.0000	0.0000	0.0000	0.0000	259.3059	515.6559	768.3702 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3821.2866
Space heating per m2										(98c) / (4) =		26.3065 (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	754.7509	587.3427	507.9754	295.0849	132.8009	0.0000	0.0000	0.0000	0.0000	259.3059	515.6559	768.3702 (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)	817.7150	636.3409	550.3525	319.7019	143.8796	0.0000	0.0000	0.0000	0.0000	280.9381	558.6737	832.4704 (211)

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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	249.9055	220.8323	234.5005	206.3063	199.9865	180.2345	178.0653	185.2291	187.3289	208.8139	221.8823	247.2277	(64)
Efficiency of water heater	86.3768	86.1452	85.7457	84.8619	83.1635	79.8000	79.8000	79.8000	79.8000	84.5466	85.8859	79.8000	(216)
Fuel for water heating, kWh/month	289.3202	256.3489	273.4837	243.1083	240.4737	225.8578	223.1395	232.1167	234.7479	246.9809	258.3453	286.0532	(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	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	41.0870	32.9615	29.6782	21.7435	16.7953	13.7219	15.3212	19.9151	25.8678	33.9399	38.3351	42.2289	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-55.1618	-77.2997	-110.3571	-123.0986	-131.7817	-122.5414	-120.9837	-114.7177	-103.4690	-87.9536	-60.4674	-47.7420	(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	-32.4557	-68.1741	-135.3693	-203.1509	-268.5087	-269.8493	-266.7130	-225.8785	-165.6066	-97.4712	-43.3165	-25.6745	(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												4140.0722	(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												3009.9761	(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)												331.5953	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2957.7419	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												4609.9017	(238)

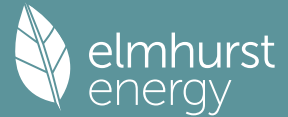
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4140.0722	0.2100	869.4152 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3009.9761	0.2100	632.0950 (264)
Space and water heating			1501.5101 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	331.5953	0.1443	47.8594 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1155.5736	0.1348	-155.7222
PV Unit electricity exported	-1802.1683	0.1259	-226.9182
Total			-382.6404 (269)
Total CO2, kg/year			1178.6585 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.1100 (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	4140.0722	1.1300	4678.2816 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3009.9761	1.1300	3401.2730 (278)
Space and water heating			8079.5546 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	331.5953	1.5338	508.6119 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1155.5736	1.4981	-1731.1082
PV Unit electricity exported	-1802.1683	0.4622	-832.9458
Total			-2564.0540 (283)
Total Primary energy kWh/year			6154.2134 (286)
Target Primary Energy Rate (TPER)			42.3700 (287)

Full SAP Calculation Printout



Property Reference	plot 2, Richard Burch Street			Issued on Date	01/05/2024
Assessment Reference	Plot 2	Prop Type Ref	1		
Property	Plot 2, 6 Richard Burch Street, Bury , BL9 6DU				
SAP Rating	94 A	DER	1.20	TER	8.11
Environmental	99 A	% DER < TER			85.20
CO ₂ Emissions (t/year)	0.19	DFEE	27.13	TFEE	30.53
Compliance Check	See BREL	% DFEE < TFEE			11.12
% DPER < TPER	66.88	DPER	14.03	TPER	42.37
Assessor Details	Mr. Mark Scotson			Assessor ID	AX66-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	59.8400 (1b)	x 2.9500 (2b)	= 176.5280 (1b) - (3b)
First floor	57.9600 (1c)	x 2.2500 (2c)	= 130.4100 (1c) - (3c)
Second floor	27.4600 (1d)	x 2.1000 (2d)	= 57.6660 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	145.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 364.6040 (5)

2. Ventilation rate

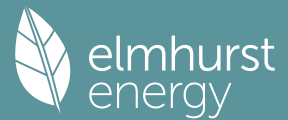
	m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.0823 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.2323	(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) =	0.1974 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Effective ac	0.2517	0.2468	0.2419	0.2172	0.2122	0.1876	0.1876	0.1826	0.1974	0.2122	0.2221	0.2320 (22b)
	0.5317	0.5305	0.5292	0.5236	0.5225	0.5176	0.5176	0.5167	0.5195	0.5225	0.5247	0.5269 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.2000	2.2680		(26)
Door 2			1.8900	1.2000	2.2680		(26a)
Window (Uw = 1.20)			8.8100	1.1450	10.0878		(27)
RL			0.8400	1.1450	0.9618		(27a)
Ground Floor			59.8400	0.1300	7.7792	110.0000	6582.4000 (28a)
External Wall	91.3200	8.6200	82.7000	0.1800	14.8860	60.0000	4962.0000 (29a)
Dormer Wall	14.2300	3.9700	10.2600	0.1800	1.8468	9.0000	92.3400 (29a)
Stud Wall	6.2700		6.2700	0.1700	1.0659	9.0000	56.4300 (29a)
Sloping Ceiling	11.9500	0.8400	11.1100	0.1500	1.6665	9.0000	99.9900 (30)
Residual Ceiling	30.5000		30.5000	0.1000	3.0500	9.0000	274.5000 (30)
Dormer Roof	18.5100		18.5100	0.1500	2.7765	9.0000	166.5900 (30)
Total net area of external elements Aum(A, m ²)			232.6200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	48.6565		(33)
Party Wall 1			81.2600	0.0000	0.0000	180.0000	14626.8000 (32)
Internal Wall 2			97.9000			9.0000	881.1000 (32c)
Internal Floor 1			40.0000			18.0000	720.0000 (32d)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	28462.1500 (34)

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

195.9394 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	12.4500	0.0880	1.0956
E1 Steel lintel with perforated steel base plate	10.6500	0.0470	0.5006
E3 Sill	38.1800	0.0400	1.5272
E4 Jamb	25.1200	0.0330	0.8290
E5 Ground floor (normal)	0.0000	0.0330	0.0000
E11 Eaves (insulation at rafter level)	2.0900	0.0790	0.1651
E13 Gable (insulation at rafter level)	8.6600	0.0490	0.4243
E14 Flat roof	19.8100	0.0350	0.6934
E16 Corner (normal)	38.9400	0.0230	0.8956
E6 Intermediate floor within a dwelling	5.4000	0.0300	0.1620
E10 Eaves (insulation at ceiling level)	3.1000	0.0210	0.0651
E12 Gable (insulation at ceiling level)	5.9000	0.0100	0.0590
E17 Corner (inverted - internal area greater than external area)			

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

Point Thermal bridges	(36a) =	6.4168 (36)
Total fabric heat loss	(33) + (36) + (36a) =	55.0733 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	63.9720	63.8240	63.6789	62.9973	62.8698	62.2762	62.2762	62.1662	62.5048	62.8698	63.1277	63.3974	(38)
Heat transfer coeff	119.0453	118.8973	118.7522	118.0706	117.9431	117.3495	117.3495	117.2396	117.5782	117.9431	118.2011	118.4708	(39)
Average = Sum(39)m / 12 =												118.0700	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8195	0.8185	0.8175	0.8128	0.8119	0.8079	0.8079	0.8071	0.8094	0.8119	0.8137	0.8156	(40)
HLP (average)												0.8128	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9265 (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	31.6393	31.1694	30.5077	29.2877	28.3741	27.3611	26.8139	27.4710	28.1864	29.2704	30.5156	31.5323	(42b)
Hot water usage for other uses	44.6003	42.9785	41.3566	39.7348	38.1130	36.4912	36.4912	38.1130	39.7348	41.3566	42.9785	44.6003	(42c)
Average daily hot water use (litres/day)													69.8803 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	76.2396	74.1479	71.8644	69.0225	66.4871	63.8522	63.3051	65.5840	67.9212	70.6270	73.4940	76.1326	(44)
Energy conte	120.7449	105.5856	110.4528	94.4883	89.5044	78.5138	76.5620	81.2067	83.7537	95.8402	104.7057	119.2053	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m	18.1117	15.8378	16.5679	14.1732	13.4257	11.7771	11.4843	12.1810	12.5631	14.3760	15.7059	17.8808	(46)
Water storage loss:													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.4500 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.7830 (55)
Total storage loss	24.2730	21.9240	24.2730	23.4900	24.2730	23.4900	24.2730	24.2730	23.4900	24.2730	23.4900	24.2730	(56)
If cylinder contains dedicated solar storage	24.2730	21.9240	24.2730	23.4900	24.2730	23.4900	24.2730	24.2730	23.4900	24.2730	23.4900	24.2730	(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	168.2803	148.5208	157.9882	140.4903	137.0398	124.5158	124.0974	128.7421	129.7557	143.3756	150.7077	166.7407	(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	-24.0188	-51.3716	-103.8915	-158.9725	-212.3093	-214.0107	-210.7441	-176.1482	-127.1790	-73.4446	-32.0801	-18.8589	(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	144.2614	97.1492	54.0967	0.0000	0.0000	0.0000	0.0000	0.0000	2.5767	69.9310	118.6276	147.8818	(64)
Electric shower(s)	59.9534	53.4189	58.3314	55.6650	56.7095	54.0954	55.8985	56.7095	55.6650	58.3314	57.2346	59.9534	(64a)
Heat gains from water heating, kWh/month	93.1643	82.8101	89.3367	82.1352	81.9659	76.4313	77.4598	79.2069	78.5659	84.4780	85.9249	92.6524	(65)

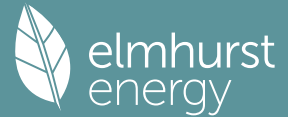
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	175.5901	175.5901	175.5901	175.5901	175.5901	175.5901	175.5901	175.5901	175.5901	175.5901	175.5901	175.5901	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	46.5262	41.3242	33.6071	25.4427	19.0187	16.0564	17.3495	22.5516	30.2687	38.4330	44.8570	47.8193	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	470.6229	475.5065	463.2000	437.0009	403.9293	372.8466	352.0815	347.1979	359.5044	385.7035	418.7751	449.8578	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.4855	55.4855	55.4855	55.4855	55.4855	55.4855	55.4855	55.4855	55.4855	55.4855	55.4855	55.4855	(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)	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	(71)
Water heating gains (Table 5)	125.2209	123.2293	120.0763	114.0767	110.1692	106.1545	104.1127	106.4609	109.1194	113.5458	119.3401	124.5328	(72)
Total internal gains	756.3855	754.0755	730.8989	690.5359	647.1328	609.0731	587.5592	590.2259	612.9080	651.6978	696.9878	736.2255	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	2.8800	10.6334	0.7600	0.7000	1.0000	14.6629 (74)

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South	4.8400	46.7521	0.7600	0.7000	1.0000	108.3429 (78)
West	1.0900	19.6403	0.7600	0.7000	1.0000	10.2501 (80)
South	0.8400	42.0754	0.7600	0.7000	1.0000	16.9224 (82)

Solar gains	150.1782	256.7746	354.7547	446.7023	507.8808	507.7947	488.0557	441.6859	386.3888	284.6310	180.0339	128.4322 (83)
Total gains	906.5637	1010.8502	1085.6536	1137.2381	1155.0135	1116.8678	1075.6149	1031.9118	999.2967	936.3288	877.0216	864.6577 (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	66.4130	66.4956	66.5769	66.9612	67.0336	67.3727	67.3727	67.4359	67.2417	67.0336	66.8873	66.7350
alpha	5.4275	5.4330	5.4385	5.4641	5.4689	5.4915	5.4915	5.4957	5.4828	5.4689	5.4592	5.4490
util living area	0.9923	0.9851	0.9683	0.9240	0.8228	0.6455	0.4756	0.5155	0.7461	0.9345	0.9846	0.9940 (86)
Living	20.1593	20.2816	20.4600	20.6708	20.8376	20.9218	20.9401	20.9382	20.8960	20.6898	20.3813	20.1282
Non living	19.2401	19.3959	19.6211	19.8830	20.0741	20.1594	20.1725	20.1723	20.1369	19.9104	19.5270	19.2033
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	31	28	31	30	31	30	31	30	31	30	31	31
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000 (87)
Th 2	20.2364	20.2373	20.2382	20.2422	20.2430	20.2465	20.2465	20.2472	20.2452	20.2430	20.2415	20.2399 (88)
util rest of house	0.9904	0.9815	0.9606	0.9054	0.7824	0.5791	0.3963	0.4345	0.6845	0.9148	0.9803	0.9925 (89)
MIT 2	20.2364	20.2373	20.2382	20.2422	20.2430	20.2465	20.2465	20.2472	20.2452	20.2430	20.2415	20.2399 (90)
Living area fraction									FLA = Living area / (4) =			0.0889 (91)
MIT	20.3044	20.3052	20.3059	20.3096	20.3103	20.3135	20.3135	20.3141	20.3123	20.3103	20.3089	20.3075 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3044	20.3052	20.3059	20.3096	20.3103	20.3135	20.3135	20.3141	20.3123	20.3103	20.3089	20.3075 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9906	0.9819	0.9614	0.9072	0.7863	0.5852	0.4035	0.4418	0.6904	0.9167	0.9807	0.9926 (94)
Useful gains	898.0543	992.5219	1043.7279	1031.7003	908.1674	653.6080	433.9625	455.9112	689.8655	858.3768	860.1190	858.2890 (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	1905.2435	1831.6312	1639.4856	1347.1426	1015.5285	670.4817	435.7826	458.8923	730.4313	1145.2660	1561.3094	1908.2638 (97)
Space heating kWh	749.3487	563.8814	443.2437	227.1185	79.8767	0.0000	0.0000	0.0000	0.0000	213.4456	504.8571	781.1813 (98a)
Space heating requirement - total per year (kWh/year)												3562.9530
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	749.3487	563.8814	443.2437	227.1185	79.8767	0.0000	0.0000	0.0000	0.0000	213.4456	504.8571	781.1813 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3562.9530
Space heating per m2										(98c) / (4) =		24.5281 (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 %)												319.9311 (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	749.3487	563.8814	443.2437	227.1185	79.8767	0.0000	0.0000	0.0000	0.0000	213.4456	504.8571	781.1813 (98)
Space heating efficiency (main heating system 1)	319.9311	319.9311	319.9311	319.9311	319.9311	0.0000	0.0000	0.0000	0.0000	319.9311	319.9311	319.9311 (210)
Space heating fuel (main heating system)	234.2219	176.2509	138.5435	70.9898	24.9668	0.0000	0.0000	0.0000	0.0000	66.7161	157.8018	244.1717 (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	144.2614	97.1492	54.0967	0.0000	0.0000	0.0000	0.0000	0.0000	2.5767	69.9310	118.6276	147.8818 (64)
Efficiency of water heater (217)m	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000 (216)
Fuel for water heating, kWh/month	128.2324	86.3548	48.0860	0.0000	0.0000	0.0000	0.0000	0.0000	2.2904	62.1609	105.4468	131.4505 (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	40.7241	32.6704	29.4161	21.5515	16.6470	13.6007	15.1859	19.7392	25.6393	33.6402	37.9965	41.8560 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-70.7161	-101.4312	-144.1907	-153.1832	-158.0282	-142.6326	-141.2726	-133.8519	-120.3575	-111.7863	-77.9276	-60.9840 (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	-2.7693	-8.6491	-25.0668	-51.7248	-77.4381	-83.0052	-81.8704	-69.9758	-51.2588	-20.3004	-5.2475	-1.8894 (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												

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Space heating fuel - main system 1	1113.6625 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	112.5000
Water heating fuel used	564.0218 (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)	328.6669 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1895.5574 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	792.7598 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1113.6625	16.4900	183.6430 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	564.0218	16.4900	93.0072 (247)
Energy for instantaneous electric shower(s)	681.9660	16.4900	112.4562 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	328.6669	16.4900	54.1972 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1416.3618	16.4900	-233.5581
PV Unit electricity exported	-479.1956	5.5900	-26.7870
Total			-260.3451 (252)
Total energy cost			182.9584 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	0.3462 (257)
SAP value	94.3884
SAP rating (Section 12)	94 (258)
SAP band	A

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1113.6625	0.1560	173.7241 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	564.0218	0.1563	88.1580 (264)
Energy for instantaneous electric shower(s)	681.9660	0.1391	94.8766 (264a)
Space and water heating			261.8821 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	328.6669	0.1443	47.4368 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1416.3618	0.1355	-191.9644
PV Unit electricity exported	-479.1956	0.1190	-57.0135
Total			-248.9779 (269)
Total CO2, kg/year			155.2175 (272)
CO2 emissions per m2			1.0700 (273)
EI value			98.9068
EI rating			99 (274)
EI band			A

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

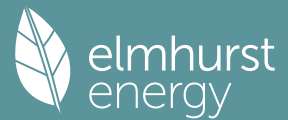
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	59.8400 (1b)	x 2.9500 (2b)	= 176.5280 (1b) - (3b)
First floor	57.9600 (1c)	x 2.2500 (2c)	= 130.4100 (1c) - (3c)
Second floor	27.4600 (1d)	x 2.1000 (2d)	= 57.6660 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	145.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n) =	364.6040 (5)

2. Ventilation rate

m3 per hour

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Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000	Air changes per hour	0.0823 (8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50				3.0000 (17)
Infiltration rate				0.2323 (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) =			0.1974 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	4.9000	4.8000	4.8000	4.4000	4.6000	3.9000	3.9000	3.9000	3.9000	4.4000	4.4000	4.7000	(22)
Adj infilt rate	1.2250	1.2000	1.2000	1.1000	1.1500	0.9750	0.9750	0.9750	0.9750	1.1000	1.1000	1.1750	(22a)
Effective ac	0.2419	0.2369	0.2369	0.2172	0.2271	0.1925	0.1925	0.1925	0.1925	0.2172	0.2172	0.2320	(22b)
	0.5292	0.5281	0.5281	0.5236	0.5258	0.5185	0.5185	0.5185	0.5185	0.5236	0.5236	0.5269	(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	
Door			1.8900	1.2000	2.2680			(26)
Door 2			1.8900	1.2000	2.2680			(26a)
Window (Uw = 1.20)			8.8100	1.1450	10.0878			(27)
RL			0.8400	1.1450	0.9618			(27a)
Ground Floor			59.8400	0.1300	7.7792	110.0000	6582.4000	(28a)
External Wall	91.3200	8.6200	82.7000	0.1800	14.8860	60.0000	4962.0000	(29a)
Dormer Wall	14.2300	3.9700	10.2600	0.1800	1.8468	9.0000	92.3400	(29a)
Stud Wall	6.2700		6.2700	0.1700	1.0659	9.0000	56.4300	(29a)
Sloping Ceiling	11.9500	0.8400	11.1100	0.1500	1.6665	9.0000	99.9900	(30)
Residual Ceiling	30.5000		30.5000	0.1000	3.0500	9.0000	274.5000	(30)
Dormer Roof	18.5100		18.5100	0.1500	2.7765	9.0000	166.5900	(30)
Total net area of external elements Aum(A, m2)			232.6200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	48.6565			(33)
Party Wall 1			81.2600	0.0000	0.0000	180.0000	14626.8000	(32)
Internal Wall 2			97.9000			9.0000	881.1000	(32c)
Internal Floor 1			40.0000			18.0000	720.0000	(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	28462.1500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		195.9394 (35)

List of Thermal Bridges

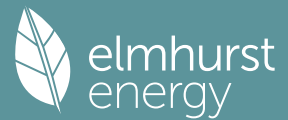
K1 Element	Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate	12.4500	0.0880	1.0956	
E3 Sill	10.6500	0.0470	0.5006	
E4 Jamb	38.1800	0.0400	1.5272	
E5 Ground floor (normal)	25.1200	0.0330	0.8290	
E11 Eaves (insulation at rafter level)	0.0000	0.0330	0.0000	
E13 Gable (insulation at rafter level)	2.0900	0.0790	0.1651	
E14 Flat roof	8.6600	0.0490	0.4243	
E16 Corner (normal)	19.8100	0.0350	0.6934	
E6 Intermediate floor within a dwelling	38.9400	0.0230	0.8956	
E10 Eaves (insulation at ceiling level)	5.4000	0.0300	0.1620	
E12 Gable (insulation at ceiling level)	3.1000	0.0210	0.0651	
E17 Corner (inverted - internal area greater than external area)	5.9000	0.0100	0.0590	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.4168	(36)
Point Thermal bridges			0.0000	(36a) =
Total fabric heat loss			55.0733	(33) + (36) + (36a) =

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	63.6789	63.5367	63.5367	62.9973	63.2611	62.3890	62.3890	62.3890	62.3890	62.9973	62.9973	63.3974	(38)
Average = Sum(39)m / 12 =	118.7522	118.6100	118.6100	118.0706	118.3345	117.4624	117.4624	117.4624	117.4624	118.0706	118.0706	118.4708	(39)
												118.0699	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.8175	0.8165	0.8165	0.8128	0.8146	0.8086	0.8086	0.8086	0.8086	0.8128	0.8128	0.8156	(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													2.9265 (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	31.6393	31.1694	30.5077	29.2877	28.3741	27.3611	26.8139	27.4710	28.1864	29.2704	30.5156	31.5323	(42b)
Hot water usage for other uses	44.6003	42.9785	41.3566	39.7348	38.1130	36.4912	36.4912	38.1130	39.7348	41.3566	42.9785	44.6003	(42c)
Average daily hot water use (litres/day)													69.8803 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	76.2396	74.1479	71.8644	69.0225	66.4871	63.8522	63.3051	65.5840	67.9212	70.6270	73.4940	76.1326	(44)
Energy content (annual)	120.7449	105.5856	110.4528	94.4883	89.5044	78.5138	76.5620	81.2067	83.7537	95.8402	104.7057	119.2053	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =			1160.5634
Water storage loss:	18.1117	15.8378	16.5679	14.1732	13.4257	11.7771	11.4843	12.1810	12.5631	14.3760	15.7059	17.8808	(46)
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.4500 (48)
Temperature factor from Table 2b													0.5400 (49)

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Enter (49) or (54) in (55)												0.7830 (55)
Total storage loss	24.2730	21.9240	24.2730	23.4900	24.2730	23.4900	24.2730	24.2730	23.4900	24.2730	23.4900	24.2730 (56)
If cylinder contains dedicated solar storage	24.2730	21.9240	24.2730	23.4900	24.2730	23.4900	24.2730	24.2730	23.4900	24.2730	23.4900	24.2730 (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	168.2803	148.5208	157.9882	140.4903	137.0398	124.5158	124.0974	128.7421	129.7557	143.3756	150.7077	166.7407 (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	-18.9935	-42.4635	-92.4906	-146.6393	-191.1015	-197.6579	-189.4486	-154.5802	-115.7102	-63.1270	-25.5235	-15.1745 (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	149.2868	106.0573	65.4976	0.0000	0.0000	0.0000	0.0000	0.0000	14.0455	80.2486	125.1842	151.5662 (64)
	Total per year (kWh/year) = Sum(64)m =											691.8863 (64)
Electric shower(s)	59.9534	53.4189	58.3314	55.6650	56.7095	54.0954	55.8985	56.7095	55.6650	58.3314	57.2346	59.9534 (64a)
	Total Energy used by instantaneous electric shower (s) (kWh/year) = Sum(64a)m =											681.9660 (64a)
Heat gains from water heating, kWh/month	93.1643	82.8101	89.3367	82.1352	81.9659	76.4313	77.4598	79.2069	78.5659	84.4780	85.9249	92.6524 (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	175.5901	175.5901	175.5901	175.5901	175.5901	175.5901	175.5901	175.5901	175.5901	175.5901	175.5901	175.5901 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	46.5262	41.3242	33.6071	25.4427	19.0187	16.0564	17.3495	22.5516	30.2687	38.4330	44.8570	47.8193 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	470.6229	475.5065	463.2000	437.0009	403.9293	372.8466	352.0815	347.1979	359.5044	385.7035	418.7751	449.8578 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.4855	55.4855	55.4855	55.4855	55.4855	55.4855	55.4855	55.4855	55.4855	55.4855	55.4855	55.4855 (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)	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600 (71)
Water heating gains (Table 5)	125.2209	123.2293	120.0763	114.0767	110.1692	106.1545	104.1127	106.4609	109.1194	113.5458	119.3401	124.5328 (72)
Total internal gains	756.3855	754.0755	730.8989	690.5359	647.1328	609.0731	587.5592	590.2259	612.9080	651.6978	696.9878	736.2255 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W	
North					2.8800	9.0093	0.7600	0.7000			1.0000	12.4233 (74)	
South					4.8400	39.6765	0.7600	0.7000			1.0000	91.9459 (78)	
West					1.0900	16.6316	0.7600	0.7000			1.0000	8.6799 (80)	
South					0.8400	35.6568	0.7600	0.7000			1.0000	14.3409 (82)	
Solar gains	127.3900	224.0308	325.8832	420.5598	468.7038	477.7305	449.7446	400.0275	360.2017	255.0389	153.1350	110.3585	(83)
Total gains	883.7755	978.1063	1056.7821	1111.0957	1115.8365	1086.8037	1037.3038	990.2534	973.1096	906.7367	850.1228	846.5839	(84)

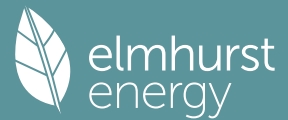
7. Mean internal temperature (heating season)

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	66.5769	66.6567	66.6567	66.9612	66.8119	67.3080	67.3080	67.3080	67.3080	66.9612	66.9612	66.7350
alpha	5.4385	5.4438	5.4438	5.4641	5.4541	5.4872	5.4872	5.4872	5.4872	5.4641	5.4641	5.4490
util living area	0.9933	0.9877	0.9746	0.9339	0.8482	0.6934	0.5652	0.6094	0.8009	0.9513	0.9874	0.9947 (86)
Living	20.1384	20.2463	20.4119	20.6443	20.8150	20.9109	20.9342	20.9297	20.8701	20.6373	20.3481	20.1072
Non living	19.2149	19.3527	19.5618	19.8516	20.0484	20.1498	20.1684	20.1655	20.1134	19.8470	19.4858	19.1765
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	31	28	31	30	31	30	31	31	30	31	30	31
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000 (87)
Th 2	20.2382	20.2390	20.2390	20.2422	20.2407	20.2459	20.2459	20.2459	20.2459	20.2422	20.2422	20.2399 (88)
util rest of house	0.9917	0.9848	0.9685	0.9174	0.8113	0.6300	0.4870	0.5307	0.7478	0.9363	0.9839	0.9934 (89)
MIT 2	20.2382	20.2390	20.2390	20.2422	20.2407	20.2459	20.2459	20.2459	20.2459	20.2422	20.2422	20.2399 (90)
Living area fraction	fLA = Living area / (4) =											0.0889 (91)
MIT	20.3059	20.3067	20.3067	20.3096	20.3082	20.3129	20.3129	20.3129	20.3129	20.3096	20.3096	20.3075 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3059	20.3067	20.3067	20.3096	20.3082	20.3129	20.3129	20.3129	20.3129	20.3096	20.3096	20.3075 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	876.5869	963.5527	1024.0870	1021.1451	909.2618	691.1487	512.5255	532.6912	732.6370	850.3862	836.7178	841.0961 (94)
Ext temp.	4.2000	4.7000	6.1000	8.7000	11.5000	14.2000	15.9000	15.7000	13.5000	10.1000	6.9000	4.1000 (96)
Heat loss rate W	1912.6157	1851.1122	1685.0581	1370.7568	1042.3140	718.0395	518.3535	541.8459	800.2631	1205.4579	1583.2839	1920.1109 (97)
Space heating kWh	770.8054	596.4399	491.7625	251.7204	98.9908	0.0000	0.0000	0.0000	0.0000	264.1733	537.5276	802.7870 (98a)
Space heating requirement - total per year (kWh/year)												3814.2071
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	770.8054	596.4399	491.7625	251.7204	98.9908	0.0000	0.0000	0.0000	0.0000	264.1733	537.5276	802.7870 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3814.2071

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Space heating per m2

(98c) / (4) = 26.2578 (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 %)													319.9311 (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	770.8054	596.4399	491.7625	251.7204	98.9908	0.0000	0.0000	0.0000	0.0000	264.1733	537.5276	802.7870	(98)
Space heating efficiency (main heating system 1)	319.9311	319.9311	319.9311	319.9311	319.9311	0.0000	0.0000	0.0000	0.0000	319.9311	319.9311	319.9311	(210)
Space heating fuel (main heating system)	240.9286	186.4276	153.7089	78.6796	30.9413	0.0000	0.0000	0.0000	0.0000	82.5719	168.0136	250.9250	(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	149.2868	106.0573	65.4976	0.0000	0.0000	0.0000	0.0000	0.0000	14.0455	80.2486	125.1842	151.5662	(64)
Efficiency of water heater (217)m	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	(216)
Fuel for water heating, kWh/month	132.6994	94.2732	58.2201	0.0000	0.0000	0.0000	0.0000	0.0000	12.4849	71.3321	111.2748	134.7255	(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	40.7241	32.6704	29.4161	21.5515	16.6470	13.6007	15.1859	19.7392	25.6393	33.6402	37.9965	41.8560	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-61.7792	-92.0201	-138.0096	-149.2747	-153.5163	-139.1138	-136.5711	-127.9169	-117.5110	-105.1972	-68.8042	-53.7142	(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	-2.0086	-6.4967	-20.5029	-46.7613	-68.9662	-77.1187	-74.1823	-61.9823	-45.3920	-15.9471	-3.8049	-1.3891	(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													1192.1964 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													112.5000
Water heating fuel used													615.0100 (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)													328.6669 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-1767.9802 (233)
Wind generation													0.0000 (234)
Hydro-electric generation (Appendix N)													0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (235)
Appendix Q - special features													
Energy saved or generated													-0.0000 (236)
Energy used													0.0000 (237)
Total delivered energy for all uses													1049.8591 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1192.1964	25.1600	299.9566	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	615.0100	25.1600	154.7365	(247)
Energy for instantaneous electric shower(s)	681.9660	25.1600	171.5826	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	328.6669	25.1600	82.6926	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1343.4281	25.1600	-338.0065	
PV Unit electricity exported	-424.5521	5.8100	-24.6665	
Total			-362.6730	(252)
Total energy cost			346.2954	(255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1192.1964	0.1556	185.4533	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	615.0100	0.1555	95.6085	(264)
Energy for instantaneous electric shower(s)	681.9660	0.1391	94.8766	(264a)
Space and water heating			281.0617	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	328.6669	0.1443	47.4368	(268)

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Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1343.4281	0.1351	-181.4869
PV Unit electricity exported	-424.5521	0.1181	-50.1414
Total			-231.6282 (269)
Total CO ₂ , kg/year			191.7468 (272)

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

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	1192.1964	1.5759	1878.7887 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	615.0100	1.5754	968.8907 (278)
Energy for instantaneous electric shower(s)	681.9660	1.5143	1032.7244 (278a)
Space and water heating			2847.6795 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	328.6669	1.5338	504.1203 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1343.4281	1.4993	-2014.2455
PV Unit electricity exported	-424.5521	0.4332	-183.9061
Total			-2198.1515 (283)
Total Primary energy kWh/year			2186.3726 (286)

SAP 10 EPC IMPROVEMENTS

Plot 2

Current energy efficiency rating:	A 94
Current environmental impact rating:	A 99

N Solar water heating	SAP increase too small
U Solar photovoltaic panels	Already installed
V2 Wind turbine	Not applicable

Recommended measures: (none)	SAP change	Cost change	CO ₂ change
---------------------------------	------------	-------------	------------------------

Measures omitted - SAP change or cost saving too small:			
N Solar water heating	+ 0.3	-£ -36	-105 kg (54.9%)

Recommended measures (none)	Typical annual savings	Energy efficiency impact	Environmental impact
	Total Savings	£0	0.00 kg/m ²

Potential energy efficiency rating:	A 94
Potential environmental impact rating:	A 99

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

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

	Current £709	Potential £709	Saving £0
Electricity			
Space heating	£300	£300	£0
Water heating	£326	£326	£0
Lighting	£83	£83	£0
Generated (PV)	-£363	-£363	£0
Total cost of fuels	£346	£346	£0
Total cost of uses	£346	£346	£0
Delivered energy	7 kWh/m ²	7 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO ₂ emissions per m ²	1 kg/m ²	1 kg/m ²	0 kg/m ²
Primary energy	15 kWh/m ²	15 kWh/m ²	0 kWh/m ²

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	59.8400 (1b)	x 2.9500 (2b)	= 176.5280 (1b) - (3b)
First floor	57.9600 (1c)	x 2.2500 (2c)	= 130.4100 (1c) - (3c)
Second floor	27.4600 (1d)	x 2.1000 (2d)	= 57.6660 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	145.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 364.6040 (5)

2. Ventilation rate

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												m3 per hour	
Number of open chimneys												0 * 80 =	0.0000 (6a)
Number of open flues												0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire												0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler												0 * 20 =	0.0000 (6d)
Number of flues attached to other heater												0 * 35 =	0.0000 (6e)
Number of blocked chimneys												0 * 20 =	0.0000 (6f)
Number of intermittent extract fans												3 * 10 =	30.0000 (7a)
Number of passive vents												0 * 10 =	0.0000 (7b)
Number of flueless gas fires												0 * 40 =	0.0000 (7c)
												Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =												30.0000 / (5) =	0.0823 (8)
Pressure test												Yes	
Pressure Test Method												Blower Door	
Measured/design AP50												3.0000 (17)	
Infiltration rate												0.2323 (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) = 0.1974 (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	0.2517	0.2468	0.2419	0.2172	0.2122	0.1876	0.1876	0.1826	0.1974	0.2122	0.2221	0.2320	(22b)
Effective ac	0.5317	0.5305	0.5292	0.5236	0.5225	0.5176	0.5176	0.5167	0.5195	0.5225	0.5247	0.5269	(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
Door			1.8900	1.2000	2.2680		(26)
Door 2			1.8900	1.2000	2.2680		(26a)
Window (Uw = 1.20)			8.8100	1.1450	10.0878		(27)
RL			0.8400	1.1450	0.9618		(27a)
Ground Floor			59.8400	0.1300	7.7792	110.0000	6582.4000 (28a)
External Wall	91.3200	8.6200	82.7000	0.1800	14.8860	60.0000	4962.0000 (29a)
Dormer Wall	14.2300	3.9700	10.2600	0.1800	1.8468	9.0000	92.3400 (29a)
Stud Wall	6.2700		6.2700	0.1700	1.0659	9.0000	56.4300 (29a)
Sloping Ceiling	11.9500	0.8400	11.1100	0.1500	1.6665	9.0000	99.9900 (30)
Residual Ceiling	30.5000		30.5000	0.1000	3.0500	9.0000	274.5000 (30)
Dormer Roof	18.5100		18.5100	0.1500	2.7765	9.0000	166.5900 (30)
Total net area of external elements Aum(A, m2)			232.6200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	48.6565		(33)
Party Wall 1			81.2600	0.0000	0.0000	180.0000	14626.8000 (32)
Internal Wall 2			97.9000			9.0000	881.1000 (32c)
Internal Floor 1			40.0000			18.0000	720.0000 (32d)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 28462.1500 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 195.9394 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	12.4500	0.0880	1.0956
E3 Sill	10.6500	0.0470	0.5006
E4 Jamb	38.1800	0.0400	1.5272
E5 Ground floor (normal)	25.1200	0.0330	0.8290
E11 Eaves (insulation at rafter level)	0.0000	0.0330	0.0000
E13 Gable (insulation at rafter level)	2.0900	0.0790	0.1651
E14 Flat roof	8.6600	0.0490	0.4243
E16 Corner (normal)	19.8100	0.0350	0.6934
E6 Intermediate floor within a dwelling	38.9400	0.0230	0.8956
E10 Eaves (insulation at ceiling level)	5.4000	0.0300	0.1620
E12 Gable (insulation at ceiling level)	3.1000	0.0210	0.0651
E17 Corner (inverted - internal area greater than external area)	5.9000	0.0100	0.0590

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.4168 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 55.0733 (37)

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

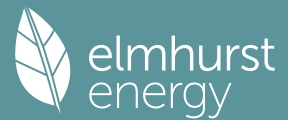
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	63.9720	63.8240	63.6789	62.9973	62.8698	62.2762	62.2762	62.1662	62.5048	62.8698	63.1277	63.3974
Average = Sum(39)m / 12 =	119.0453	118.8973	118.7522	118.0706	117.9431	117.3495	117.3495	117.2396	117.5782	117.9431	118.2011	118.4708

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8195	0.8185	0.8175	0.8128	0.8119	0.8079	0.8079	0.8071	0.8094	0.8119	0.8137	0.8156
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

											2.9265 (42)		
Assumed occupancy													
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	31.6393	31.1694	30.5077	29.2877	28.3741	27.3611	26.8139	27.4710	28.1864	29.2704	30.5156	31.5323	(42b)
Hot water usage for other uses	44.6003	42.9785	41.3566	39.7348	38.1130	36.4912	36.4912	38.1130	39.7348	41.3566	42.9785	44.6003	(42c)
Average daily hot water use (litres/day)												69.8803 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	76.2396	74.1479	71.8644	69.0225	66.4871	63.8522	63.3051	65.5840	67.9212	70.6270	73.4940	76.1326	(44)
Energy conte	120.7449	105.5856	110.4528	94.4883	89.5044	78.5138	76.5620	81.2067	83.7537	95.8402	104.7057	119.2053	(45)
Energy content (annual)												Total = Sum(45)m = 1160.5634	
Distribution loss (46)m = 0.15 x (45)m	18.1117	15.8378	16.5679	14.1732	13.4257	11.7771	11.4843	12.1810	12.5631	14.3760	15.7059	17.8808	(46)
Water storage loss:													

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Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4500 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7830 (55)
Total storage loss												
	24.2730	21.9240	24.2730	23.4900	24.2730	23.4900	24.2730	24.2730	23.4900	24.2730	23.4900	24.2730 (56)
If cylinder contains dedicated solar storage												
	24.2730	21.9240	24.2730	23.4900	24.2730	23.4900	24.2730	24.2730	23.4900	24.2730	23.4900	24.2730 (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												
	168.2803	148.5208	157.9882	140.4903	137.0398	124.5158	124.0974	128.7421	129.7557	143.3756	150.7077	166.7407 (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	-24.0188	-51.3716	-103.8915	-158.9725	-212.3093	-214.0107	-210.7441	-176.1482	-127.1790	-73.4446	-32.0801	-18.8589 (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												
	144.2614	97.1492	54.0967	0.0000	0.0000	0.0000	0.0000	0.0000	2.5767	69.9310	118.6276	147.8818 (64)
												Total per year (kWh/year) = Sum(64)m = 634.5245 (64)
Electric shower(s)												
	59.9534	53.4189	58.3314	55.6650	56.7095	54.0954	55.8985	56.7095	55.6650	58.3314	57.2346	59.9534 (64a)
												Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 681.9660 (64a)
Heat gains from water heating, kWh/month												
	93.1643	82.8101	89.3367	82.1352	81.9659	76.4313	77.4598	79.2069	78.5659	84.4780	85.9249	92.6524 (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	175.5901	175.5901	175.5901	175.5901	175.5901	175.5901	175.5901	175.5901	175.5901	175.5901	175.5901	175.5901 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	46.5262	41.3242	33.6071	25.4427	19.0187	16.0564	17.3495	22.5516	30.2687	38.4330	44.8570	47.8193 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	470.6229	475.5065	463.2000	437.0009	403.9293	372.8466	352.0815	347.1979	359.5044	385.7035	418.7751	449.8578 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	55.4855	55.4855	55.4855	55.4855	55.4855	55.4855	55.4855	55.4855	55.4855	55.4855	55.4855	55.4855 (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)												
	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600 (71)
Water heating gains (Table 5)												
	125.2209	123.2293	120.0763	114.0767	110.1692	106.1545	104.1127	106.4609	109.1194	113.5458	119.3401	124.5328 (72)
Total internal gains	756.3855	754.0755	730.8989	690.5359	647.1328	609.0731	587.5592	590.2259	612.9080	651.6978	696.9878	736.2255 (73)

6. Solar gains

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

North	2.8800				10.6334		0.7600		0.7000		1.0000		14.6629 (74)	
South	4.8400				46.7521		0.7600		0.7000		1.0000		108.3429 (78)	
West	1.0900				19.6403		0.7600		0.7000		1.0000		10.2501 (80)	
South	0.8400				42.0754		0.7600		0.7000		1.0000		16.9224 (82)	

Solar gains	150.1782	256.7746	354.7547	446.7023	507.8808	507.7947	488.0557	441.6859	386.3888	284.6310	180.0339	128.4322	(83)	
Total gains	906.5637	1010.8502	1085.6536	1137.2381	1155.0135	1116.8678	1075.6149	1031.9118	999.2967	936.3288	877.0216	864.6577	(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	66.4130	66.4956	66.5769	66.9612	67.0336	67.3727	67.3727	67.4359	67.2417	67.0336	66.8873	66.7350
alpha	5.4275	5.4330	5.4385	5.4641	5.4689	5.4915	5.4915	5.4957	5.4828	5.4689	5.4592	5.4490
util living area	0.9923	0.9851	0.9683	0.9240	0.8228	0.6455	0.4756	0.5155	0.7461	0.9345	0.9846	0.9940 (86)
Living	20.1593	20.2816	20.4600	20.6708	20.8376	20.9218	20.9401	20.9382	20.8960	20.6898	20.3813	20.1282
Non living	19.2401	19.3959	19.6211	19.8830	20.0741	20.1594	20.1725	20.1723	20.1369	19.9104	19.5270	19.2033
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	31	28	31	30	31	30	31	31	30	31	30	31
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000 (87)
Th 2	20.2364	20.2373	20.2382	20.2422	20.2430	20.2465	20.2465	20.2472	20.2452	20.2430	20.2415	20.2399 (88)
util rest of house												
	0.9904	0.9815	0.9606	0.9054	0.7824	0.5791	0.3963	0.4345	0.6845	0.9148	0.9803	0.9925 (89)
MIT 2	20.2364	20.2373	20.2382	20.2422	20.2430	20.2465	20.2465	20.2472	20.2452	20.2430	20.2415	20.2399 (90)
Living area fraction												
	20.3044	20.3052	20.3059	20.3096	20.3103	20.3135	20.3135	20.3141	20.3123	20.3103	20.3089	20.3075 (91)
Temperature adjustment												0.0000
adjusted MIT	20.3044	20.3052	20.3059	20.3096	20.3103	20.3135	20.3135	20.3141	20.3123	20.3103	20.3089	20.3075 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9906	0.9819	0.9614	0.9072	0.7863	0.5852	0.4035	0.4418	0.6904	0.9167	0.9807	0.9926 (94)
Useful gains	898.0543	992.5219	1043.7279	1031.7003	908.1674	653.6080	433.9625	455.9112	689.8655	858.3768	860.1190	858.2890 (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												
	1905.2435	1831.6312	1639.4856	1347.1426	1015.5285	670.4817	435.7826	458.8923	730.4313	1145.2660	1561.3094	1908.2638 (97)
Space heating kWh												
	749.3487	563.8814	443.2437	227.1185	79.8767	0.0000	0.0000	0.0000	0.0000	213.4456	504.8571	781.1813 (98a)
Space heating requirement - total per year (kWh/year)												3562.9530
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

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Space heating kWh	749.3487	563.8814	443.2437	227.1185	79.8767	0.0000	0.0000	0.0000	0.0000	213.4456	504.8571	781.1813 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3562.9530
Space heating per m2												(98c) / (4) = 24.5281 (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 %)												319.9311 (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	749.3487	563.8814	443.2437	227.1185	79.8767	0.0000	0.0000	0.0000	0.0000	213.4456	504.8571	781.1813 (98)
Space heating efficiency (main heating system 1)	319.9311	319.9311	319.9311	319.9311	319.9311	0.0000	0.0000	0.0000	0.0000	319.9311	319.9311	319.9311 (210)
Space heating fuel (main heating system)	234.2219	176.2509	138.5435	70.9898	24.9668	0.0000	0.0000	0.0000	0.0000	66.7161	157.8018	244.1717 (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	144.2614	97.1492	54.0967	0.0000	0.0000	0.0000	0.0000	0.0000	2.5767	69.9310	118.6276	147.8818 (64)
Efficiency of water heater (217)m	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000 (216)
Fuel for water heating, kWh/month	128.2324	86.3548	48.0860	0.0000	0.0000	0.0000	0.0000	0.0000	2.2904	62.1609	105.4468	131.4505 (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	40.7241	32.6704	29.4161	21.5515	16.6470	13.6007	15.1859	19.7392	25.6393	33.6402	37.9965	41.8560 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-70.7161	-101.4312	-144.1907	-153.1832	-158.0282	-142.6326	-141.2726	-133.8519	-120.3575	-111.7863	-77.9276	-60.9840 (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)	-2.7693	-8.6491	-25.0668	-51.7248	-77.4381	-83.0052	-81.8704	-69.9758	-51.2588	-20.3004	-5.2475	-1.8894 (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												1113.6625 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												112.5000
Water heating fuel used												564.0218 (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)												328.6669 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1895.5574 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												792.7598 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1113.6625	16.4900	183.6430 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	564.0218	16.4900	93.0072 (247)
Energy for instantaneous electric shower(s)	681.9660	16.4900	112.4562 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	328.6669	16.4900	54.1972 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1416.3618	16.4900	-233.5581
PV Unit electricity exported	-479.1956	5.5900	-26.7870
Total			-260.3451 (252)
Total energy cost			182.9584 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)		0.3462 (257)
SAP value	[(255) x (256)] / [(4) + 45.0] =	94.3884
SAP rating (Section 12)		94 (258)
SAP band		A

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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	1113.6625	0.1560	173.7241 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	564.0218	0.1563	88.1580 (264)
Energy for instantaneous electric shower(s)	681.9660	0.1391	94.8766 (264a)
Space and water heating			261.8821 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	328.6669	0.1443	47.4368 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1416.3618	0.1355	-191.9644
PV Unit electricity exported	-479.1956	0.1190	-57.0135
Total			-248.9779 (269)
Total CO2, kg/year			155.2175 (272)
CO2 emissions per m2			1.0700 (273)
EI value			98.9068
EI rating			99 (274)
EI band			A

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	59.8400 (1b)	x 2.9500 (2b)	= 176.5280 (1b) - (3b)
First floor	57.9600 (1c)	x 2.2500 (2c)	= 130.4100 (1c) - (3c)
Second floor	27.4600 (1d)	x 2.1000 (2d)	= 57.6660 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	145.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 364.6040 (5)

2. Ventilation rate

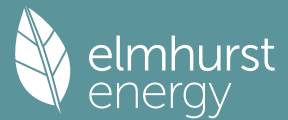
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour	30.0000 / (5) = 0.0823 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.2323	(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) =	0.1974 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.9000	4.8000	4.8000	4.4000	4.6000	3.9000	3.9000	3.9000	3.9000	4.4000	4.4000	4.7000 (22)
Wind factor	1.2250	1.2000	1.2000	1.1000	1.1500	0.9750	0.9750	0.9750	0.9750	1.1000	1.1000	1.1750 (22a)
Adj infilt rate	0.2419	0.2369	0.2369	0.2172	0.2271	0.1925	0.1925	0.1925	0.1925	0.2172	0.2172	0.2320 (22b)
Effective ac	0.5292	0.5281	0.5281	0.5236	0.5258	0.5185	0.5185	0.5185	0.5185	0.5236	0.5236	0.5269 (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
Door			1.8900	1.2000	2.2680		(26)
Door 2			1.8900	1.2000	2.2680		(26a)
Window (Uw = 1.20)			8.8100	1.1450	10.0878		(27)
RL			0.8400	1.1450	0.9618		(27a)
Ground Floor			59.8400	0.1300	7.7792	110.0000	6582.4000 (28a)
External Wall	91.3200	8.6200	82.7000	0.1800	14.8860	60.0000	4962.0000 (29a)
Dormer Wall	14.2300	3.9700	10.2600	0.1800	1.8468	9.0000	92.3400 (29a)
Stud Wall	6.2700		6.2700	0.1700	1.0659	9.0000	56.4300 (29a)
Sloping Ceiling	11.9500	0.8400	11.1100	0.1500	1.6665	9.0000	99.9900 (30)
Residual Ceiling	30.5000		30.5000	0.1000	3.0500	9.0000	274.5000 (30)
Dormer Roof	18.5100		18.5100	0.1500	2.7765	9.0000	166.5900 (30)
Total net area of external elements Aum(A, m2)			232.6200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		48.6565		(33)
Party Wall 1			81.2600	0.0000	0.0000	180.0000	14626.8000 (32)
Internal Wall 2			97.9000			9.0000	881.1000 (32c)
Internal Floor 1			40.0000			18.0000	720.0000 (32d)

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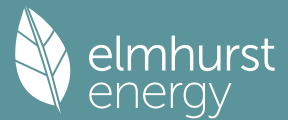
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) = 28462.1500 (34)							
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K						195.9394 (35)							
List of Thermal Bridges													
K1 Element						Length	Psi-value	Total					
E1 Steel lintel with perforated steel base plate						12.4500	0.0880	1.0956					
E3 Sill						10.6500	0.0470	0.5006					
E4 Jamb						38.1800	0.0400	1.5272					
E5 Ground floor (normal)						25.1200	0.0330	0.8290					
E11 Eaves (insulation at rafter level)						0.0000	0.0330	0.0000					
E13 Gable (insulation at rafter level)						2.0900	0.0790	0.1651					
E14 Flat roof						8.6600	0.0490	0.4243					
E16 Corner (normal)						19.8100	0.0350	0.6934					
E6 Intermediate floor within a dwelling						38.9400	0.0230	0.8956					
E10 Eaves (insulation at ceiling level)						5.4000	0.0300	0.1620					
E12 Gable (insulation at ceiling level)						3.1000	0.0210	0.0651					
E17 Corner (inverted - internal area greater than external area)						5.9000	0.0100	0.0590					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)						6.4168 (36)							
Point Thermal bridges						(36a) = 0.0000							
Total fabric heat loss						(33) + (36) + (36a) = 55.0733 (37)							
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(38)
	63.6789	63.5367	63.5367	62.9973	63.2611	62.3890	62.3890	62.3890	62.3890	62.9973	62.9973	63.3974	
Heat transfer coeff	118.7522	118.6100	118.6100	118.0706	118.3345	117.4624	117.4624	117.4624	117.4624	118.0706	118.0706	118.4708	(39)
Average = Sum(39)m / 12 =						118.0699							
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(40)
	0.8175	0.8165	0.8165	0.8128	0.8146	0.8086	0.8086	0.8086	0.8086	0.8128	0.8128	0.8156	
HLP (average)						0.8128							
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.9265 (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	31.6393	31.1694	30.5077	29.2877	28.3741	27.3611	26.8139	27.4710	28.1864	29.2704	30.5156	31.5323 (42b)
Hot water usage for other uses	44.6003	42.9785	41.3566	39.7348	38.1130	36.4912	36.4912	38.1130	39.7348	41.3566	42.9785	44.6003 (42c)
Average daily hot water use (litres/day)												69.8803 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	76.2396	74.1479	71.8644	69.0225	66.4871	63.8522	63.3051	65.5840	67.9212	70.6270	73.4940	76.1326 (44)
Energy content (annual)	120.7449	105.5856	110.4528	94.4883	89.5044	78.5138	76.5620	81.2067	83.7537	95.8402	104.7057	119.2053 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1160.5634
	18.1117	15.8378	16.5679	14.1732	13.4257	11.7771	11.4843	12.1810	12.5631	14.3760	15.7059	17.8808 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4500 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7830 (55)
Total storage loss	24.2730	21.9240	24.2730	23.4900	24.2730	23.4900	24.2730	24.2730	23.4900	24.2730	23.4900	24.2730 (56)
If cylinder contains dedicated solar storage	24.2730	21.9240	24.2730	23.4900	24.2730	23.4900	24.2730	24.2730	23.4900	24.2730	23.4900	24.2730 (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												
	168.2803	148.5208	157.9882	140.4903	137.0398	124.5158	124.0974	128.7421	129.7557	143.3756	150.7077	166.7407 (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	-18.9935	-42.4635	-92.4906	-146.6393	-191.1015	-197.6579	-189.4486	-154.5802	-115.7102	-63.1270	-25.5235	-15.1745 (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	149.2868	106.0573	65.4976	0.0000	0.0000	0.0000	0.0000	0.0000	14.0455	80.2486	125.1842	151.5662 (64)
										Total per year (kWh/year) = Sum(64)m =		691.8863 (64)
Electric shower(s)	59.9534	53.4189	58.3314	55.6650	56.7095	54.0954	55.8985	56.7095	55.6650	58.3314	57.2346	59.9534 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		681.9660 (64a)
Heat gains from water heating, kWh/month												
	93.1643	82.8101	89.3367	82.1352	81.9659	76.4313	77.4598	79.2069	78.5659	84.4780	85.9249	92.6524 (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	175.5901	175.5901	175.5901	175.5901	175.5901	175.5901	175.5901	175.5901	175.5901	175.5901	175.5901	175.5901 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	46.5262	41.3242	33.6071	25.4427	19.0187	16.0564	17.3495	22.5516	30.2687	38.4330	44.8570	47.8193 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	470.6229	475.5065	463.2000	437.0009	403.9293	372.8466	352.0815	347.1979	359.5044	385.7035	418.7751	449.8578 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.4855	55.4855	55.4855	55.4855	55.4855	55.4855	55.4855	55.4855	55.4855	55.4855	55.4855	55.4855 (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)												
	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600	-117.0600 (71)
Water heating gains (Table 5)	125.2209	123.2293	120.0763	114.0767	110.1692	106.1545	104.1127	106.4609	109.1194	113.5458	119.3401	124.5328 (72)
Total internal gains	756.3855	754.0755	730.8989	690.5359	647.1328	609.0731	587.5592	590.2259	612.9080	651.6978	696.9878	736.2255 (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						

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North	2.8800	9.0093	0.7600	0.7000	1.0000	12.4233 (74)
South	4.8400	39.6765	0.7600	0.7000	1.0000	91.9459 (78)
West	1.0900	16.6316	0.7600	0.7000	1.0000	8.6799 (80)
South	0.8400	35.6568	0.7600	0.7000	1.0000	14.3409 (82)

Solar gains	127.3900	224.0308	325.8832	420.5598	468.7038	477.7305	449.7446	400.0275	360.2017	255.0389	153.1350	110.3585 (83)
Total gains	883.7755	978.1063	1056.7821	1111.0957	1115.8365	1086.8037	1037.3038	990.2534	973.1096	906.7367	850.1228	846.5839 (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	66.5769	66.6567	66.6567	66.9612	66.8119	67.3080	67.3080	67.3080	67.3080	66.9612	66.9612	66.7350
alpha	5.4385	5.4438	5.4438	5.4641	5.4541	5.4872	5.4872	5.4872	5.4872	5.4641	5.4641	5.4490
util living area	0.9933	0.9877	0.9746	0.9339	0.8482	0.6934	0.5652	0.6094	0.8009	0.9513	0.9874	0.9947 (86)
Living	20.1384	20.2463	20.4119	20.6443	20.8150	20.9109	20.9342	20.9297	20.8701	20.6373	20.3481	20.1072
Non living	19.2149	19.3527	19.5618	19.8516	20.0484	20.1498	20.1684	20.1655	20.1134	19.8470	19.4858	19.1765
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	31	28	31	30	31	30	31	31	30	31	30	31
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000 (87)
Th 2	20.2382	20.2390	20.2390	20.2422	20.2407	20.2459	20.2459	20.2459	20.2459	20.2422	20.2422	20.2399 (88)
util rest of house	0.9917	0.9848	0.9685	0.9174	0.8113	0.6300	0.4870	0.5307	0.7478	0.9363	0.9839	0.9934 (89)
MIT 2	20.2382	20.2390	20.2390	20.2422	20.2407	20.2459	20.2459	20.2459	20.2459	20.2422	20.2422	20.2399 (90)
Living area fraction									fLA = Living area / (4) =			0.0889 (91)
MIT	20.3059	20.3067	20.3067	20.3096	20.3082	20.3129	20.3129	20.3129	20.3129	20.3096	20.3096	20.3075 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3059	20.3067	20.3067	20.3096	20.3082	20.3129	20.3129	20.3129	20.3129	20.3096	20.3096	20.3075 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9919	0.9851	0.9691	0.9190	0.8149	0.6359	0.4941	0.5379	0.7529	0.9379	0.9842	0.9935 (94)
Useful gains	876.5869	963.5527	1024.0870	1021.1451	909.2618	691.1487	512.5255	532.6912	732.6370	850.3862	836.7178	841.0961 (95)
Ext temp.	4.2000	4.7000	6.1000	8.7000	11.5000	14.2000	15.9000	15.7000	13.5000	10.1000	6.9000	4.1000 (96)
Heat loss rate W	1912.6157	1851.1122	1685.0581	1370.7568	1042.3140	718.0395	518.3535	541.8459	800.2631	1205.4579	1583.2839	1920.1109 (97)
Space heating kWh	770.8054	596.4399	491.7625	251.7204	98.9908	0.0000	0.0000	0.0000	0.0000	264.1733	537.5276	802.7870 (98a)
Space heating requirement - total per year (kWh/year)												3814.2071
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	770.8054	596.4399	491.7625	251.7204	98.9908	0.0000	0.0000	0.0000	0.0000	264.1733	537.5276	802.7870 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3814.2071
Space heating per m2										(98c) / (4) =		26.2578 (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 %)												319.9311 (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	770.8054	596.4399	491.7625	251.7204	98.9908	0.0000	0.0000	0.0000	0.0000	264.1733	537.5276	802.7870 (98)
Space heating efficiency (main heating system 1)	319.9311	319.9311	319.9311	319.9311	319.9311	0.0000	0.0000	0.0000	0.0000	319.9311	319.9311	319.9311 (210)
Space heating fuel (main heating system)	240.9286	186.4276	153.7089	78.6796	30.9413	0.0000	0.0000	0.0000	0.0000	82.5719	168.0136	250.9250 (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	149.2868	106.0573	65.4976	0.0000	0.0000	0.0000	0.0000	0.0000	14.0455	80.2486	125.1842	151.5662 (64)
Efficiency of water heater	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000 (216)
Fuel for water heating, kWh/month	132.6994	94.2732	58.2201	0.0000	0.0000	0.0000	0.0000	0.0000	12.4849	71.3321	111.2748	134.7255 (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	40.7241	32.6704	29.4161	21.5515	16.6470	13.6007	15.1859	19.7392	25.6393	33.6402	37.9965	41.8560 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-61.7792	-92.0201	-138.0096	-149.2747	-153.5163	-139.1138	-136.5711	-127.9169	-117.5110	-105.1972	-68.8042	-53.7142 (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	-2.0086	-6.4967	-20.5029	-46.7613	-68.9662	-77.1187	-74.1823	-61.9823	-45.3920	-15.9471	-3.8049	-1.3891 (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)

Full SAP Calculation Printout



Annual totals kWh/year		
Space heating fuel - main system 1	1192.1964	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	112.5000	
Water heating fuel used	615.0100	(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)	328.6669	(232)

Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1767.9802	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1049.8591	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1192.1964	25.1600	299.9566 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	615.0100	25.1600	154.7365 (247)
Energy for instantaneous electric shower(s)	681.9660	25.1600	171.5826 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	328.6669	25.1600	82.6926 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1343.4281	25.1600	-338.0065
PV Unit electricity exported	-424.5521	5.8100	-24.6665
Total			-362.6730 (252)
Total energy cost			346.2954 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1192.1964	0.1556	185.4533 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	615.0100	0.1555	95.6085 (264)
Energy for instantaneous electric shower(s)	681.9660	0.1391	94.8766 (264a)
Space and water heating			281.0617 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	328.6669	0.1443	47.4368 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1343.4281	0.1351	-181.4869
PV Unit electricity exported	-424.5521	0.1181	-50.1414
Total			-231.6282 (269)
Total CO2, kg/year			191.7468 (272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1192.1964	1.5759	1878.7887 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	615.0100	1.5754	968.8907 (278)
Energy for instantaneous electric shower(s)	681.9660	1.5143	1032.7244 (278a)
Space and water heating			2847.6795 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	328.6669	1.5338	504.1203 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1343.4281	1.4993	-2014.2455
PV Unit electricity exported	-424.5521	0.4332	-183.9061
Total			-2198.1515 (283)
Total Primary energy kWh/year			2186.3726 (286)

Predicted Energy Assessment



Plot 2, 6 Richard Burch Street, Bury , BL9 6DU

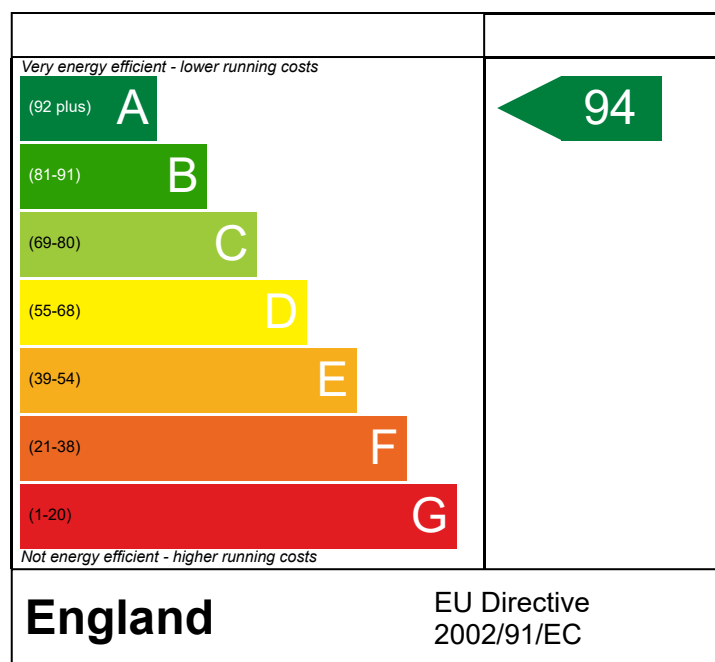
Dwelling type:
Date of assessment:
Produced by:
Total floor area:
DRRN:

House, Mid-Terrace
01/05/2024
Mark Scotson
145.26 m²
0022-5549-4003

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

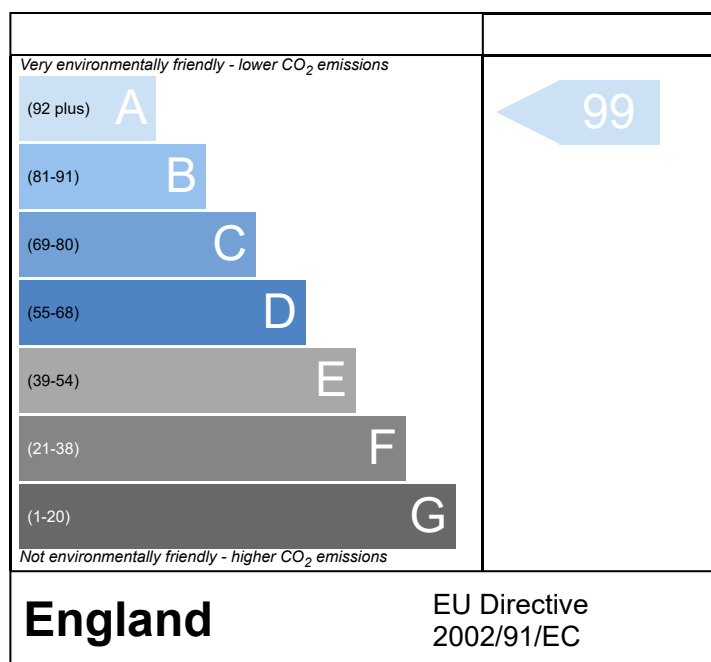
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.

Energy Efficiency Rating



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.

Environmental Impact (CO₂) Rating



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

Thermal Bridging

Property Reference	plot 2, Richard Burch Street		Issued on Date	01/05/2024
Assessment Reference	Plot 2	Prop Type Ref	Mid-Terrace House	
Property	Plot 2, 6 Richard Burch Street, Bury , BL9 6DU			

SAP Rating	94 A	DER	1.20	TER	8.11
Environmental	99 A	% DER < TER			85.20
CO ₂ Emissions (t/year)	0.19	DFEE	27.13	TFEE	30.53
Compliance Check	See BREL	% DFEE < TFEE			11.12
% DPER < TPER	66.88	DPER	14.03	TPER	42.37

Assessor Details	Mr. Mark Scotson	Assessor ID	AX66-0001
Client			

	Junction details	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E1 Steel lintel with perforated steel base plate	Independently assessed	0.088	12.45	1.10	
External wall	E3 Sill	Independently assessed	0.047	10.65	0.50	
External wall	E4 Jamb	Independently assessed	0.040	38.18	1.53	
External wall	E5 Ground floor (normal)	Independently assessed	0.033	25.12	0.83	
External wall	E11 Eaves (insulation at rafter level)	Independently assessed	0.033	0.00	0.00	
External wall	E13 Gable (insulation at rafter level)	Independently assessed	0.079	2.09	0.17	
External wall	E14 Flat roof	Independently assessed	0.049	8.66	0.42	
External wall	E16 Corner (normal)	Independently assessed	0.035	19.81	0.69	
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.023	38.94	0.90	
External wall	E10 Eaves (insulation at ceiling level)	Independently assessed	0.030	5.40	0.16	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.021	3.10	0.07	
External wall	E17 Corner (inverted – internal area greater than external area)	Independently assessed	0.010	5.90	0.06	

Total: 170.30 W/mK:
Y-Value: 0.00 W/m²K: