

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 16:23:00

Project Information			
Assessed By	Mark Scotson	Building Type	House, End-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 1, Richard Burch Street	Plot Reference	Plot 1
Address	Plot 1, 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	8.85 kgCO ₂ /m ²
Dwelling carbon dioxide emission rate	1.36 kgCO ₂ /m ² OK

1b Target primary energy rate and dwelling primary energy

Target primary energy	46.23 kWh _{PE} /m ²
Dwelling primary energy	15.55 kWh _{PE} /m ² OK

1c Target fabric energy efficiency and dwelling fabric energy efficiency

Target fabric energy efficiency	34.1 kWh/m ²
Dwelling fabric energy efficiency	30.6 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)	123.91	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	3.51	West	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 m³/hm²		
Dwelling air permeability at 50Pa		3 m³/hm², 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		321.4%		
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 1, Richard Burch Street	Issued on Date	01/05/2024
Assessment Reference	Plot 1	Prop Type Ref	1
Property	Plot 1, 6 Richard Burch Street, Bury , BL9 6DU		

SAP Rating	94 A	DER	1.36	TER	8.85
Environmental	99 A	% DER < TER			84.63
CO ₂ Emissions (t/year)	0.21	DFEE	30.56	TFEE	34.14
Compliance Check	See BREL	% DFEE < TFEE			10.46
% DPER < TPER	66.36	DPER	15.55	TPER	46.23

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, End-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	136.04	123.91	0.00	None	12.13	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	External Wall	West	3.51	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 AP ₅₀	3.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP ₅₀	0.10	m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Mechanical Ventilation	
Mechanical Ventilation System Present	No

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System

22.0 Lighting

No Fixed Lighting

Summary for Input Data

	Name Lighting 1	Efficacy 114.00	Power 5	Capacity 570	Count 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									

Summary for Input Data

Summer Immersion	No
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

Hot Water Cylinder	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

32.0 Photovoltaic Unit

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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SAP Rating	94 A	DER	1.36	TER	8.85
Environmental	99 A	% DER < TER			84.63
CO ₂ Emissions (t/year)	0.21	DFEE	30.56	TFEE	34.14
Compliance Check	See BREL	% DFEE < TFEE			10.46
% DPER < TPER	66.36	DPER	15.55	TPER	46.23
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

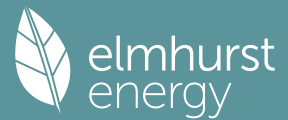
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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)			12.3200	1.1450	14.1069		(27)
RL			0.8400	1.1450	0.9618		(27a)
Ground Floor			59.8400	0.1300	7.7792	110.0000	6582.4000 (28a)
External Wall	136.0400	12.1300	123.9100	0.1800	22.3038	60.0000	7434.6000 (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)			277.3400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	60.0934		(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) =	30934.7500 (34)

Full SAP Calculation Printout



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

212.9612 (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) = 66.5102 (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	130.4822	130.3342	130.1891	129.5075	129.3800	128.7864	128.7864	128.6765	129.0150	129.3800	129.6380	129.9077	(39)
Average = Sum(39)m / 12 =												129.5069	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8983	0.8972	0.8962	0.8916	0.8907	0.8866	0.8866	0.8858	0.8882	0.8907	0.8925	0.8943	(40)
HLP (average)												0.8916	
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)
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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)
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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)
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Average daily hot water use (litres/day)

												69.8803	(43)
--	--	--	--	--	--	--	--	--	--	--	--	---------	------

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

	-24.0360	-51.4020	-103.9392	-159.0265	-212.3635	-214.0589	-210.7974	-176.2080	-127.2382	-73.4894	-32.1034	-18.8734	(63b)
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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)
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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)
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Output from w/h

	144.2442	97.1188	54.0490	0.0000	0.0000	0.0000	0.0000	0.0000	2.5175	69.8862	118.6043	147.8673	(64)
--	----------	---------	---------	--------	--------	--------	--------	--------	--------	---------	----------	----------	------

Total per year (kWh/year) = Sum(64)m = 634.2874 (64)

12Total per year (kWh/year)

												634	(64)
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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)
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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)
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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	
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(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

	186.9256	206.9533	186.9256	193.1565	186.9256	193.1565	186.9256	186.9256	193.1565	186.9256	193.1565	186.9256	(67)
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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)
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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)
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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)
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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)
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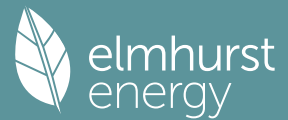
Total internal gains

	694.3614	715.6696	684.2434	666.9213	634.6250	616.0158	593.8304	592.9066	610.0413	625.7902	659.9734	679.7607	(73)
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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			4.6000		19.6403		0.7600		0.7000		0.7700		33.3081 (80)
South			0.8400		42.0754		0.7600		0.7000		1.0000		16.9224 (82)

Solar gains	144.9449	254.6254	366.1014	478.6948	555.7307	559.4214	536.1992	478.1378	405.3115	286.4635	175.0868	123.0504 (83)
Total gains	839.3062	970.2950	1050.3448	1145.6161	1190.3556	1175.4371	1130.0296	1071.0445	1015.3528	912.2537	835.0602	802.8110 (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	65.8556	65.9304	66.0039	66.3512	66.4166	66.7228	66.7228	66.7798	66.6045	66.4166	66.2845	66.1469	
alpha	5.3904	5.3954	5.4003	5.4234	5.4278	5.4482	5.4482	5.4520	5.4403	5.4278	5.4190	5.4098	
util living area	0.9964	0.9916	0.9808	0.9432	0.8489	0.6675	0.4956	0.5427	0.7843	0.9574	0.9916	0.9972 (86)	
Living	20.0546	20.1910	20.3753	20.6207	20.8152	20.9168	20.9387	20.9360	20.8808	20.6302	20.2980	20.0281	
Non living	19.0471	19.2217	19.4559	19.7628	19.9874	20.0889	20.1041	20.1035	20.0585	19.7794	19.3622	19.0160	
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	20.1690	20.1698	20.1707	20.1747	20.1754	20.1789	20.1789	20.1796	20.1776	20.1754	20.1739	20.1723 (88)	
util rest of house	0.9954	0.9893	0.9754	0.9268	0.8078	0.5943	0.4060	0.4507	0.7191	0.9418	0.9889	0.9964 (89)	
MIT 2	20.1690	20.1698	20.1707	20.1747	20.1754	20.1789	20.1789	20.1796	20.1776	20.1754	20.1739	20.1723 (90)	
Living area fraction									fLA = Living area / (4) =			0.0889 (91)	
MIT	20.2429	20.2437	20.2445	20.2481	20.2488	20.2519	20.2519	20.2525	20.2507	20.2488	20.2474	20.2460 (92)	
Temperature adjustment												0.0000	
adjusted MIT	20.2429	20.2437	20.2445	20.2481	20.2488	20.2519	20.2519	20.2525	20.2507	20.2488	20.2474	20.2460 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9955	0.9895	0.9760	0.9284	0.8118	0.6011	0.4141	0.4591	0.7254	0.9434	0.9892	0.9965 (94)	
Useful gains	835.5392	960.1037	1025.0849	1063.6431	966.3418	706.5636	467.9973	491.7089	736.5344	860.6213	826.0502	799.9757 (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	2080.2636	1999.8058	1789.3776	1469.6630	1106.0400	727.8933	470.3205	495.7299	793.5355	1248.3580	1704.4014	2084.4924 (97)	
Space heating kWh	926.0749	698.6798	568.6337	292.3343	103.9355	0.0000	0.0000	0.0000	0.0000	288.4761	632.4129	955.6804 (98a)	
Space heating requirement - total per year (kWh/year)												4466.2278	
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	926.0749	698.6798	568.6337	292.3343	103.9355	0.0000	0.0000	0.0000	0.0000	288.4761	632.4129	955.6804 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												4466.2278	
Space heating per m2										(98c) / (4) =		30.7464 (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 %)													321.3680 (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	926.0749	698.6798	568.6337	292.3343	103.9355	0.0000	0.0000	0.0000	0.0000	288.4761	632.4129	955.6804 (98)	
Space heating efficiency (main heating system 1)	321.3680	321.3680	321.3680	321.3680	321.3680	0.0000	0.0000	0.0000	0.0000	321.3680	321.3680	321.3680 (210)	
Space heating fuel (main heating system)	288.1665	217.4080	176.9416	90.9656	32.3416	0.0000	0.0000	0.0000	0.0000	89.7650	196.7877	297.3788 (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	144.2442	97.1188	54.0490	0.0000	0.0000	0.0000	0.0000	0.0000	2.5175	69.8862	118.6043	147.8673 (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	128.2171	86.3278	48.0436	0.0000	0.0000	0.0000	0.0000	0.0000	2.2378	62.1210	105.4260	131.4376 (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	39.6559	31.8134	28.6445	20.9862	16.2103	13.2440	14.7876	19.2215	24.9668	32.7578	36.9998	40.7581 (232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-71.4833	-102.8994	-147.0475	-156.0070	-159.4832	-142.5460	-141.1765	-133.7423	-120.2391	-113.3043	-78.8354	-61.5806 (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	-1.9830	-7.1472	-22.1570	-48.8409	-75.9229	-83.0382	-81.9072	-70.0190	-51.3113	-18.7326	-4.3137	-1.2767 (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	1389.7549 (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	563.8110 (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)	320.0458 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1894.9944 (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	1060.5832 (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	1389.7549	0.1558	216.5014 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	563.8110	0.1563	88.1276 (264)
Energy for instantaneous electric shower(s)	681.9660	0.1391	94.8766 (264a)
Space and water heating			304.6290 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	320.0458	0.1443	46.1925 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1428.3446	0.1356	-193.7503
PV Unit electricity exported	-466.6498	0.1178	-54.9500
Total			-248.7003 (269)
Total CO2, kg/year			196.9978 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.3600 (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	1389.7549	1.5767	2191.2849 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	563.8110	1.5786	890.0087 (278)
Energy for instantaneous electric shower(s)	681.9660	1.5143	1032.7244 (278a)
Space and water heating			3081.2936 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	320.0458	1.5338	490.8969 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1428.3446	1.5014	-2144.5302
PV Unit electricity exported	-466.6498	0.4319	-201.5273
Total			-2346.0575 (283)
Total Primary energy kWh/year			2258.8574 (286)
Dwelling Primary energy Rate (DPER)			15.5500 (287)

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

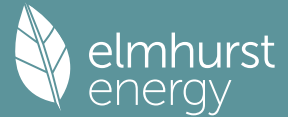
1. Overall dwelling characteristics

	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

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

$$(21) = (18) \times (20) = 0.3058 (21)$$

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infiltr rate													
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)			12.3200	1.1450	14.1069			(27)
RL			0.8400	2.0221	1.6985			(27a)
Ground Floor			59.8400	0.1300	7.7792			(28a)
External Wall	136.0400	12.1300	123.9100	0.1800	22.3038			(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)			277.3400					(31)
Fabric heat loss, W/K = Sum (A x U)								(33)
Party Wall 1			81.2600	0.0000	0.0000			(32)

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

212.9612 (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) = 68.9621 (37)

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

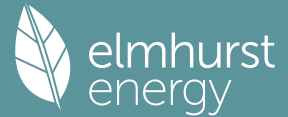
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	69.3021	68.9471	68.5991	66.9647	66.6589	65.2353	65.2353	64.9717	65.7836	66.6589	67.2775	67.9243	(38)
Heat transfer coeff	138.2642	137.9092	137.5612	135.9268	135.6210	134.1974	134.1974	133.9338	134.7457	135.6210	136.2396	136.8864	(39)
Average = Sum(39)m / 12 =													135.9253

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9518	0.9494	0.9470	0.9357	0.9336	0.9238	0.9238	0.9220	0.9276	0.9336	0.9379	0.9424	(40)
HLP (average)													0.9357
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	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	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	44.6003	(42c)
Average daily hot water use (litres/day)													137.4491 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	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)													
Distribution loss (46)m = 0.15 x (45)m													2283.0009
35.5222	31.2567	32.8401	28.0361	26.6004	23.3448	22.6014	23.8586	24.5154	28.0816	30.7654	35.0275	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	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	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	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	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	186.9256	206.9533	186.9256	193.1565	186.9256	193.1565	186.9256	186.9256	193.1565	186.9256	193.1565	186.9256 (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	728.0770	748.6459	715.1126	692.2613	656.8108	631.8351	607.1582	607.6319	626.4997	649.0125	688.4530	712.6904 (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					4.6000	19.6403	0.6300	0.7000			0.7700	27.6107 (80)				
South					0.8400	42.0754	0.6300	0.7000			1.0000	14.0278 (82)				

Solar gains					120.1517	211.0711	303.4788	396.8128	460.6715	463.7309	444.4810	396.3511	335.9819	237.4632	145.1377	102.0023 (83)
Total gains					848.2287	959.7170	1018.5913	1089.0741	1117.4823	1095.5659	1051.6391	1003.9830	962.4817	886.4757	833.5907	814.6926 (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	62.1490	62.3090	62.4666	63.2178	63.3603	64.0324	64.0324	64.1585	63.7719	63.3603	63.0726	62.7746
alpha	5.1433	5.1539	5.1644	5.2145	5.2240	5.2688	5.2688	5.2772	5.2515	5.2240	5.2048	5.1850
util living area	0.9963	0.9924	0.9845	0.9573	0.8855	0.7239	0.5494	0.5948	0.8252	0.9652	0.9921	0.9970 (86)
MIT	19.7242	19.8945	20.1348	20.4735	20.7623	20.9423	20.9889	20.9834	20.8813	20.5146	20.0676	19.7011 (87)
Th 2	20.1237	20.1257	20.1277	20.1372	20.1390	20.1473	20.1473	20.1488	20.1441	20.1390	20.1354	20.1316 (88)
util rest of house	0.9953	0.9903	0.9800	0.9440	0.8492	0.6483	0.4488	0.4936	0.7626	0.9517	0.9895	0.9962 (89)
MIT 2	18.6211	18.8398	19.1466	19.5768	19.9195	20.1088	20.1427	20.1414	20.0537	19.6338	19.0686	18.5973 (90)
Living area fraction	18.7192	18.9336	19.2345	19.6566	19.9944	20.1830	20.2180	20.2163	20.1273	19.7121	19.1575	18.6955 (91)
MIT	18.7192	18.9336	19.2345	19.6566	19.9944	20.1830	20.2180	20.2163	20.1273	19.7121	19.1575	18.6955 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7192	18.9336	19.2345	19.6566	19.9944	20.1830	20.2180	20.2163	20.1273	19.7121	19.1575	18.6955 (93)

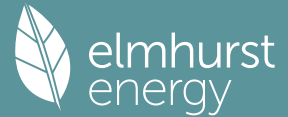
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9929	0.9862	0.9736	0.9346	0.8421	0.6517	0.4574	0.5019	0.7612	0.9429	0.9854	0.9941 (94)
Useful gains	842.1857	946.5184	991.7221	1017.8430	941.0258	713.9773	481.0374	503.9123	732.6632	835.8992	821.3862	809.9209 (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	1993.6654	1935.3575	1751.7700	1462.1062	1124.8973	749.2185	485.5267	511.1332	812.1529	1235.7942	1642.7087	1984.2352 (97)
Space heating kWh	856.7009	664.4999	565.4757	319.8696	136.8003	0.0000	0.0000	0.0000	0.0000	297.5219	591.3522	873.6899 (98a)
Space heating requirement - total per year (kWh/year)	4305.9103											
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	856.7009	664.4999	565.4757	319.8696	136.8003	0.0000	0.0000	0.0000	0.0000	297.5219	591.3522	873.6899 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	4305.9103											
Space heating per m2	(98c) / (4) = 29.6428 (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	856.7009	664.4999	565.4757	319.8696	136.8003	0.0000	0.0000	0.0000	0.0000	297.5219	591.3522	873.6899 (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)	928.1700	719.9349	612.6497	346.5542	148.2127	0.0000	0.0000	0.0000	0.0000	322.3422	640.6850	946.5762 (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	86.5945	86.3703	85.9582	85.0395	83.2263	79.8000	79.8000	79.8000	79.8000	84.8533	86.1491	79.8000	(216)
Fuel for water heating, kWh/month	288.5928	255.6810	272.8076	242.6005	240.2925	225.8578	223.1395	232.1167	234.7479	246.0880	257.5562	285.3350	(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	38.8394	31.1584	28.0547	20.5541	15.8766	12.9713	14.4831	18.8257	24.4528	32.0834	36.2381	39.9189	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-55.0913	-77.1795	-110.1736	-122.8966	-131.5812	-122.3632	-120.7844	-114.4888	-103.2377	-87.7736	-60.3712	-47.6816	(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	-32.5262	-68.2942	-135.5528	-203.3529	-268.7092	-270.0275	-266.9122	-226.1073	-165.8379	-97.6512	-43.4127	-25.7349	(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												4665.1249	(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												3004.8154	(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)												313.4566	(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												5111.6550	(238)

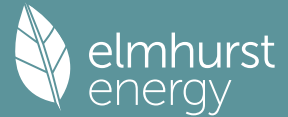
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4665.1249	0.2100	979.6762 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3004.8154	0.2100	631.0112 (264)
Space and water heating			1610.6875 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	313.4566	0.1443	45.2415 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1153.6229	0.1348	-155.4619
PV Unit electricity exported	-1804.1191	0.1259	-227.1806
Total			-382.6425 (269)
Total CO2, kg/year			1285.2157 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.8500 (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	4665.1249	1.1300	5271.5911 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3004.8154	1.1300	3395.4415 (278)
Space and water heating			8667.0326 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	313.4566	1.5338	480.7902 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1153.6229	1.4981	-1728.1953
PV Unit electricity exported	-1804.1191	0.4622	-833.9099
Total			-2562.1052 (283)
Total Primary energy kWh/year			6715.8184 (286)
Target Primary Energy Rate (TPER)			46.2300 (287)

Full SAP Calculation Printout



Property Reference	plot 1, Richard Burch Street			Issued on Date	01/05/2024
Assessment Reference	Plot 1	Prop Type Ref	1		
Property	Plot 1, 6 Richard Burch Street, Bury , BL9 6DU				
SAP Rating	94 A	DER	1.36	TER	8.85
Environmental	99 A	% DER < TER			84.63
CO ₂ Emissions (t/year)	0.21	DFEE	30.56	TFEE	34.14
Compliance Check	See BREL	% DFEE < TFEE			10.46
% DPER < TPER	66.36	DPER	15.55	TPER	46.23
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)

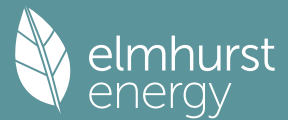
2. Ventilation rate

	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)											
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)											
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2815	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)												
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
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)			12.3200	1.1450	14.1069		(27)
RL			0.8400	1.1450	0.9618		(27a)
Ground Floor			59.8400	0.1300	7.7792	110.0000	6582.4000 (28a)
External Wall	136.0400	12.1300	123.9100	0.1800	22.3038	60.0000	7434.6000 (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)			277.3400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	60.0934		(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) = 30934.7500 (34)			
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K				212.9612 (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) = 66.5102 (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	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)
Average = Sum(39)m / 12 =	131.4357	131.2506	131.0692	130.2172	130.0578	129.3157	129.3157	129.1783	129.6016	130.0578	130.3803	130.7174 (39)
												130.2164
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9048	0.9036	0.9023	0.8964	0.8953	0.8902	0.8902	0.8893	0.8922	0.8953	0.8976	0.8999 (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 (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:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	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)
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												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	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)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	186.9256	206.9533	186.9256	193.1565	186.9256	193.1565	186.9256	186.9256	193.1565	186.9256	193.1565	186.9256 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), 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)
Pumps, fans	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)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-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)
Total internal gains	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)
	623.3489	645.2833	614.9025	599.6530	568.6743	551.4214	529.9729	528.2943	544.5621	558.8061	590.9908	608.9966 (73)

6. Solar gains							
[Jan]	Area	Solar flux	g	FF	Access	Gains	
	m2	Table 6a	Specific data	Specific data	factor	W	
		W/m2	or Table 6b	or Table 6c	Table 6d		
North	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	4.6000	19.6403	0.7600	0.7000	0.7700	33.3081 (80)
South	0.8400	42.0754	0.7600	0.7000	1.0000	16.9224 (82)

Solar gains	144.9449	254.6254	366.1014	478.6948	555.7307	559.4214	536.1992	478.1378	405.3115	286.4635	175.0868	123.0504 (83)
Total gains	768.2938	899.9087	981.0039	1078.3478	1124.4050	1110.8428	1066.1722	1006.4321	949.8736	845.2696	766.0776	732.0469 (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	65.3779	65.4701	65.5607	65.9896	66.0705	66.4497	66.4497	66.5204	66.3031	66.0705	65.9071	65.7371
alpha	5.3585	5.3647	5.3707	5.3993	5.4047	5.4300	5.4300	5.4347	5.4202	5.4047	5.3938	5.3825
util living area	0.9977	0.9941	0.9859	0.9553	0.8729	0.6998	0.5253	0.5761	0.8177	0.9689	0.9944	0.9982 (86)
MIT	19.7424	19.9269	20.1779	20.5189	20.7989	20.9556	20.9921	20.9873	20.8962	20.5292	20.0737	19.7085 (87)
Th 2	20.1634	20.1645	20.1655	20.1705	20.1715	20.1758	20.1758	20.1766	20.1741	20.1715	20.1696	20.1676 (88)
util rest of house	0.9970	0.9924	0.9818	0.9417	0.8352	0.6259	0.4311	0.4798	0.7556	0.9568	0.9926	0.9977 (89)
MIT 2	19.0021	19.1866	19.4362	19.7717	20.0279	20.1530	20.1733	20.1722	20.1128	19.7867	19.3375	18.9717 (90)
Living area fraction									fLA = Living area / (4) =			0.0889 (91)
MIT	19.0680	19.2525	19.5021	19.8382	20.0965	20.2244	20.2461	20.2447	20.1824	19.8528	19.4030	19.0373 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0680	19.2525	19.5021	19.8382	20.0965	20.2244	20.2461	20.2447	20.1824	19.8528	19.4030	19.0373 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9958	0.9900	0.9775	0.9350	0.8313	0.6305	0.4393	0.4880	0.7563	0.9508	0.9902	0.9967 (94)
Useful gains	765.0500	890.8946	958.9068	1008.2308	934.6921	700.3671	468.3549	491.1815	718.3611	803.6582	758.5783	729.6370 (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	1941.0379	1883.7719	1704.1797	1424.3365	1092.0273	727.3229	471.5038	496.6555	788.2939	1203.3925	1604.0655	1939.4873 (97)
Space heating kWh	874.9350	667.2135	554.4830	299.5961	117.0574	0.0000	0.0000	0.0000	0.0000	297.4024	608.7508	900.1286 (98a)
Space heating requirement - total per year (kWh/year)												4319.5667
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	874.9350	667.2135	554.4830	299.5961	117.0574	0.0000	0.0000	0.0000	0.0000	297.4024	608.7508	900.1286 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4319.5667
Space heating per m2										(98c) / (4) =		29.7368 (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	1215.5678	956.9363	981.7551	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8335	0.9075	0.8797	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1013.2020	868.4216	863.6615	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1184.9888	1137.7084	1073.5002	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	123.6865	200.3494	156.1200	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	30.9216	50.0873	39.0300	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												120.0390 (107)
Energy for space heating												29.7368 (99)
Energy for space cooling												0.8264 (108)
Total												30.5632 (109)
Fabric Energy Efficiency (DFEE)												30.6 (109)

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

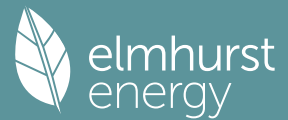
1. Overall dwelling characteristics

	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

Full SAP Calculation Printout



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	Air changes per hour	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)			12.3200	1.1450	14.1069			(27)
RL			0.8400	2.0221	1.6985			(27a)
Ground Floor			59.8400	0.1300	7.7792			(28a)
External Wall	136.0400	12.1300	123.9100	0.1800	22.3038			(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)			277.3400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	59.2570			(33)
Party Wall 1			81.2600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 212.9612 (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) = 68.9621 (37)

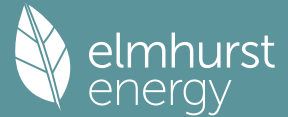
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	69.3021	68.9471	68.5991	66.9647	66.6589	65.2353	65.2353	64.9717	65.7836	66.6589	67.2775	67.9243	(38)
Average = Sum(39)m / 12 =	138.2642	137.9092	137.5612	135.9268	135.6210	134.1974	134.1974	133.9338	134.7457	135.6210	136.2396	136.8864	(39)
												135.9253	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9518	0.9494	0.9470	0.9357	0.9336	0.9238	0.9238	0.9220	0.9276	0.9336	0.9379	0.9424	(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												
	186.9256	206.9533	186.9256	193.1565	186.9256	193.1565	186.9256	186.9256	193.1565	186.9256	193.1565	186.9256 (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												
	623.3489	645.2833	614.9025	599.6530	568.6743	551.4214	529.9729	528.2943	544.5621	558.8061	590.9908	608.9966 (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		4.6000	19.6403	0.6300	0.7000	0.7700	27.6107 (80)
South		0.8400	42.0754	0.6300	0.7000	1.0000	14.0278 (82)
Solar gains							
	120.1517	211.0711	303.4788	396.8128	460.6715	463.7309	444.4810
Total gains							
	743.5006	856.3543	918.3812	996.4658	1029.3458	1015.1523	974.4539
							924.6454
							880.5440
							796.2693
							736.1285
							102.0023 (83)
							710.9988 (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	62.1490	62.3090	62.4666	63.2178	63.3603	64.0324	64.0324	64.1585	63.7719	63.3603	63.0726	62.7746
alpha	5.1433	5.1539	5.1644	5.2145	5.2240	5.2688	5.2688	5.2772	5.2515	5.2240	5.2048	5.1850
util living area												
	0.9980	0.9955	0.9901	0.9698	0.9114	0.7629	0.5881	0.6380	0.8620	0.9774	0.9955	0.9984 (86)
MIT												
	19.6344	19.8073	20.0531	20.4067	20.7173	20.9260	20.9848	20.9770	20.8504	20.4469	19.9852	19.6117 (87)
Th 2	20.1237	20.1257	20.1277	20.1372	20.1390	20.1473	20.1473	20.1488	20.1441	20.1390	20.1354	20.1316 (88)
util rest of house												
	0.9974	0.9942	0.9870	0.9597	0.8803	0.6888	0.4827	0.5329	0.8055	0.9680	0.9940	0.9980 (89)
MIT 2												
	18.8633	19.0372	19.2831	19.6377	19.9305	20.1077	20.1423	20.1406	20.0520	19.6815	19.2226	18.8468 (90)
Living area fraction												
	18.9318	19.1057	19.3516	19.7061	20.0005	20.1804	20.2173	20.2150	20.1230	19.7496	19.2905	18.9149 (92)
Temperature adjustment												
	18.9318	19.1057	19.3516	19.7061	20.0005	20.1804	20.2173	20.2150	20.1230	19.7496	19.2905	18.9149 (93)
adjusted MIT												

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9963	0.9920	0.9834	0.9533	0.8744	0.6920	0.4917	0.5415	0.8039	0.9623	0.9919	0.9971 (94)
Useful gains	740.7632	849.5401	903.1216	949.9206	900.0711	702.4377	479.1505	500.7180	707.8792	766.2660	730.1555	708.9163 (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												
	2023.0610	1959.0911	1767.8810	1468.8436	1125.7152	748.8806	485.4265	510.9590	811.5762	1240.8724	1660.8230	2014.2635 (97)
Space heating kWh												
	954.0296	745.6183	643.3809	373.6246	167.8792	0.0000	0.0000	0.0000	0.0000	353.1072	670.0806	971.1783 (98a)
Space heating requirement - total per year (kWh/year)												
												4878.8987
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												
	954.0296	745.6183	643.3809	373.6246	167.8792	0.0000	0.0000	0.0000	0.0000	353.1072	670.0806	971.1783 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												
												4878.8987
Space heating per m2												33.5874 (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	1261.4556	993.0608	1017.8967	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.7668	0.8565	0.8243	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	967.2242	850.5310	839.0108	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1075.4790	1032.7361	979.8546	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	77.9434	135.5606	104.7877	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	19.4859	33.8902	26.1969	0.0000	0.0000	0.0000	0.0000 (107)
Energy for space heating												79.5730 (107)
Energy for space cooling												33.5874 (99)
Total												0.5478 (108)
Fabric Energy Efficiency (TFEE)												34.1351 (109)
												34.1 (109)

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Property Reference	plot 1, Richard Burch Street			Issued on Date	01/05/2024
Assessment Reference	Plot 1	Prop Type Ref	1		
Property	Plot 1, 6 Richard Burch Street, Bury , BL9 6DU				
SAP Rating	94 A	DER	1.36	TER	8.85
Environmental	99 A	% DER < TER			84.63
CO ₂ Emissions (t/year)	0.21	DFEE	30.56	TFEE	34.14
Compliance Check	See BREL	% DFEE < TFEE			10.46
% DPER < TPER	66.36	DPER	15.55	TPER	46.23
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

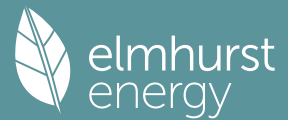
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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)			12.3200	1.1450	14.1069		(27)
RL			0.8400	1.1450	0.9618		(27a)
Ground Floor			59.8400	0.1300	7.7792	110.0000	6582.4000 (28a)
External Wall	136.0400	12.1300	123.9100	0.1800	22.3038	60.0000	7434.6000 (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)			277.3400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	60.0934		(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) =	30934.7500 (34)

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

212.9612 (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) = 66.5102 (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	130.4822	130.3342	130.1891	129.5075	129.3800	128.7864	128.7864	128.6765	129.0150	129.3800	129.6380	129.9077	(39)
Average = Sum(39)m / 12 =												129.5069	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8983	0.8972	0.8962	0.8916	0.8907	0.8866	0.8866	0.8858	0.8882	0.8907	0.8925	0.8943	(40)
HLP (average)												0.8916	
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 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)

18.1117 15.8378 16.5679 14.1732 13.4257 11.7771 11.4843 12.1810 12.5631 14.3760 15.7059 17.8808 (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) 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)

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: 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 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)

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

Temperature factor from Table 2b 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)

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

Total 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)

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 -24.0360 -51.4020 -103.9392 -159.0265 -212.3635 -214.0589 -210.7974 -176.2080 -127.2382 -73.4894 -32.1034 -18.8734 (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 144.2442 97.1188 54.0490 0.0000 0.0000 0.0000 0.0000 0.0000 2.5175 69.8862 118.6043 147.8673 (64)

Total per year (kWh/year) = Sum(64)m = 634.2874 (64)

12Total per year (kWh/year) = Sum(64)m = 634.2874 (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)

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 5 186.9256 206.9533 186.9256 193.1565 186.9256 193.1565 186.9256 186.9256 193.1565 186.9256 193.1565 186.9256 (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)

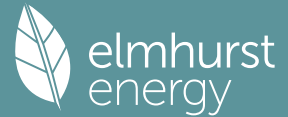
Total internal gains 694.3614 715.6696 684.2434 666.9213 634.6250 616.0158 593.8304 592.9066 610.0413 625.7902 659.9734 679.7607 (73)

694.3614 715.6696 684.2434 666.9213 634.6250 616.0158 593.8304 592.9066 610.0413 625.7902 659.9734 679.7607 (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			4.6000		19.6403		0.7600		0.7000		0.7700		33.3081 (80)
South			0.8400		42.0754		0.7600		0.7000		1.0000		16.9224 (82)

Solar gains	144.9449	254.6254	366.1014	478.6948	555.7307	559.4214	536.1992	478.1378	405.3115	286.4635	175.0868	123.0504 (83)
Total gains	839.3062	970.2950	1050.3448	1145.6161	1190.3556	1175.4371	1130.0296	1071.0445	1015.3528	912.2537	835.0602	802.8110 (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	65.8556	65.9304	66.0039	66.3512	66.4166	66.7228	66.7228	66.7798	66.6045	66.4166	66.2845	66.1469	
alpha	5.3904	5.3954	5.4003	5.4234	5.4278	5.4482	5.4482	5.4520	5.4403	5.4278	5.4190	5.4098	
util living area	0.9964	0.9916	0.9808	0.9432	0.8489	0.6675	0.4956	0.5427	0.7843	0.9574	0.9916	0.9972 (86)	
Living	20.0546	20.1910	20.3753	20.6207	20.8152	20.9168	20.9387	20.9360	20.8808	20.6302	20.2980	20.0281	
Non living	19.0471	19.2217	19.4559	19.7628	19.9874	20.0889	20.1041	20.1035	20.0585	19.7794	19.3622	19.0160	
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	20.1690	20.1698	20.1707	20.1747	20.1754	20.1789	20.1789	20.1796	20.1776	20.1754	20.1739	20.1723 (88)	
util rest of house	0.9954	0.9893	0.9754	0.9268	0.8078	0.5943	0.4060	0.4507	0.7191	0.9418	0.9889	0.9964 (89)	
MIT 2	20.1690	20.1698	20.1707	20.1747	20.1754	20.1789	20.1789	20.1796	20.1776	20.1754	20.1739	20.1723 (90)	
Living area fraction									fLA = Living area / (4) =			0.0889 (91)	
MIT	20.2429	20.2437	20.2445	20.2481	20.2488	20.2519	20.2519	20.2525	20.2507	20.2488	20.2474	20.2460 (92)	
Temperature adjustment												0.0000	
adjusted MIT	20.2429	20.2437	20.2445	20.2481	20.2488	20.2519	20.2519	20.2525	20.2507	20.2488	20.2474	20.2460 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9955	0.9895	0.9760	0.9284	0.8118	0.6011	0.4141	0.4591	0.7254	0.9434	0.9892	0.9965 (94)	
Useful gains	835.5392	960.1037	1025.0849	1063.6431	966.3418	706.5636	467.9973	491.7089	736.5344	860.6213	826.0502	799.9757 (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	2080.2636	1999.8058	1789.3776	1469.6630	1106.0400	727.8933	470.3205	495.7299	793.5355	1248.3580	1704.4014	2084.4924 (97)	
Space heating kWh	926.0749	698.6798	568.6337	292.3343	103.9355	0.0000	0.0000	0.0000	0.0000	288.4761	632.4129	955.6804 (98a)	
Space heating requirement - total per year (kWh/year)												4466.2278	
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	926.0749	698.6798	568.6337	292.3343	103.9355	0.0000	0.0000	0.0000	0.0000	288.4761	632.4129	955.6804 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												4466.2278	
Space heating per m2										(98c) / (4) =		30.7464 (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 %)													321.3680 (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	926.0749	698.6798	568.6337	292.3343	103.9355	0.0000	0.0000	0.0000	0.0000	288.4761	632.4129	955.6804 (98)	
Space heating efficiency (main heating system 1)	321.3680	321.3680	321.3680	321.3680	321.3680	0.0000	0.0000	0.0000	0.0000	321.3680	321.3680	321.3680 (210)	
Space heating fuel (main heating system)	288.1665	217.4080	176.9416	90.9656	32.3416	0.0000	0.0000	0.0000	0.0000	89.7650	196.7877	297.3788 (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	144.2442	97.1188	54.0490	0.0000	0.0000	0.0000	0.0000	0.0000	2.5175	69.8862	118.6043	147.8673 (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	128.2171	86.3278	48.0436	0.0000	0.0000	0.0000	0.0000	0.0000	2.2378	62.1210	105.4260	131.4376 (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	39.6559	31.8134	28.6445	20.9862	16.2103	13.2440	14.7876	19.2215	24.9668	32.7578	36.9998	40.7581 (232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-71.4833	-102.8994	-147.0475	-156.0070	-159.4832	-142.5460	-141.1765	-133.7423	-120.2391	-113.3043	-78.8354	-61.5806 (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	-1.9830	-7.1472	-22.1570	-48.8409	-75.9229	-83.0382	-81.9072	-70.0190	-51.3113	-18.7326	-4.3137	-1.2767 (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	1389.7549 (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	563.8110 (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)	320.0458 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1894.9944 (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	1060.5832 (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	1389.7549	0.1558	216.5014 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	563.8110	0.1563	88.1276 (264)
Energy for instantaneous electric shower(s)	681.9660	0.1391	94.8766 (264a)
Space and water heating			304.6290 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	320.0458	0.1443	46.1925 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1428.3446	0.1356	-193.7503
PV Unit electricity exported	-466.6498	0.1178	-54.9500
Total			-248.7003 (269)
Total CO2, kg/year			196.9978 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.3600 (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	1389.7549	1.5767	2191.2849 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	563.8110	1.5786	890.0087 (278)
Energy for instantaneous electric shower(s)	681.9660	1.5143	1032.7244 (278a)
Space and water heating			3081.2936 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	320.0458	1.5338	490.8969 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1428.3446	1.5014	-2144.5302
PV Unit electricity exported	-466.6498	0.4319	-201.5273
Total			-2346.0575 (283)
Total Primary energy kWh/year			2258.8574 (286)
Dwelling Primary energy Rate (DPER)			15.5500 (287)

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

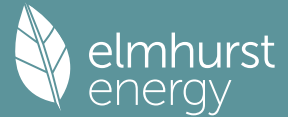
1. Overall dwelling characteristics

	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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infiltr rate													
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)			12.3200	1.1450	14.1069			(27)
RL			0.8400	2.0221	1.6985			(27a)
Ground Floor			59.8400	0.1300	7.7792			(28a)
External Wall	136.0400	12.1300	123.9100	0.1800	22.3038			(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)			277.3400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	59.2570			(33)
Party Wall 1			81.2600	0.0000	0.0000			(32)

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

212.9612 (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) = 68.9621 (37)

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

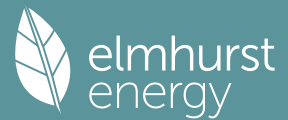
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	69.3021	68.9471	68.5991	66.9647	66.6589	65.2353	65.2353	64.9717	65.7836	66.6589	67.2775	67.9243	(38)
Heat transfer coeff	138.2642	137.9092	137.5612	135.9268	135.6210	134.1974	134.1974	133.9338	134.7457	135.6210	136.2396	136.8864	(39)
Average = Sum(39)m / 12 =													135.9253

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9518	0.9494	0.9470	0.9357	0.9336	0.9238	0.9238	0.9220	0.9276	0.9336	0.9379	0.9424	(40)
HLP (average)													0.9357
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	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	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	44.6003	(42c)
Average daily hot water use (litres/day)													137.4491 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	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	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	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	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	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	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	186.9256	206.9533	186.9256	193.1565	186.9256	193.1565	186.9256	186.9256	193.1565	186.9256	193.1565	186.9256 (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	728.0770	748.6459	715.1126	692.2613	656.8108	631.8351	607.1582	607.6319	626.4997	649.0125	688.4530	712.6904 (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					4.6000	19.6403	0.6300	0.7000			0.7700	27.6107 (80)				
South					0.8400	42.0754	0.6300	0.7000			1.0000	14.0278 (82)				

Solar gains					120.1517	211.0711	303.4788	396.8128	460.6715	463.7309	444.4810	396.3511	335.9819	237.4632	145.1377	102.0023 (83)
Total gains					848.2287	959.7170	1018.5913	1089.0741	1117.4823	1095.5659	1051.6391	1003.9830	962.4817	886.4757	833.5907	814.6926 (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	62.1490	62.3090	62.4666	63.2178	63.3603	64.0324	64.0324	64.1585	63.7719	63.3603	63.0726	62.7746
alpha	5.1433	5.1539	5.1644	5.2145	5.2240	5.2688	5.2688	5.2772	5.2515	5.2240	5.2048	5.1850
util living area	0.9963	0.9924	0.9845	0.9573	0.8855	0.7239	0.5494	0.5948	0.8252	0.9652	0.9921	0.9970 (86)
MIT	19.7242	19.8945	20.1348	20.4735	20.7623	20.9423	20.9889	20.9834	20.8813	20.5146	20.0676	19.7011 (87)
Th 2	20.1237	20.1257	20.1277	20.1372	20.1390	20.1473	20.1473	20.1488	20.1441	20.1390	20.1354	20.1316 (88)
util rest of house	0.9953	0.9903	0.9800	0.9440	0.8492	0.6483	0.4488	0.4936	0.7626	0.9517	0.9895	0.9962 (89)
MIT 2	18.6211	18.8398	19.1466	19.5768	19.9195	20.1088	20.1427	20.1414	20.0537	19.6338	19.0686	18.5973 (90)
Living area fraction	18.7192	18.9336	19.2345	19.6566	19.9944	20.1830	20.2180	20.2163	20.1273	19.7121	19.1575	18.6955 (91)
MIT	18.7192	18.9336	19.2345	19.6566	19.9944	20.1830	20.2180	20.2163	20.1273	19.7121	19.1575	18.6955 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7192	18.9336	19.2345	19.6566	19.9944	20.1830	20.2180	20.2163	20.1273	19.7121	19.1575	18.6955 (93)

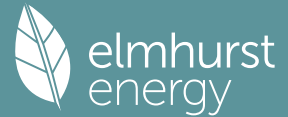
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9929	0.9862	0.9736	0.9346	0.8421	0.6517	0.4574	0.5019	0.7612	0.9429	0.9854	0.9941 (94)
Useful gains	842.1857	946.5184	991.7221	1017.8430	941.0258	713.9773	481.0374	503.9123	732.6632	835.8992	821.3862	809.9209 (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	1993.6654	1935.3575	1751.7700	1462.1062	1124.8973	749.2185	485.5267	511.1332	812.1529	1235.7942	1642.7087	1984.2352 (97)
Space heating kWh	856.7009	664.4999	565.4757	319.8696	136.8003	0.0000	0.0000	0.0000	0.0000	297.5219	591.3522	873.6899 (98a)
Space heating requirement - total per year (kWh/year)												4305.9103
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	856.7009	664.4999	565.4757	319.8696	136.8003	0.0000	0.0000	0.0000	0.0000	297.5219	591.3522	873.6899 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4305.9103
Space heating per m2											(98c) / (4) =	29.6428 (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	856.7009	664.4999	565.4757	319.8696	136.8003	0.0000	0.0000	0.0000	0.0000	297.5219	591.3522	873.6899 (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)	928.1700	719.9349	612.6497	346.5542	148.2127	0.0000	0.0000	0.0000	0.0000	322.3422	640.6850	946.5762 (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	86.5945	86.3703	85.9582	85.0395	83.2263	79.8000	79.8000	79.8000	79.8000	84.8533	86.1491	79.8000	(216)
Fuel for water heating, kWh/month	288.5928	255.6810	272.8076	242.6005	240.2925	225.8578	223.1395	232.1167	234.7479	246.0880	257.5562	285.3350	(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	38.8394	31.1584	28.0547	20.5541	15.8766	12.9713	14.4831	18.8257	24.4528	32.0834	36.2381	39.9189	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-55.0913	-77.1795	-110.1736	-122.8966	-131.5812	-122.3632	-120.7844	-114.4888	-103.2377	-87.7736	-60.3712	-47.6816	(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	-32.5262	-68.2942	-135.5528	-203.3529	-268.7092	-270.0275	-266.9122	-226.1073	-165.8379	-97.6512	-43.4127	-25.7349	(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												4665.1249	(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												3004.8154	(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)												313.4566	(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												5111.6550	(238)

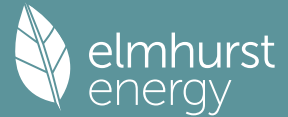
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4665.1249	0.2100	979.6762 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3004.8154	0.2100	631.0112 (264)
Space and water heating			1610.6875 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	313.4566	0.1443	45.2415 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1153.6229	0.1348	-155.4619
PV Unit electricity exported	-1804.1191	0.1259	-227.1806
Total			-382.6425 (269)
Total CO2, kg/year			1285.2157 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.8500 (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	4665.1249	1.1300	5271.5911 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3004.8154	1.1300	3395.4415 (278)
Space and water heating			8667.0326 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	313.4566	1.5338	480.7902 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1153.6229	1.4981	-1728.1953
PV Unit electricity exported	-1804.1191	0.4622	-833.9099
Total			-2562.1052 (283)
Total Primary energy kWh/year			6715.8184 (286)
Target Primary Energy Rate (TPER)			46.2300 (287)

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Property Reference	plot 1, Richard Burch Street			Issued on Date	01/05/2024
Assessment Reference	Plot 1	Prop Type Ref	1		
Property	Plot 1, 6 Richard Burch Street, Bury , BL9 6DU				
SAP Rating	94 A	DER	1.36	TER	8.85
Environmental	99 A	% DER < TER			84.63
CO ₂ Emissions (t/year)	0.21	DFEE	30.56	TFEE	34.14
Compliance Check	See BREL	% DFEE < TFEE			10.46
% DPER < TPER	66.36	DPER	15.55	TPER	46.23
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

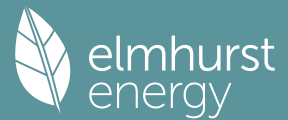
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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)

	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)			12.3200	1.1450	14.1069		(27)
RL			0.8400	1.1450	0.9618		(27a)
Ground Floor			59.8400	0.1300	7.7792	110.0000	6582.4000 (28a)
External Wall	136.0400	12.1300	123.9100	0.1800	22.3038	60.0000	7434.6000 (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)			277.3400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	60.0934		(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) =	30934.7500 (34)

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

212.9612 (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) = 66.5102 (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	130.4822	130.3342	130.1891	129.5075	129.3800	128.7864	128.7864	128.6765	129.0150	129.3800	129.6380	129.9077	(39)
Average = Sum(39)m / 12 =												129.5069	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8983	0.8972	0.8962	0.8916	0.8907	0.8866	0.8866	0.8858	0.8882	0.8907	0.8925	0.8943	(40)
HLP (average)												0.8916	
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)
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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)
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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)
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Average daily hot water use (litres/day)

												69.8803	(43)
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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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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)
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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)
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Energy content (annual)

												1160.5634	
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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)
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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)
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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)
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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)
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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)
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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)
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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)
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PV diverter

	-24.0589	-51.4424	-104.0026	-159.0984	-212.4355	-214.1228	-210.8684	-176.2875	-127.3170	-73.5491	-32.1345	-18.8926	(63b)
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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)
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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)
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Output from w/h

	144.2214	97.0784	53.9856	0.0000	0.0000	0.0000	0.0000	0.0000	2.4387	69.8265	118.5732	147.8481	(64)
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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)
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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)
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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)
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Heat gains from water heating, kWh/month

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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)
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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)
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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)
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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)
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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)
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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)
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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)
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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)
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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)
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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)
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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)
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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)
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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)
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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)
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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)
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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)
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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)
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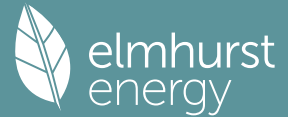
Heat gains from water heating, kWh/month

	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)
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Heat gains from water heating, kWh/month

	93.1643	82.8101	89.3367	82.1352	81.9659	76.4313	77.4598	79.
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Full SAP Calculation Printout



South	4.8400	46.7521	0.7600	0.7000	1.0000	108.3429 (78)
West	4.6000	19.6403	0.7600	0.7000	1.0000	43.2573 (80)
South	0.8400	42.0754	0.7600	0.7000	1.0000	16.9224 (82)

Solar gains	183.1854	321.3437	461.0908	601.7871	697.9430	702.3572	673.2871	600.7970	510.0620	361.2476	221.1900	155.5757 (83)
Total gains	936.7304	1072.8963	1189.9379	1290.7696	1343.9147	1310.4501	1259.7871	1189.6461	1121.1220	1010.5990	915.4391	888.8817 (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	65.8556	65.9304	66.0039	66.3512	66.4166	66.7228	66.7228	66.7798	66.6045	66.4166	66.2845	66.1469
alpha	5.3904	5.3954	5.4003	5.4234	5.4278	5.4482	5.4482	5.4520	5.4403	5.4278	5.4190	5.4098
util living area	0.9940	0.9867	0.9677	0.9135	0.7942	0.6093	0.4466	0.4919	0.7337	0.9374	0.9873	0.9954 (86)
Living	20.1173	20.2549	20.4556	20.6860	20.8529	20.9260	20.9404	20.9387	20.8982	20.6791	20.3481	20.0839
Non living	19.1270	19.3024	19.5551	19.8382	20.0242	20.0952	20.1048	20.1047	20.0726	19.8363	19.4254	19.0872
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	30
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	20.1690	20.1698	20.1707	20.1747	20.1754	20.1789	20.1789	20.1796	20.1776	20.1754	20.1739	20.1723 (88)
util rest of house	0.9923	0.9832	0.9592	0.8914	0.7477	0.5387	0.3649	0.4070	0.6660	0.9164	0.9833	0.9941 (89)
MIT 2	20.1690	20.1698	20.1707	20.1747	20.1754	20.1789	20.1789	20.1796	20.1776	20.1754	20.1739	20.1723 (90)
Living area fraction									FLA = Living area / (4) =			0.0889 (91)
MIT	20.2429	20.2437	20.2445	20.2481	20.2488	20.2519	20.2519	20.2525	20.2507	20.2488	20.2474	20.2460 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2429	20.2437	20.2445	20.2481	20.2488	20.2519	20.2519	20.2525	20.2507	20.2488	20.2474	20.2460 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9925	0.9836	0.9601	0.8935	0.7521	0.5452	0.3722	0.4146	0.6724	0.9186	0.9838	0.9943 (94)
Useful gains	929.7058	1055.2882	1142.4158	1153.3575	1010.8065	714.4443	468.9436	493.2754	753.8752	928.2950	900.5655	883.7906 (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	2080.2636	1999.8058	1789.3776	1469.6630	1106.0400	727.8933	470.3205	495.7299	793.5355	1248.3580	1704.4014	2084.4924 (97)
Space heating kWh	856.0150	634.7158	481.3396	227.7400	70.8538	0.0000	0.0000	0.0000	0.0000	238.1269	578.7619	893.3221 (98a)
Space heating requirement - total per year (kWh/year)												3980.8750
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	856.0150	634.7158	481.3396	227.7400	70.8538	0.0000	0.0000	0.0000	0.0000	238.1269	578.7619	893.3221 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3980.8750
Space heating per m2										(98c) / (4) =		27.4052 (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 %)												321.3680 (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	856.0150	634.7158	481.3396	227.7400	70.8538	0.0000	0.0000	0.0000	0.0000	238.1269	578.7619	893.3221 (98)
Space heating efficiency (main heating system 1)	321.3680	321.3680	321.3680	321.3680	321.3680	0.0000	0.0000	0.0000	0.0000	321.3680	321.3680	321.3680 (210)
Space heating fuel (main heating system)	266.3659	197.5044	149.7783	70.8658	22.0475	0.0000	0.0000	0.0000	0.0000	74.0979	180.0932	277.9748 (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	144.2214	97.0784	53.9856	0.0000	0.0000	0.0000	0.0000	0.0000	2.4387	69.8265	118.5732	147.8481 (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	128.1968	86.2919	47.9872	0.0000	0.0000	0.0000	0.0000	0.0000	2.1677	62.0680	105.3984	131.4205 (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	38.2378	30.6758	27.6202	20.2357	15.6306	12.7704	14.2588	18.5341	24.0740	31.5864	35.6767	39.3006 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-71.1538	-102.1442	-144.9186	-152.9690	-157.1926	-142.4310	-141.0488	-133.5965	-120.0816	-112.1521	-78.4120	-61.3473 (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	-2.2871	-7.8575	-24.2154	-51.7991	-78.1335	-83.0822	-81.9561	-70.0765	-51.3812	-19.8184	-4.7026	-1.4885 (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	1238.7278	(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	563.5306	(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)	308.6011	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1894.2458	(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	898.5796	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1238.7278	16.4900	204.2662 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	563.5306	16.4900	92.9262 (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	308.6011	16.4900	50.8883 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1417.4476	16.4900	-233.7371
PV Unit electricity exported	-476.7983	5.5900	-26.6530
Total			-260.3901 (252)
Total energy cost			200.1468 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.3787 (257)
SAP value		93.8612
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	1238.7278	0.1563	193.5598 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	563.5306	0.1563	88.0872 (264)
Energy for instantaneous electric shower(s)	681.9660	0.1391	94.8766 (264a)
Space and water heating			281.6470 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	308.6011	0.1443	44.5407 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1417.4476	0.1356	-192.1911
PV Unit electricity exported	-476.7983	0.1185	-56.5220
Total			-248.7131 (269)
Total CO2, kg/year			172.3511 (272)
CO2 emissions per m2			1.1900 (273)
EI value			98.7861
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

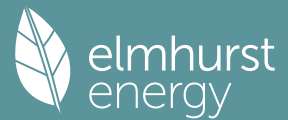
1. Overall dwelling characteristics

	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)			12.3200	1.1450	14.1069			(27)
RL			0.8400	1.1450	0.9618			(27a)
Ground Floor			59.8400	0.1300	7.7792	110.0000	6582.4000	(28a)
External Wall	136.0400	12.1300	123.9100	0.1800	22.3038	60.0000	7434.6000	(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)			277.3400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	60.0934			(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) =	30934.7500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		212.9612 (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			66.5102	(33) + (36) + (36a) = (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	63.6789	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 =	130.1891	130.0469	130.0469	129.5075	129.7714	128.8993	128.8993	128.8993	128.8993	129.5075	129.5075	129.9077	(39)
												129.5068	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.8962	0.8953	0.8953	0.8916	0.8934	0.8874	0.8874	0.8874	0.8874	0.8916	0.8916	0.8943	(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	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)

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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	-19.0257	-42.5232	-92.5912	-146.7572	-191.2177	-197.7634	-189.5631	-154.7058	-115.8379	-63.2186	-25.5677	-15.2021 (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	149.2546	105.9976	65.3970	0.0000	0.0000	0.0000	0.0000	0.0000	13.9178	80.1570	125.1400	151.5387 (64)
	Total per year (kWh/year) = Sum(64)m =											691.4027 (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	43.6857	38.8012	31.5553	23.8894	17.8576	15.0761	16.2903	21.1747	28.4207	36.0866	42.1184	44.8998 (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	753.5450	751.5526	728.8471	688.9825	645.9717	608.0929	586.5000	588.8491	611.0600	649.3514	694.2492	733.3060 (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					4.6000	16.6316	0.7600	0.7000	1.0000	36.6308 (80)		
South					0.8400	35.6568	0.7600	0.7000	1.0000	14.3409 (82)		
Solar gains	155.3409	280.2711	423.4214	566.4175	643.9930	660.6888	620.3438	544.0075	475.3414	323.5780	188.0821	133.6426 (83)
Total gains	908.8859	1031.8237	1152.2685	1255.4000	1289.9647	1268.7816	1206.8438	1132.8566	1086.4014	972.9294	882.3313	866.9486 (84)

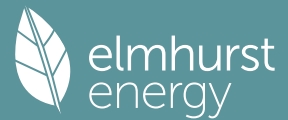
7. Mean internal temperature (heating season)

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	66.0039	66.0761	66.0761	66.3512	66.2164	66.6644	66.6644	66.6644	66.6644	66.3512	66.3512	66.1469
alpha	5.4003	5.4051	5.4051	5.4234	5.4144	5.4443	5.4443	5.4443	5.4443	5.4234	5.4234	5.4098
util living area	0.9949	0.9894	0.9747	0.9257	0.8244	0.6594	0.5355	0.5872	0.7916	0.9546	0.9899	0.9960 (86)
Living	20.0939	20.2156	20.4036	20.6575	20.8306	20.9166	20.9356	20.9311	20.8723	20.6230	20.3120	20.0612
Non living	19.0986	19.2540	19.4912	19.8051	19.9998	20.0874	20.1016	20.0990	20.0500	19.7689	19.3803	19.0582
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	20.1707	20.1715	20.1715	20.1747	20.1731	20.1782	20.1782	20.1782	20.1782	20.1747	20.1747	20.1723 (88)
util rest of house	0.9935	0.9866	0.9680	0.9060	0.7813	0.5909	0.4534	0.5031	0.7327	0.9389	0.9867	0.9949 (89)
MIT 2	20.1707	20.1715	20.1715	20.1747	20.1731	20.1782	20.1782	20.1782	20.1782	20.1747	20.1747	20.1723 (90)
Living area fraction	20.2445	20.2452	20.2452	20.2481	20.2467	20.2513	20.2513	20.2513	20.2513	20.2481	20.2481	20.2460 (91)
MIT	20.2445	20.2452	20.2452	20.2481	20.2467	20.2513	20.2513	20.2513	20.2513	20.2481	20.2481	20.2460 (92)
Temperature adjustment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
adjusted MIT	20.2445	20.2452	20.2452	20.2481	20.2467	20.2513	20.2513	20.2513	20.2513	20.2481	20.2481	20.2460 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9937	0.9869	0.9686	0.9080	0.7855	0.5973	0.4609	0.5108	0.7384	0.9405	0.9871	0.9951 (94)
Useful gains	903.1185	1018.3166	1116.1135	1139.8484	1013.2697	757.7885	556.2198	578.6850	802.2127	915.0834	870.9236	862.6618 (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	2088.8125	2021.6066	1839.5409	1495.5645	1135.0687	780.0131	560.8844	586.6642	870.2426	1314.2540	1728.6781	2097.4831 (97)
Space heating kWh	882.1564	674.2108	538.2300	256.1156	90.6184	0.0000	0.0000	0.0000	0.0000	296.9829	617.5832	918.7071 (98a)
Space heating requirement - total per year (kWh/year)												4274.6044
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	882.1564	674.2108	538.2300	256.1156	90.6184	0.0000	0.0000	0.0000	0.0000	296.9829	617.5832	918.7071 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4274.6044

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Space heating per m2

(98c) / (4) = 29.4273 (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 %)												321.3680 (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	882.1564	674.2108	538.2300	256.1156	90.6184	0.0000	0.0000	0.0000	0.0000	296.9829	617.5832	918.7071 (98)
Space heating efficiency (main heating system 1)	321.3680	321.3680	321.3680	321.3680	321.3680	0.0000	0.0000	0.0000	0.0000	321.3680	321.3680	321.3680 (210)
Space heating fuel (main heating system)	274.5004	209.7940	167.4809	79.6954	28.1977	0.0000	0.0000	0.0000	0.0000	92.4121	192.1732	285.8738 (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	149.2546	105.9976	65.3970	0.0000	0.0000	0.0000	0.0000	0.0000	13.9178	80.1570	125.1400	151.5387 (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	132.6707	94.2201	58.1307	0.0000	0.0000	0.0000	0.0000	0.0000	12.3714	71.2507	111.2356	134.7010 (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	38.2378	30.6758	27.6202	20.2357	15.6306	12.7704	14.2588	18.5341	24.0740	31.5864	35.6767	39.3006 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-62.1398	-92.6628	-138.8081	-149.2336	-152.7880	-138.9233	-136.3637	-127.6849	-117.2634	-105.6424	-69.2191	-54.0153 (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	-1.6121	-5.7877	-19.5926	-46.6713	-69.5653	-77.1920	-74.2625	-62.0748	-45.4978	-15.4000	-3.3408	-1.0573 (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												1330.1275 (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												614.5801 (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)												308.6011 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1766.7988 (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												1168.4759 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1330.1275	25.1600	334.6601 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	614.5801	25.1600	154.6284 (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	308.6011	25.1600	77.6440 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1344.7445	25.1600	-338.3377
PV Unit electricity exported	-422.0543	5.8100	-24.5214
Total			-362.8591 (252)
Total energy cost			375.6560 (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	1330.1275	0.1558	207.2374 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	614.5801	0.1555	95.5468 (264)
Energy for instantaneous electric shower(s)	681.9660	0.1391	94.8766 (264a)
Space and water heating			302.7841 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	308.6011	0.1443	44.5407 (268)

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Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1344.7445	0.1351	-181.7389
PV Unit electricity exported	-422.0543	0.1176	-49.6493
Total			-231.3882 (269)
Total CO2, kg/year			210.8132 (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	1330.1275	1.5768	2097.3607 (273)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	614.5801	1.5754	968.2326 (278)
Energy for instantaneous electric shower(s)	681.9660	1.5143	1032.7244 (278a)
Space and water heating			3065.5934 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	308.6011	1.5338	473.3426 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1344.7445	1.4995	-2016.4990
PV Unit electricity exported	-422.0543	0.4315	-182.0975
Total			-2198.5966 (283)
Total Primary energy kWh/year			2373.0638 (286)

SAP 10 EPC IMPROVEMENTS

Plot 1

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	CO2 change
---------------------------------	------------	-------------	------------

Measures omitted - SAP change or cost saving too small:	
N Solar water heating	+ 0.3 -£ -36 -105 kg (50.0%)

Recommended measures (none)	Typical annual savings	Energy efficiency impact	Environmental impact
	Total Savings	£0	0.00 kg/m²

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 £739	Potential £739	Saving £0
Electricity			
Space heating	£335	£335	£0
Water heating	£326	£326	£0
Lighting	£78	£78	£0
Generated (PV)	-£363	-£363	£0
Total cost of fuels	£376	£376	£0
Total cost of uses	£376	£376	£0
Delivered energy	8 kWh/m²	8 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	16 kWh/m²	16 kWh/m²	0 kWh/m²

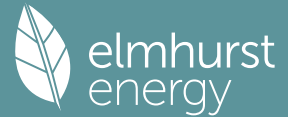
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
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)	
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)		
	0.2517	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)			12.3200	1.1450	14.1069		(27)
RL			0.8400	1.1450	0.9618		(27a)
Ground Floor			59.8400	0.1300	7.7792	110.0000	6582.4000 (28a)
External Wall	136.0400	12.1300	123.9100	0.1800	22.3038	60.0000	7434.6000 (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)			277.3400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	60.0934		(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) = 30934.7500 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 212.9612 (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) = 66.5102 (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 (38)
Average = Sum(39)m / 12 =	130.4822	130.3342	130.1891	129.5075	129.3800	128.7864	128.7864	128.6765	129.0150	129.3800	129.6380	129.9077 (39)
												129.5069
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8983	0.8972	0.8962	0.8916	0.8907	0.8866	0.8866	0.8858	0.8882	0.8907	0.8925	0.8943 (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
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
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
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
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
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	-24.0589	-51.4424	-104.0026	-159.0984	-212.4355	-214.1228	-210.8684	-176.2875	-127.3170	-73.5491	-32.1345	-18.8926 (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												
	144.2214	97.0784	53.9856	0.0000	0.0000	0.0000	0.0000	0.0000	2.4387	69.8265	118.5732	147.8481 (64)
											Total per year (kWh/year) = Sum(64)m =	633.9719 (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												
	43.6857	38.8012	31.5553	23.8894	17.8576	15.0761	16.2903	21.1747	28.4207	36.0866	42.1184	44.8998 (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	753.5450	751.5526	728.8471	688.9825	645.9717	608.0929	586.5000	588.8491	611.0600	649.3514	694.2492	733.3060 (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					4.6000	19.6403	0.7600		0.7000		1.0000	43.2573 (80)
South					0.8400	42.0754	0.7600		0.7000		1.0000	16.9224 (82)
Solar gains	183.1854	321.3437	461.0908	601.7871	697.9430	702.3572	673.2871	600.7970	510.0620	361.2476	221.1900	155.5757 (83)
Total gains	936.7304	1072.8963	1189.9379	1290.7696	1343.9147	1310.4501	1259.7871	1189.6461	1121.1220	1010.5990	915.4391	888.8817 (84)

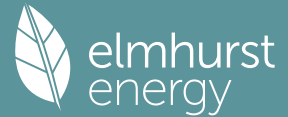
7. Mean internal temperature (heating season)

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	65.8556	65.9304	66.0039	66.3512	66.4166	66.7228	66.7228	66.7798	66.6045	66.4166	66.2845	66.1469
alpha	5.3904	5.3954	5.4003	5.4234	5.4278	5.4482	5.4482	5.4520	5.4403	5.4278	5.4190	5.4098
util living area	0.9940	0.9867	0.9677	0.9135	0.7942	0.6093	0.4466	0.4919	0.7337	0.9374	0.9873	0.9954 (86)
Living	20.1173	20.2549	20.4556	20.6860	20.8529	20.9260	20.9404	20.9387	20.8982	20.6791	20.3481	20.0839
Non living	19.1270	19.3024	19.5551	19.8382	20.0242	20.0952	20.1048	20.1047	20.0726	19.8363	19.4254	19.0872
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	20.1690	20.1698	20.1707	20.1747	20.1754	20.1789	20.1789	20.1796	20.1776	20.1754	20.1739	20.1723 (88)
util rest of house												
	0.9923	0.9832	0.9592	0.8914	0.7477	0.5387	0.3649	0.4070	0.6660	0.9164	0.9833	0.9941 (89)
MIT 2	20.1690	20.1698	20.1707	20.1747	20.1754	20.1789	20.1789	20.1796	20.1776	20.1754	20.1739	20.1723 (90)
Living area fraction												
	20.2429	20.2437	20.2445	20.2481	20.2488	20.2519	20.2519	20.2525	20.2507	20.2488	20.2474	20.2460 (91)
Temperature adjustment												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (92)
adjusted MIT	20.2429	20.2437	20.2445	20.2481	20.2488	20.2519	20.2519	20.2525	20.2507	20.2488	20.2474	20.2460 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9925	0.9836	0.9601	0.8935	0.7521	0.5452	0.3722	0.4146	0.6724	0.9186	0.9838	0.9943 (94)
Useful gains	929.7058	1055.2882	1142.4158	1153.3575	1010.8065	714.4443	468.9436	493.2754	753.8752	928.2950	900.5655	883.7906 (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												
	2080.2636	1999.8058	1789.3776	1469.6630	1106.0400	727.8933	470.3205	495.7299	793.5355	1248.3580	1704.4014	2084.4924 (97)
Space heating kWh												
	856.0150	634.7158	481.3396	227.7400	70.8538	0.0000	0.0000	0.0000	0.0000	238.1269	578.7619	893.3221 (98a)
Space heating requirement - total per year (kWh/year)												
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)												

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Space heating kWh	856.0150	634.7158	481.3396	227.7400	70.8538	0.0000	0.0000	0.0000	0.0000	238.1269	578.7619	893.3221 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3980.8750
Space heating per m2												(98c) / (4) = 27.4052 (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 %)												321.3680 (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	856.0150	634.7158	481.3396	227.7400	70.8538	0.0000	0.0000	0.0000	0.0000	238.1269	578.7619	893.3221 (98)
Space heating efficiency (main heating system 1)	321.3680	321.3680	321.3680	321.3680	321.3680	0.0000	0.0000	0.0000	0.0000	321.3680	321.3680	321.3680 (210)
Space heating fuel (main heating system)	266.3659	197.5044	149.7783	70.8658	22.0475	0.0000	0.0000	0.0000	0.0000	74.0979	180.0932	277.9748 (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	144.2214	97.0784	53.9856	0.0000	0.0000	0.0000	0.0000	0.0000	2.4387	69.8265	118.5732	147.8481 (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	128.1968	86.2919	47.9872	0.0000	0.0000	0.0000	0.0000	0.0000	2.1677	62.0680	105.3984	131.4205 (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	38.2378	30.6758	27.6202	20.2357	15.6306	12.7704	14.2588	18.5341	24.0740	31.5864	35.6767	39.3006 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-71.1538	-102.1442	-144.9186	-152.9690	-157.1926	-142.4310	-141.0488	-133.5965	-120.0816	-112.1521	-78.4120	-61.3473 (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	-2.2871	-7.8575	-24.2154	-51.7991	-78.1335	-83.0822	-81.9561	-70.0765	-51.3812	-19.8184	-4.7026	-1.4885 (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												1238.7278 (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												563.5306 (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)												308.6011 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1894.2458 (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												898.5796 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1238.7278	16.4900	204.2662 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	563.5306	16.4900	92.9262 (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	308.6011	16.4900	50.8883 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1417.4476	16.4900	-233.7371
PV Unit electricity exported	-476.7983	5.5900	-26.6530
Total			-260.3901 (252)
Total energy cost			200.1468 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)		0.3787 (257)
SAP value	[(255) x (256)] / [(4) + 45.0] =	93.8612
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	1238.7278	0.1563	193.5598 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	563.5306	0.1563	88.0872 (264)
Energy for instantaneous electric shower(s)	681.9660	0.1391	94.8766 (264a)
Space and water heating			281.6470 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	308.6011	0.1443	44.5407 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1417.4476	0.1356	-192.1911
PV Unit electricity exported	-476.7983	0.1185	-56.5220
Total			-248.7131 (269)
Total CO2, kg/year			172.3511 (272)
CO2 emissions per m2			1.1900 (273)
EI value			98.7861
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

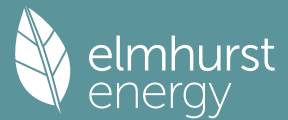
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked 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) =	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)			12.3200	1.1450	14.1069		(27)
RL			0.8400	1.1450	0.9618		(27a)
Ground Floor			59.8400	0.1300	7.7792	110.0000	6582.4000 (28a)
External Wall	136.0400	12.1300	123.9100	0.1800	22.3038	60.0000	7434.6000 (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)			277.3400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	60.0934		(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 kJ/m²K
 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
Total fabric heat loss		(33) + (36) + (36a) =	66.5102 (37)

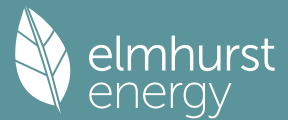
Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	63.6789	63.5367	63.5367	62.9973	63.2611	62.3890	62.3890	62.3890	62.3890	62.9973	62.9973	63.3974
Average = Sum(39)m / 12 =	130.1891	130.0469	130.0469	129.5075	129.7714	128.8993	128.8993	128.8993	128.8993	129.5075	129.5075	129.5068
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8962	0.8953	0.8953	0.8916	0.8934	0.8874	0.8874	0.8874	0.8874	0.8916	0.8916	0.8943
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 (42a)
Hot water usage for baths												31.6393 (42b)
Hot water usage for other uses												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 = $0.15 \times (45)\text{m}$												1160.5634
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 (56)
If cylinder contains dedicated solar storage												
Primary 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 (57)
Combi 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)
Total heat required for water heating calculated for each month	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)
WWHRS	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)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
Solar input	-19.0257	-42.5232	-92.5912	-146.7572	-191.2177	-197.7634	-189.5631	-154.7058	-115.8379	-63.2186	-25.5677	-15.2021 (63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
Output from w/h	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)
Electric shower(s)	149.2546	105.9976	65.3970	0.0000	0.0000	0.0000	0.0000	0.0000	13.9178	80.1570	125.1400	151.5387 (64)
Heat gains from water heating, kWh/month	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 =	93.1643	82.8101	89.3367	82.1352	81.9659	76.4313	77.4598	79.2069	78.5659	84.4780	85.9249	82.6524 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	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)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	43.6857	38.8012	31.5553	23.8894	17.8576	15.0761	16.2903	21.1747	28.4207	36.0866	42.1184	44.8998 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), 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)
Pumps, fans	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)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-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)
Total internal gains	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)
	753.5450	751.5526	728.8471	688.9825	645.9717	608.0929	586.5000	588.8491	611.0600	649.3514	694.2492	733.3060 (73)

6. Solar gains												
[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m ²	Table 6a	Specific data	Specific data	factor	W						
		W/m ²	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			4.6000		16.6316		0.7600		0.7000		1.0000		36.6308 (80)
South			0.8400		35.6568		0.7600		0.7000		1.0000		14.3409 (82)

Solar gains	155.3409	280.2711	423.4214	566.4175	643.9930	660.6888	620.3438	544.0075	475.3414	323.5780	188.0821	133.6426 (83)
Total gains	908.8859	1031.8237	1152.2685	1255.4000	1289.9647	1268.7816	1206.8438	1132.8566	1086.4014	972.9294	882.3313	866.9486 (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	66.0039	66.0761	66.0761	66.3512	66.2164	66.6644	66.6644	66.6644	66.6644	66.3512	66.3512	66.1469	
alpha	5.4003	5.4051	5.4051	5.4234	5.4144	5.4443	5.4443	5.4443	5.4443	5.4234	5.4234	5.4098	
util living area	0.9949	0.9894	0.9747	0.9257	0.8244	0.6594	0.5355	0.5872	0.7916	0.9546	0.9899	0.9960 (86)	
Living	20.0939	20.2156	20.4036	20.6575	20.8306	20.9166	20.9356	20.9311	20.8723	20.6230	20.3120	20.0612	
Non living	19.0986	19.2540	19.4912	19.8051	19.9998	20.0874	20.1016	20.0990	20.0500	19.7689	19.3803	19.0582	
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	20.1707	20.1715	20.1715	20.1747	20.1731	20.1782	20.1782	20.1782	20.1782	20.1747	20.1747	20.1723 (88)	
util rest of house	0.9935	0.9866	0.9680	0.9060	0.7813	0.5909	0.4534	0.5031	0.7327	0.9389	0.9867	0.9949 (89)	
MIT 2	20.1707	20.1715	20.1715	20.1747	20.1731	20.1782	20.1782	20.1782	20.1782	20.1747	20.1747	20.1723 (90)	
Living area fraction									fLA = Living area / (4) =			0.0889 (91)	
MIT	20.2445	20.2452	20.2452	20.2481	20.2467	20.2513	20.2513	20.2513	20.2513	20.2481	20.2481	20.2460 (92)	
Temperature adjustment												0.0000	
adjusted MIT	20.2445	20.2452	20.2452	20.2481	20.2467	20.2513	20.2513	20.2513	20.2513	20.2481	20.2481	20.2460 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9937	0.9869	0.9686	0.9080	0.7855	0.5973	0.4609	0.5108	0.7384	0.9405	0.9871	0.9951 (94)	
Useful gains	903.1185	1018.3166	1116.1135	1139.8484	1013.2697	757.7885	556.2198	578.6850	802.2127	915.0834	870.9236	862.6618 (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	2088.8125	2021.6066	1839.5409	1495.5645	1135.0687	780.0131	560.8844	586.6642	870.2426	1314.2540	1728.6781	2097.4831 (97)	
Space heating kWh	882.1564	674.2108	538.2300	256.1156	90.6184	0.0000	0.0000	0.0000	0.0000	296.9829	617.5832	918.7071 (98a)	
Space heating requirement - total per year (kWh/year)												4274.6044	
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	882.1564	674.2108	538.2300	256.1156	90.6184	0.0000	0.0000	0.0000	0.0000	296.9829	617.5832	918.7071 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												4274.6044	
Space heating per m2										(98c) / (4) =		29.4273 (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 %)													321.3680 (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	882.1564	674.2108	538.2300	256.1156	90.6184	0.0000	0.0000	0.0000	0.0000	296.9829	617.5832	918.7071 (98)	
Space heating efficiency (main heating system 1)	321.3680	321.3680	321.3680	321.3680	321.3680	0.0000	0.0000	0.0000	0.0000	321.3680	321.3680	321.3680 (210)	
Space heating fuel (main heating system)	274.5004	209.7940	167.4809	79.6954	28.1977	0.0000	0.0000	0.0000	0.0000	92.4121	192.1732	285.8738 (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	149.2546	105.9976	65.3970	0.0000	0.0000	0.0000	0.0000	0.0000	13.9178	80.1570	125.1400	151.5387 (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	132.6707	94.2201	58.1307	0.0000	0.0000	0.0000	0.0000	0.0000	12.3714	71.2507	111.2356	134.7010 (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	38.2378	30.6758	27.6202	20.2357	15.6306	12.7704	14.2588	18.5341	24.0740	31.5864	35.6767	39.3006 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-62.1398	-92.6628	-138.8081	-149.2336	-152.7880	-138.9233	-136.3637	-127.6849	-117.2634	-105.6424	-69.2191	-54.0153 (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)	-1.6121	-5.7877	-19.5926	-46.6713	-69.5653	-77.1920	-74.2625	-62.0748	-45.4978	-15.4000	-3.3408	-1.0573 (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	1330.1275	(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	614.5801	(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)	308.6011	(232)

Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1766.7988	(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	1168.4759	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1330.1275	25.1600	334.6601	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	614.5801	25.1600	154.6284	(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	308.6011	25.1600	77.6440	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1344.7445	25.1600	-338.3377	
PV Unit electricity exported	-422.0543	5.8100	-24.5214	
Total			-362.8591	(252)
Total energy cost			375.6560	(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	1330.1275	0.1558	207.2374	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	614.5801	0.1555	95.5468	(264)
Energy for instantaneous electric shower(s)	681.9660	0.1391	94.8766	(264a)
Space and water heating			302.7841	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	308.6011	0.1443	44.5407	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1344.7445	0.1351	-181.7389	
PV Unit electricity exported	-422.0543	0.1176	-49.6493	
Total			-231.3882	(269)
Total CO2, kg/year			210.8132	(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	1330.1275	1.5768	2097.3607	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	614.5801	1.5754	968.2326	(278)
Energy for instantaneous electric shower(s)	681.9660	1.5143	1032.7244	(278a)
Space and water heating			3065.5934	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	308.6011	1.5338	473.3426	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1344.7445	1.4995	-2016.4990	
PV Unit electricity exported	-422.0543	0.4315	-182.0975	
Total			-2198.5966	(283)
Total Primary energy kWh/year			2373.0638	(286)

Predicted Energy Assessment



Plot 1, 6 Richard Burch Street, Bury , BL9 6DU

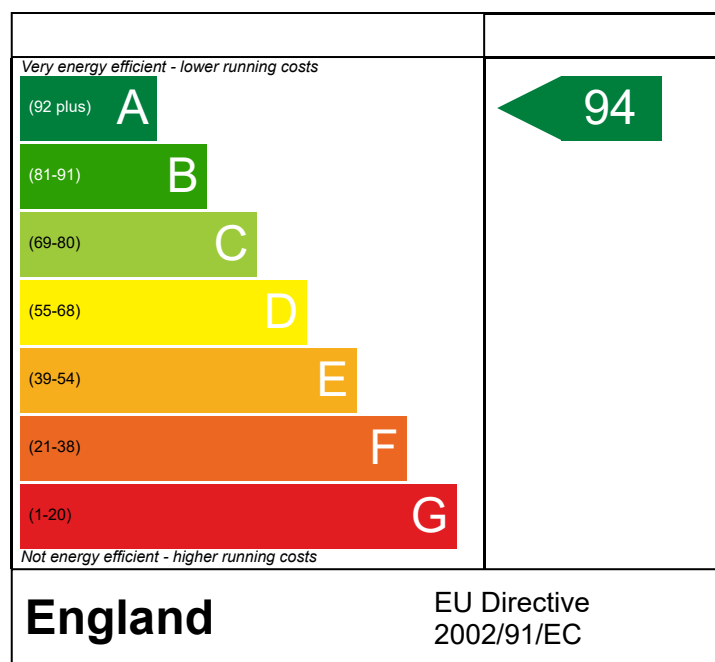
Dwelling type:
Date of assessment:
Produced by:
Total floor area:
DRRN:

House, End-Terrace
01/05/2024
Mark Scotson
145.26 m²
4599-2005-0440

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.

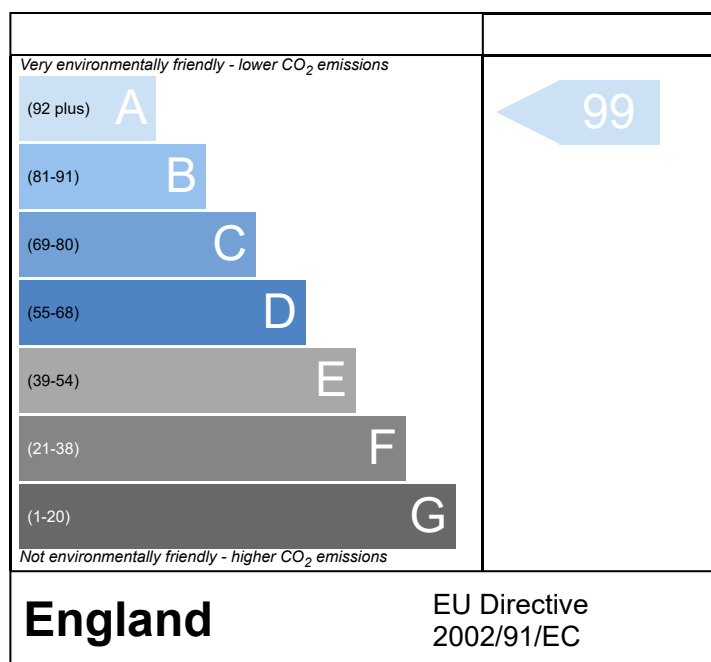
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.

Energy Efficiency Rating



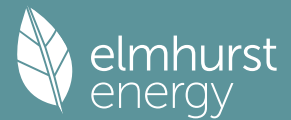
The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

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 1, Richard Burch Street	Issued on Date	01/05/2024
Assessment Reference	Plot 1	Prop Type Ref	End-Terrace House
Property	Plot 1, 6 Richard Burch Street, Bury , BL9 6DU		

SAP Rating	94 A	DER	1.36	TER	8.85
Environmental	99 A	% DER < TER			84.63
CO ₂ Emissions (t/year)	0.21	DFEE	30.56	TFEE	34.14
Compliance Check	See BREL	% DFEE < TFEE			10.46
% DPER < TPER	66.36	DPER	15.55	TPER	46.23

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: