

Building Regulations England Part L (BREL) Compliance Report

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

Date: Fri 15 Nov 2024 10:34:51

Project Information			
Assessed By	Victoria Gartside	Building Type	House, Detached
OCDEA Registration	EES/026678	Assessment Date	2024-11-15

Dwelling Details			
Assessment Type	As designed	Total Floor Area	89 m ²
Site Reference	SAP VG 21-0282	Plot Reference	Plot 25
Address			

Client Details	
Name	Newett Homes
Company	Newett Homes
Address	Thorp Arch Grange , Thorp Arch, Wetherby , Wetherby

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	Mains gas		
Target carbon dioxide emission rate	12.23 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	12.16 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	63.92 kWh _{PE} /m ²		
Dwelling primary energy	63.75 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	41.8 kWh/m ²		
Dwelling fabric energy efficiency	38.5 kWh/m ²		OK

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.19	Walls (1) (0.19)	OK
Party walls	0.2	N/A	N/A	N/A
Curtain walls	1.6	N/A	N/A	N/A
Floors	0.18	0.13	Ground Floor (0.13)	OK
Roofs	0.16	0.09	Roof (1) (0.09)	OK
Windows, doors, and roof windows	1.6	1.3	Front (1.3)	OK
Rooflights	2.2	N/A	N/A	N/A

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))			
Name	Net area [m ²]	U-Value [W/m ² K]	
Exposed wall: Walls (1)	114.73	0.19	
Ground floor: Ground Floor, Ground Floor	44.62	0.13	
Exposed roof: Roof (1)	44.62	0.09 (!)	

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]
Front , Windows	10.47	East	0.7	1.3
Rear , Windows	0.91	West	0.7	1.3
Front Door, Door	2.14	East	N/A	1.3
Side, Windows	3.75	North	0.7	1.3
Side, Windows	6.5	South	0.7	1.3

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	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.024 (!)	MFF-150-E2-02
External wall	E3: Sill	Calculated by person with suitable expertise	0.021 (!)	E3-01

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E4: Jamb	Calculated by person with suitable expertise	0.016 (!)	E4-01 RCD
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.092	Manufacturer Declaration
External wall	E10: Eaves (insulation at ceiling level)	Calculated by person with suitable expertise	0.058	E10-01
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.047	E16-01 RCD
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.001 (!)	E6-01 RCD
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.057	E12-01 RCD

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

Maximum permitted air permeability at 50Pa	8 m ³ /hm ²	
Dwelling air permeability at 50Pa	4 m ³ /hm ² , Design value	OK
Air permeability test certificate reference		

4 Space heating

Main heating system 1: Boiler with radiators or underfloor heating - Mains gas

Efficiency	88.5%
Emitter type	Both radiators and underfloor
Flow temperature	
System type	Combi boiler
Manufacturer	Vaillant
Model	ecoTEC sustain 28
Commissioning	

Secondary heating system: N/A

Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water

Cylinder/store - type: N/A

Capacity	N/A
Declared heat loss	N/A
Primary pipework insulated	N/A
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	85 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	2.43 kWp	
Orientation	East	
Pitch	45°	
Overshading	None or very little	
Manufacturer		
MCS certificate		
Technology type: Photovoltaic system (2)		
Peak power	0.35 kWp	
Orientation	West	
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	SAP VG 21-0282		Issued on Date	15/11/2024
Assessment Reference	Plot 25	Prop Type Ref	SAP VG 21-0282	
Property				

SAP Rating	93 A	DER	12.16	TER	12.23
Environmental	90 B	% DER < TER			0.57
CO ₂ Emissions (t/year)	1.04	DFEE	38.46	TFEE	41.84
Compliance Check	See BREL	% DFEE < TFEE			8.08
% DPER < TPER	0.26	DPER	63.75	TPER	63.92

Assessor Details	Miss Victoria Gartside	Assessor ID	AL30-0001
Client			

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

Orientation	East
Property Tenure	ND
Transaction Type	6
Terrain Type	Suburban
1.0 Property Type	House, Detached
Which Floor	0
2.0 Number of Storeys	2
3.0 Date Built	2023
3.0 Property Age Band	L
4.0 Sheltered Sides	0
5.0 Sunlight/Shade	Average or unknown
6.0 Thermal Mass Parameter	Precise calculation
Thermal Mass	244.51 kJ/m ² K
7.0 Electricity Tariff	Standard
Smart electricity meter fitted	Yes
Smart gas meter fitted	Yes

7.0 Measurements	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	30.80 m	44.62 m ²	2.39 m
1st Storey:	30.80 m	44.62 m ²	2.62 m
2nd Storey:	32.20 m	60.31 m ²	2.28 m

8.0 Living Area	11.35 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 or battens, lightweight aggregate block, filled cavity, any outside structure	0.19	110.00	138.50	114.73	0.00	None	23.77	Enter Gross Area

9.2 Internal Walls	Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
	Studs	Plasterboard on timber frame	9.00	189.84
	Block	Dense block, plasterboard on dabs	75.00	33.84

10.0 External Roofs	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area (m ²)	Shelter Code	Shelter Factor	Calculation Type	Openings
	Plane Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	44.62	44.62	None	0.00	Enter Gross Area	0.00

10.2 Internal Ceilings	Description	Storey	Construction	Area (m ²)
	Internal Ceiling 1	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	44.62

11.0 Heat Loss Floors	Description	Type	Storey Index	Construction	U-Value (W/m ² K)	Shelter Code	Shelter Factor	Kappa (kJ/m ² K)	Area (m ²)
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Summary for Input Data

Ground Floor Ground Floor - Solid Lowest occupied Suspended concrete floor, carpeted 0.13 None 0.00 75.00 44.62

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1		Plasterboard ceiling, carpeted chipboard floor	9.00	44.62

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Windows	Manufacturer	Window	Double Low-E Soft 0.05			0.73		0.70	1.30
Door	Manufacturer	Half Glazed Door	Double Low-E Soft 0.05			0.73		0.70	1.30

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Front	Windows	External Wall	East	10.47	0
Rear	Windows	External Wall	West	0.91	0
Front Door	Door	External Wall	East	2.14	0
Side	Windows	External Wall	North	3.75	0
Side	Windows	External Wall	South	6.50	0

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	16.63	0.02	0.02 MFF-150-E2-02	No
E3 Sill	Independently assessed	13.80	0.02	0.02 E3-01	No
E4 Jamb	Independently assessed	36.30	0.02	0.02 E4-01 RCD	No
E5 Ground floor (normal)	Independently assessed	27.70	0.09	0.09 Manufacturer Declaration	No
E10 Eaves (insulation at ceiling level)	Independently assessed	17.50	0.06	0.06 E10-01	No
E16 Corner (normal)	Independently assessed	20.04	0.05	0.05 E16-01 RCD	No
E6 Intermediate floor within a dwelling	Independently assessed	27.70	0.00	0.00 E6-01 RCD	No
E12 Gable (insulation at ceiling level)	Independently assessed	10.20	0.06	0.06 E12-01 RCD	No

Y-value 0.03 W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present No

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.15	In Room Fan	0
	Kitchen	
0.15	In Room Fan Other	2
	Wet Room	
0.00	In Duct Fan Kitchen	0
0.00	In Duct Fan Other	0
	Wet Room	
0.11	Through Wall Fan	1
	Kitchen	
0.14	Through Wall Fan	2
	Other Wet Room	

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	5
Number of passive vents	0
Number of flueless gas fires	0

21.0 Fixed Cooling System

No

22.0 Pressure Testing

Yes

Designed AP₅₀ 4.00 m³/(h.m²) @ 50 Pa

Summary for Input Data

Property Tested?

Test Method

22.0 Lighting

No Fixed Lighting

Name	Efficacy	Power	Capacity	Count
Lighting 1	85.00	10.00	850.00	16

24.0 Main Heating 1

Database

Percentage of Heat %

Database Ref. No.

Fuel Type

SAP Code

In Winter

In Summer

Model Name

Manufacturer

System Type

Controls SAP Code

Delayed Start Stat

Burner Control

HETAS approved System

Flue Type

Fan Assisted Flue

Is MHS Pumped

Heating Pump Age

Heat Emitter

Underfloor Heating

Flow Temperature

Flow Temperature Value

Boiler Interlock

Combi boiler type

25.0 Main Heating 2

26.0 Heat Networks

	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									

27.0 Secondary Heating

28.0 Water Heating

Water Heating

SAP Code

Flue Gas Heat Recovery System

Waste Water Heat Recovery Instantaneous System 1

Waste Water Heat Recovery Instantaneous System 2

Waste Water Heat Recovery Storage System

Solar Panel

Water use <= 125 litres/person/day

Immersion Heater

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
Bathroom	Combi boiler or unvented hot water system	8.00		No	
Ensuite	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder

Cylinder Stat	None				
Cylinder In Heated Space	Yes				
Independent Time Control	Yes				
Insulation Type	Measured Loss				
Insulation Thickness Type	Other				
Insulation Thickness	50				
Cylinder Volume	210.00			L	
Loss	2.10			kWh/day	
Pipes insulation	Fully insulated primary pipework				
In Airing Cupboard	No				

31.0 Thermal Store

	None
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32.0 Photovoltaic Unit

One Dwelling	
Export Capable Meter?	Yes
Connected To Dwelling	Yes
Diverter	No
Battery Capacity [kWh]	0.00

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
2.43	East	45°	None Or Little	No	No	1.00		
0.35	West	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

Recommendations

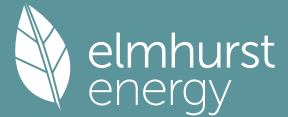
Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout



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Property							
SAP Rating	93 A	DER	12.16	TER	12.23		
Environmental	90 B	% DER < TER				0.57	
CO ₂ Emissions (t/year)	1.04	DFEE	38.46	TFEE	41.84		
Compliance Check	See BREL	% DFEE < TFEE				8.08	
% DPER < TPER	0.26	DPER	63.75	TPER	63.92		
Assessor Details	Miss Victoria Gartside				Assessor ID	AL30-0001	
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	44.6200 (1b)	x 2.3900 (2b)	= 106.6418 (1b) - (3b)
First floor	44.6200 (1c)	x 2.6200 (2c)	= 116.9044 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 223.5462 (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	5 * 10 = 50.0000 (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) =	50.0000 / (5) = 0.2237 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.4237 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.4237 (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	0.5402	0.5296	0.5190	0.4660	0.4554	0.4025	0.4025	0.3919	0.4237	0.4554	0.4766	0.4978 (22b)
Effective ac	0.6459	0.6402	0.6347	0.6086	0.6037	0.5810	0.5810	0.5768	0.5897	0.6037	0.6136	0.6239 (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
Windows (Uw = 1.30)			21.6300	1.2357	26.7291		(27)
Door			2.1400	1.3000	2.7820		(26a)
Ground Floor			44.6200	0.1300	5.8006	75.0000	3346.5000 (28a)
External Wall	138.5000	23.7700	114.7300	0.1900	21.7987	110.0000	12620.3000 (29a)
Plane Roof	44.6200		44.6200	0.0900	4.0158	9.0000	401.5800 (30)
Total net area of external elements Aum(A, m ²)			227.7400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	61.1262		(33)
Studs			189.8400			9.0000	1708.5600 (32c)
Block			33.8400			75.0000	2538.0000 (32c)
Internal Floor 1			44.6200			18.0000	803.1600 (32d)
Internal Ceiling 1			44.6200			9.0000	401.5800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	21819.6800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							244.5056 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				16.6300	0.0240	0.3991	
E3 Sill				13.8000	0.0210	0.2898	
E4 Jamb				36.3000	0.0160	0.5808	

Full SAP Calculation Printout



E5 Ground floor (normal)	27.7000	0.0920	2.5484
E10 Eaves (insulation at ceiling level)	17.5000	0.0580	1.0150
E16 Corner (normal)	20.0400	0.0470	0.9419
E6 Intermediate floor within a dwelling	27.7000	0.0010	0.0277
E12 Gable (insulation at ceiling level)	10.2000	0.0570	0.5814
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.3841 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	67.5103 (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	47.6478	47.2299	46.8203	44.8961	44.5361	42.8603	42.8603	42.5499	43.5058	44.5361	45.2644	46.0258 (38)
Average = Sum(39)m / 12 =	115.1581	114.7402	114.3305	112.4064	112.0464	110.3706	110.3706	110.0602	111.0161	112.0464	112.7747	113.5361 (39)
												112.4047
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2904	1.2857	1.2812	1.2596	1.2556	1.2368	1.2368	1.2333	1.2440	1.2556	1.2637	1.2723 (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												2.6152 (42)
Hot water usage for mixer showers												67.8068 (42a)
Hot water usage for baths												29.2952 (42b)
Hot water usage for other uses												41.4120 (42c)
Average daily hot water use (litres/day)												127.6567 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	138.8742	135.9088	132.2975	126.8062	122.3468	117.5527	115.7102	119.3059	123.0980	128.1311	133.7071	138.5140 (44)
Energy content (annual)	219.9427	193.5323	203.3364	173.5913	164.7023	144.5447	139.9415	147.7256	151.7922	173.8727	190.4902	216.8794 (45)
Distribution loss (46)m = 0.15 x (45)m												2120.3514
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
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 (57)
Combi loss	19.4094	17.4793	19.2416	18.3868	18.8514	18.0934	18.6014	18.6800	18.1666	18.9441	18.5575	19.3784 (61)
Total heat required for water heating calculated for each month	239.3521	211.0116	222.5781	191.9781	183.5538	162.6381	158.5428	166.4056	169.9588	192.8167	209.0477	236.2579 (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	239.3521	211.0116	222.5781	191.9781	183.5538	162.6381	158.5428	166.4056	169.9588	192.8167	209.0477	236.2579 (64)
12Total per year (kWh/year)												2344.1411 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Heat gains from water heating, kWh/month	77.9833	68.7193	72.4198	62.3158	59.4764	52.5845	51.1809	53.7887	55.0126	62.5487	67.9774	76.9570 (65)

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

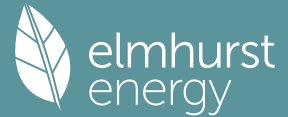
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	119.8785	132.7226	119.8785	123.8745	119.8785	123.8745	119.8785	119.8785	123.8745	119.8785	123.8745	119.8785 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	237.6726	240.1389	233.9239	220.6929	203.9912	188.2939	177.8071	175.3408	181.5558	194.7868	211.4885	227.1858 (68)
Pumps, fans	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070 (71)
Total internal gains	104.8163	102.2609	97.3384	86.5497	79.9414	73.0340	68.7915	72.2967	76.4063	84.0708	94.4130	103.4369 (72)
	527.5950	540.3500	516.3684	496.3447	469.0387	447.4300	428.7048	429.7437	444.0642	463.9637	495.0036	515.7288 (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			3.7500		10.6334		0.7300		0.7000		0.7700		14.1207 (74)
East			10.4700		19.6403		0.7300		0.7000		0.7700		72.8196 (76)
South			6.5000		46.7521		0.7300		0.7000		0.7700		107.6139 (78)
West			0.9100		19.6403		0.7300		0.7000		0.7700		6.3291 (80)
Solar gains	200.8833	358.0609	525.3438	699.2735	819.3843	827.2222	791.9601	701.6591	586.2115	405.9389	243.6680	169.8481	(83)
Total gains	728.4783	898.4109	1041.7122	1195.6182	1288.4230	1274.6522	1220.6648	1131.4028	1030.2757	869.9026	738.6716	685.5769	(84)

7. Mean internal temperature (heating season)

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Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	52.6322	52.8239	53.0132	53.9206	54.0939	54.9152	54.9152	55.0701	54.5959	54.0939	53.7445	53.3841
alpha	4.5088	4.5216	4.5342	4.5947	4.6063	4.6610	4.6610	4.6713	4.6397	4.6063	4.5830	4.5589
util living area	0.9922	0.9799	0.9511	0.8698	0.7251	0.5378	0.3946	0.4416	0.6841	0.9182	0.9829	0.9939 (86)
MIT	19.8588	20.0668	20.3347	20.6450	20.8359	20.9148	20.9300	20.9278	20.8782	20.6032	20.1769	19.8330 (87)
Th 2	19.8483	19.8520	19.8556	19.8726	19.8758	19.8907	19.8907	19.8934	19.8849	19.8758	19.8694	19.8626 (88)
util rest of house	0.9896	0.9737	0.9362	0.8338	0.6609	0.4515	0.2968	0.3384	0.5952	0.8862	0.9766	0.9920 (89)
MIT 2	18.5339	18.7993	19.1344	19.5135	19.7151	19.7957	19.8045	19.8065	19.7658	19.4799	18.9547	18.5122 (90)
Living area fraction									fLA = Living area / (4) =			0.1272 (91)
MIT	18.7024	18.9605	19.2871	19.6574	19.8577	19.9381	19.9476	19.9491	19.9073	19.6228	19.1101	18.6802 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.5524	18.8105	19.1371	19.5074	19.7077	19.7881	19.7976	19.7991	19.7573	19.4728	18.9601	18.5302 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9856	0.9661	0.9243	0.8201	0.6504	0.4432	0.2885	0.3294	0.5841	0.8718	0.9694	0.9887 (94)
Useful gains	717.9578	867.9224	962.8628	980.5636	837.9961	564.9596	352.1486	372.6833	601.7695	758.3509	716.0860	677.7979 (95)
Ext temp.	4.3000	4.9200	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	1641.2781	1596.0944	1444.8026	1192.3421	897.2310	572.6100	352.9212	374.1101	628.0510	994.1629	1337.5212	1626.9917 (97)
Space heating kWh	686.9503	489.3316	358.5633	152.4805	44.0708	0.0000	0.0000	0.0000	0.0000	175.4442	447.4333	706.2002 (98a)
Space heating requirement - total per year (kWh/year)												3060.4740
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	686.9503	489.3316	358.5633	152.4805	44.0708	0.0000	0.0000	0.0000	0.0000	175.4442	447.4333	706.2002 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3060.4740
Space heating per m2										(98c) / (4) =		34.2949 (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 %)													88.5000 (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	686.9503	489.3316	358.5633	152.4805	44.0708	0.0000	0.0000	0.0000	0.0000	175.4442	447.4333	706.2002	(98)
Space heating efficiency (main heating system 1)	88.5000	88.5000	88.5000	88.5000	88.5000	0.0000	0.0000	0.0000	0.0000	88.5000	88.5000	88.5000	(210)
Space heating fuel (main heating system)	776.2150	552.9170	405.1562	172.2943	49.7975	0.0000	0.0000	0.0000	0.0000	198.2420	505.5744	797.9663	(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	239.3521	211.0116	222.5781	191.9781	183.5538	162.6381	158.5428	166.4056	169.9588	192.8167	209.0477	236.2579	(64)
Efficiency of water heater (217)m	88.1075	88.0426	87.9194	87.6577	87.2864	87.0000	87.0000	87.0000	87.0000	87.7082	88.0168	88.1191	(217)
Fuel for water heating, kWh/month	271.6592	239.6698	253.1614	219.0088	210.2890	186.9404	182.2331	191.2708	195.3549	219.8388	237.5089	268.1119	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.3993	19.5740	17.6242	12.9123	9.9738	8.1487	9.0984	11.8265	15.3614	20.1550	22.7651	25.0774	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-29.6624	-45.7979	-72.3148	-87.0055	-96.8193	-91.2246	-89.7042	-82.9422	-70.7644	-54.6690	-33.6686	-24.9819	(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)	-13.3821	-32.0932	-74.8774	-128.7797	-183.9535	-190.1695	-185.7447	-148.6166	-97.5031	-49.0071	-18.6217	-10.1861	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												3458.1627	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.0000	
Water heating fuel used												2675.0471	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												196.9161	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1912.4894	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)

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Appendix Q - special features

Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4503.6365 (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	3458.1627	0.2100	726.2142 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2675.0471	0.2100	561.7599 (264)
Space and water heating			1287.9741 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	196.9161	0.1443	28.4211 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-779.5547	0.1332	-103.8666
PV Unit electricity exported	-1132.9346	0.1227	-138.9673
Total			-242.8339 (269)
Total CO2, kg/year			1085.4905 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.1600 (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	3458.1627	1.1300	3907.7238 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2675.0471	1.1300	3022.8032 (278)
Space and water heating			6930.5270 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	196.9161	1.5338	302.0365 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-779.5547	1.4924	-1163.3748
PV Unit electricity exported	-1132.9346	0.4501	-509.9321
Total			-1673.3069 (283)
Total Primary energy kWh/year			5689.3575 (286)
Dwelling Primary energy Rate (DPER)			63.7500 (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	44.6200 (1b)	x 2.3900 (2b)	= 106.6418 (1b) - (3b)
First floor	44.6200 (1c)	x 2.6200 (2c)	= 116.9044 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 223.5462 (5)

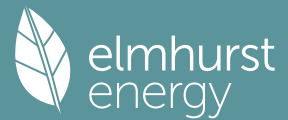
2. Ventilation rate

	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	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) = 0.1342 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3842 (18)
Number of sides sheltered		0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3842 (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	0.4899	0.4803	0.4706	0.4226	0.4130	0.3650	0.3650	0.3554	0.3842	0.4130	0.4322	0.4514 (22b)
Effective ac	0.6200	0.6153	0.6108	0.5893	0.5853	0.5666	0.5666	0.5631	0.5738	0.5853	0.5934	0.6019 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Semi-glazed door			2.1400	1.0000	2.1400			(26a)
TER Opening Type (Uw = 1.20)			20.1700	1.1450	23.0954			(27)
Ground Floor			44.6200	0.1300	5.8006			(28a)
External Wall	138.5000	22.3100	116.1900	0.1800	20.9142			(29a)
Plane Roof	44.6200		44.6200	0.1100	4.9082			(30)
Total net area of external elements Aum(A, m2)			227.7400					(31)
Fabric heat loss, W/K = Sum (A x U)								(32)
								(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 244.5056 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	16.6300	0.0500	0.8315	
E3 Sill	13.8000	0.0500	0.6900	
E4 Jamb	36.3000	0.0500	1.8150	
E5 Ground floor (normal)	27.7000	0.1600	4.4320	
E10 Eaves (insulation at ceiling level)	17.5000	0.0600	1.0500	
E16 Corner (normal)	20.0400	0.0900	1.8036	
E6 Intermediate floor within a dwelling	27.7000	0.0000	0.0000	
E12 Gable (insulation at ceiling level)	10.2000	0.0600	0.6120	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.2341 (36)

Point Thermal bridges

Total fabric heat loss (33) + (36) + (36a) = 68.0925 (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	45.7360	45.3923	45.0554	43.4731	43.1771	41.7989	41.7989	41.5437	42.3297	43.1771	43.7760	44.4021	(38)
Average = Sum(39)m / 12 =	113.8285	113.4848	113.1480	111.5656	111.2696	109.8914	109.8914	109.6362	110.4223	111.2696	111.8685	112.4946	(39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2755	1.2717	1.2679	1.2502	1.2469	1.2314	1.2314	1.2286	1.2374	1.2469	1.2536	1.2606	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

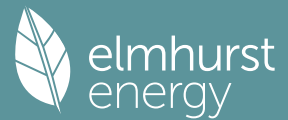
Assumed occupancy													2.6152 (42)
Hot water usage for mixer showers													
68.0676	67.0447	65.5541	62.7021	60.5974	58.2503	56.9161	58.3955	60.0171	62.5372	65.4504	67.8068	(42a)	
Hot water usage for baths													
29.3945	28.9580	28.3432	27.2097	26.3610	25.4199	24.9115	25.5220	26.1866	27.1937	28.3505	29.2952	(42b)	
Hot water usage for other uses													
41.4120	39.9061	38.4002	36.8943	35.3884	33.8825	33.8825	35.3884	36.8943	38.4002	39.9061	41.4120	(42c)	
Average daily hot water use (litres/day)													127.6567 (43)
Daily hot water use													
138.8742	135.9088	132.2975	126.8062	122.3468	117.5527	115.7102	119.3059	123.0980	128.1311	133.7071	138.5140	(44)	
Energy conte	219.9427	193.5323	203.3364	173.5913	164.7023	144.5447	139.9415	147.7256	151.7922	173.8727	190.4902	216.8794	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
32.9914	29.0298	30.5005	26.0387	24.7054	21.6817	20.9912	22.1588	22.7688	26.0809	28.5735	32.5319	(46)	
Water storage loss:													
Total storage loss													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
270.9016	239.5597	254.2953	222.9064	215.6612	193.8598	190.9004	198.6845	201.1073	224.8316	239.8053	267.8383	(62)	
WWHRS	-31.1177	-27.5207	-28.8181	-23.8625	-22.2390	-19.0301	-17.8377	-18.9686	-19.6893	-23.2115	-26.2958	-30.5414	(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													
239.7839	212.0390	225.4772	199.0438	193.4222	174.8297	173.0627	179.7159	181.4180	201.6201	213.5095	237.2969	(64)	
12Total per year (kWh/year)													
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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													
85.8707	75.8563	80.3491	70.0479	67.5033	60.3899	59.2703	61.8585	62.7997	70.5524	75.6668	84.8521	(65)	

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

Metabolic gains (Table 5), Watts													
(66)m	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
119.8567	132.6985	119.8567	123.8520	119.8567	123.8520	119.8567	119.8567	123.8520	119.8567	123.8520	119.8567	119.8567	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
237.6726	240.1389	233.9239	220.6929	203.9912	188.2939	177.8071	175.3408	181.5558	194.7868	211.4885	227.1858	(68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	(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)													
-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	(71)
Water heating gains (Table 5)													
115.4176	112.8815	107.9961	97.2887	90.7302	83.8748	79.6643	83.1431	87.2218	94.8285	105.0927	114.0486	(72)	
Total internal gains													
538.1745	550.9465	527.0043	507.0612	479.8057	458.2483	439.5558	440.5683	454.8572	474.6996	505.6609	526.3187	(73)	

6. Solar gains

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[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	3.5000				10.6334	0.6300		0.7000		0.7700		11.3740 (74)
East	9.7600				19.6403	0.6300		0.7000		0.7700		58.5826 (76)
South	6.0600				46.7521	0.6300		0.7000		0.7700		86.5855 (78)
West	0.8500				19.6403	0.6300		0.7000		0.7700		5.1020 (80)
Solar gains	161.6441	288.1216	422.7358	562.7062	659.3715	665.6843	637.3057	564.6303	471.7188	326.6493	196.0718	136.6709 (83)
Total gains	699.8186	839.0681	949.7401	1069.7674	1139.1772	1123.9326	1076.8616	1005.1986	926.5760	801.3489	701.7327	662.9896 (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	53.2469	53.4082	53.5672	54.3270	54.4715	55.1547	55.1547	55.2830	54.8895	54.4715	54.1799	53.8783
alpha	4.5498	4.5605	4.5711	4.6218	4.6314	4.6770	4.6770	4.6855	4.6593	4.6314	4.6120	4.5919
util living area	0.9933	0.9842	0.9637	0.9029	0.7808	0.5976	0.4431	0.4916	0.7346	0.9358	0.9859	0.9947 (86)
MIT	19.5594	19.8030	20.1322	20.5391	20.8254	20.9620	20.9923	20.9878	20.9022	20.5109	19.9647	19.5261 (87)
Th 2	19.8600	19.8631	19.8661	19.8801	19.8827	19.8950	19.8950	19.8972	19.8902	19.8827	19.8774	19.8718 (88)
util rest of house	0.9911	0.9793	0.9521	0.8729	0.7200	0.5059	0.3349	0.3788	0.6468	0.9090	0.9805	0.9930 (89)
MIT 2	18.2081	18.5186	18.9325	19.4317	19.7435	19.8745	19.8927	19.8932	19.8283	19.4136	18.7364	18.1738 (90)
Living area fraction	fLA = Living area / (4) =											0.1272 (91)
MIT	18.3800	18.6820	19.0851	19.5725	19.8811	20.0128	20.0325	20.0324	19.9649	19.5531	18.8926	18.3458 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3800	18.6820	19.0851	19.5725	19.8811	20.0128	20.0325	20.0324	19.9649	19.5531	18.8926	18.3458 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9869	0.9720	0.9416	0.8631	0.7199	0.5162	0.3486	0.3930	0.6533	0.8990	0.9738	0.9895 (94)
Useful gains	690.6388	815.6101	894.2668	923.3450	820.0630	580.1475	375.3879	395.0874	605.3021	720.3834	683.3302	655.9971 (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	1602.7061	1564.0472	1423.9768	1190.6862	910.3103	594.8225	377.2063	398.2442	647.6178	996.2110	1319.2226	1591.3264 (97)
Space heating kWh	678.5780	502.9497	394.1042	192.4857	67.1440	0.0000	0.0000	0.0000	0.0000	205.2157	457.8425	695.8850 (98a)
Space heating requirement - total per year (kWh/year)												3194.2048
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	678.5780	502.9497	394.1042	192.4857	67.1440	0.0000	0.0000	0.0000	0.0000	205.2157	457.8425	695.8850 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3194.2048
Space heating per m2	(98c) / (4) =											35.7934 (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 %)												92.4000 (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	678.5780	502.9497	394.1042	192.4857	67.1440	0.0000	0.0000	0.0000	0.0000	205.2157	457.8425	695.8850 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	734.3918	544.3179	426.5197	208.3178	72.6667	0.0000	0.0000	0.0000	0.0000	222.0950	495.5005	753.1223 (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	239.7839	212.0390	225.4772	199.0438	193.4222	174.8297	173.0627	179.7159	181.4180	201.6201	213.5095	237.2969 (64)
Efficiency of water heater (217)m	86.4817	86.1633	85.5651	84.3097	82.3529	80.3000	80.3000	80.3000	80.3000	84.4194	85.9718	80.3000 (216)
Fuel for water heating, kWh/month	277.2656	246.0896	263.5154	236.0866	234.8700	217.7207	215.5201	223.8056	225.9253	238.8316	248.3484	274.1951 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	24.9039	19.9788	17.9887	13.1793	10.1801	8.3172	9.2866	12.0711	15.6791	20.5719	23.2359	25.5960 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-41.2241	-57.8560	-82.7938	-92.6615	-99.5485	-92.7656	-91.5854	-86.6149	-77.8255	-65.9147	-45.2138	-35.6687 (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	-24.1084	-50.6173	-100.4333	-150.6081	-198.9301	-199.8225	-197.5026	-167.3524	-122.8121	-72.3483	-32.1731	-19.0747 (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	3456.9317 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	80.3000
Water heating fuel used	2902.1738 (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)	200.9884 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2205.4553 (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	4440.6386 (238)

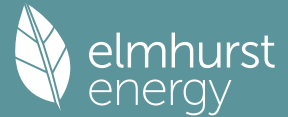
----- 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP -----

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3456.9317	0.2100	725.9556 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2902.1738	0.2100	609.4565 (264)
Space and water heating			1335.4122 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	200.9884	0.1443	29.0088 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-869.6725	0.1347	-117.1340
PV Unit electricity exported	-1335.7828	0.1259	-168.2269
Total			-285.3610 (269)
Total CO2, kg/year			1090.9893 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.2300 (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	3456.9317	1.1300	3906.3328 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2902.1738	1.1300	3279.4564 (278)
Space and water heating			7185.7892 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	200.9884	1.5338	308.2828 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-869.6725	1.4978	-1302.5851
PV Unit electricity exported	-1335.7828	0.4623	-617.5108
Total			-1920.0959 (283)
Total Primary energy kWh/year			5704.0769 (286)
Target Primary Energy Rate (TPER)			63.9200 (287)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 25			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	93 A	DER	12.16	TER	12.23		
Environmental	90 B	% DER < TER				0.57	
CO ₂ Emissions (t/year)	1.04	DFEE	38.46	TFEE	41.84		
Compliance Check	See BREL	% DFEE < TFEE				8.08	
% DPER < TPER	0.26	DPER	63.75	TPER	63.92		
Assessor Details	Miss Victoria Gartside				Assessor ID	AL30-0001	
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	44.6200 (1b)	x 2.3900 (2b)	= 106.6418 (1b) - (3b)
First floor	44.6200 (1c)	x 2.6200 (2c)	= 116.9044 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 223.5462 (5)

2. Ventilation rate

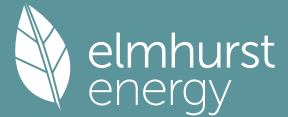
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1342 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3342 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3342 (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	0.4261	0.4178	0.4094	0.3676	0.3593	0.3175	0.3175	0.3091	0.3342	0.3593	0.3760	0.3927 (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	0.5908	0.5873	0.5838	0.5676	0.5645	0.5504	0.5504	0.5478	0.5558	0.5645	0.5707	0.5771 (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
Windows (Uw = 1.30)			21.6300	1.2357	26.7291		(27)
Door			2.1400	1.3000	2.7820		(26a)
Ground Floor			44.6200	0.1300	5.8006	75.0000	3346.5000 (28a)
External Wall	138.5000	23.7700	114.7300	0.1900	21.7987	110.0000	12620.3000 (29a)
Plane Roof	44.6200		44.6200	0.0900	4.0158	9.0000	401.5800 (30)
Total net area of external elements Aum(A, m ²)			227.7400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	61.1262		(33)
Studs			189.8400			9.0000	1708.5600 (32c)
Block			33.8400			75.0000	2538.0000 (32c)
Internal Floor 1			44.6200			18.0000	803.1600 (32d)
Internal Ceiling 1			44.6200			9.0000	401.5800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	21819.6800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							244.5056 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				16.6300	0.0240	0.3991	

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E3 Sill	13.8000	0.0210	0.2898
E4 Jamb	36.3000	0.0160	0.5808
E5 Ground floor (normal)	27.7000	0.0920	2.5484
E10 Eaves (insulation at ceiling level)	17.5000	0.0580	1.0150
E16 Corner (normal)	20.0400	0.0470	0.9419
E6 Intermediate floor within a dwelling	27.7000	0.0010	0.0277
E12 Gable (insulation at ceiling level)	10.2000	0.0570	0.5814
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.3841 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	67.5103 (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	43.5822	43.3221	43.0672	41.8700	41.6459	40.6031	40.6031	40.4100	41.0048	41.6459	42.0991	42.5729 (38)
Average = Sum(39)m / 12 =	111.0925	110.8324	110.5775	109.3802	109.1562	108.1134	108.1134	107.9203	108.5151	109.1562	109.6094	110.0832 (39)
												109.3792
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2449	1.2420	1.2391	1.2257	1.2232	1.2115	1.2115	1.2093	1.2160	1.2232	1.2283	1.2336 (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												2.6152 (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	29.3945	28.9580	28.3432	27.2097	26.3610	25.4199	24.9115	25.5220	26.1866	27.1937	28.3505	29.2952 (42b)
Hot water usage for other uses	41.4120	39.9061	38.4002	36.8943	35.3884	33.8825	33.8825	35.3884	36.8943	38.4002	39.9061	41.4120 (42c)
Average daily hot water use (litres/day)												64.9006 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	70.8065	68.8641	66.7434	64.1041	61.7494	59.3024	58.7941	60.9104	63.0810	65.5939	68.2566	70.7072 (44)
Energy content (annual)	112.1402	98.0615	102.5822	87.7553	83.1266	72.9192	71.1063	75.4198	77.7851	89.0103	97.2441	110.7103 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1077.8609
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	95.3192	83.3523	87.1949	74.5920	70.6576	61.9813	60.4404	64.1068	66.1174	75.6587	82.6575	94.1038 (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	95.3192	83.3523	87.1949	74.5920	70.6576	61.9813	60.4404	64.1068	66.1174	75.6587	82.6575	94.1038 (64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				916.1818 (64)
Electric shower(s)	54.5108	48.5696	53.0361	50.6117	51.5614	49.1846	50.8241	51.5614	50.6117	53.0361	52.0389	54.5108 (64a)
Heat gains from water heating, kWh/month	37.4575	32.9805	35.0577	31.3009	30.5548	27.7915	27.8161	28.9171	29.1823	32.1737	33.6741	37.1536 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												620.0575 (64a)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.8785	132.7226	119.8785	123.8745	119.8785	123.8745	119.8785	119.8785	123.8745	119.8785	123.8745	119.8785 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	237.6726	240.1389	233.9239	220.6929	203.9912	188.2939	177.8071	175.3408	181.5558	194.7868	211.4885	227.1858 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759 (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)	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070 (71)
Water heating gains (Table 5)	50.3461	49.0781	47.1206	43.4735	41.0682	38.5993	37.3873	38.8670	40.5309	43.2442	46.7696	49.9377 (72)
Total internal gains	470.1248	484.1672	463.1506	450.2685	427.1655	412.9953	397.3005	396.3140	408.1889	420.1372	444.3602	459.2297 (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				3.7500	10.6334		0.7300		0.7000		0.7700		14.1207 (74)
East				10.4700	19.6403		0.7300		0.7000		0.7700		72.8196 (76)
South				6.5000	46.7521		0.7300		0.7000		0.7700		107.6139 (78)
West				0.9100	19.6403		0.7300		0.7000		0.7700		6.3291 (80)
Solar gains	200.8833	358.0609	525.3438	699.2735	819.3843	827.2222	791.9601	701.6591	586.2115	405.9389	243.6680	169.8481	(83)
Total gains	671.0081	842.2281	988.4945	1149.5420	1246.5498	1240.2175	1189.2606	1097.9731	994.4003	826.0761	688.0282	629.0777	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	54.5583	54.6864	54.8124	55.4124	55.5261	56.0617	56.0617	56.1620	55.8542	55.5261	55.2966	55.0586
alpha	4.6372	4.6458	4.6542	4.6942	4.7017	4.7374	4.7374	4.7441	4.7236	4.7017	4.6864	4.6706
util living area	0.9943	0.9836	0.9568	0.8771	0.7309	0.5418	0.3969	0.4463	0.6923	0.9270	0.9866	0.9957 (86)
MIT	19.5727	19.8510	20.2092	20.6199	20.8745	20.9759	20.9955	20.9923	20.9272	20.5544	19.9821	19.5277 (87)
Th 2	19.8843	19.8866	19.8888	19.8995	19.9015	19.9108	19.9108	19.9125	19.9072	19.9015	19.8975	19.8932 (88)
util rest of house	0.9924	0.9785	0.9435	0.8426	0.6679	0.4564	0.3003	0.3438	0.6047	0.8978	0.9816	0.9943 (89)
MIT 2	18.6044	18.8807	19.2300	19.6168	19.8259	19.9010	19.9098	19.9106	19.8723	19.5714	19.0210	18.5666 (90)
Living area fraction	18.7275	19.0041	19.3546	19.7444	19.9593	20.0377	20.0479	20.0482	fLA = Living area / (4) =			0.1272 (91)
MIT	18.7275	19.0041	19.3546	19.7444	19.9593	20.0377	20.0479	20.0482	20.0065	19.6965	19.1432	18.6888 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7275	19.0041	19.3546	19.7444	19.9593	20.0377	20.0479	20.0482	20.0065	19.6965	19.1432	18.6888 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9897	0.9731	0.9356	0.8371	0.6714	0.4667	0.3126	0.3568	0.6132	0.8911	0.9768	0.9921 (94)
Useful gains	664.0767	819.5820	924.8029	962.2275	836.9883	578.7602	371.7105	391.7615	609.8079	736.1149	672.0925	624.1122 (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	1602.7922	1563.1913	1421.4273	1186.1613	901.5490	587.8888	372.7618	393.7133	640.9448	992.9353	1320.0531	1594.9731 (97)
Space heating kWh	698.4043	499.7054	369.4885	161.2324	48.0332	0.0000	0.0000	0.0000	0.0000	191.0744	466.5317	722.3206 (98a)
Space heating requirement - total per year (kWh/year)												3156.7904
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	698.4043	499.7054	369.4885	161.2324	48.0332	0.0000	0.0000	0.0000	0.0000	191.0744	466.5317	722.3206 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3156.7904
Space heating per m2										(98c) / (4) =		35.3742 (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	1016.2663	800.0394	820.1945	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9290	0.9636	0.9476	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	944.0662	770.9242	777.2248	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1402.6166	1345.3820	1241.0324	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	330.1563	427.3966	345.0728	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	82.5391	106.8491	86.2682	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												275.6564 (107)
Energy for space heating												35.3742 (99)
Energy for space cooling												3.0889 (108)
Total												38.4631 (109)
Fabric Energy Efficiency (DFEE)												38.5 (109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

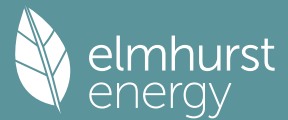
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	44.6200 (1b)	x	2.3900 (2b) = 106.6418 (1b) - (3b)
First floor	44.6200 (1c)	x	2.6200 (2c) = 116.9044 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	223.5462 (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	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	

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Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 30.0000 / (5) = 0.1342 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 5.0000 (17)
Infiltration rate 0.3842 (18)
Number of sides sheltered 0 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3842 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4899	0.4803	0.4706	0.4226	0.4130	0.3650	0.3650	0.3554	0.3842	0.4130	0.4322	0.4514	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													(23c)
Effective ac	0.6200	0.6153	0.6108	0.5893	0.5853	0.5666	0.5666	0.5631	0.5738	0.5853	0.5934	0.6019	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Semi-glazed door			2.1400	1.0000	2.1400			(26a)
TER Opening Type (Uw = 1.20)			20.1700	1.1450	23.0954			(27)
Ground Floor			44.6200	0.1300	5.8006			(28a)
External Wall	138.5000	22.3100	116.1900	0.1800	20.9142			(29a)
Plane Roof	44.6200		44.6200	0.1100	4.9082			(30)
Total net area of external elements Aum (A, m2)			227.7400					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 56.8584			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 244.5056 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element	16.6300	0.0500	0.8315	
E2 Other lintels (including other steel lintels)	13.8000	0.0500	0.6900	
E3 Sill	36.3000	0.0500	1.8150	
E4 Jamb	27.7000	0.1600	4.4320	
E5 Ground floor (normal)	17.5000	0.0600	1.0500	
E10 Eaves (insulation at ceiling level)	20.0400	0.0900	1.8036	
E16 Corner (normal)	27.7000	0.0000	0.0000	
E6 Intermediate floor within a dwelling	10.2000	0.0600	0.6120	
E12 Gable (insulation at ceiling level)				11.2341 (36)

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

Point Thermal Bridges

Total fabric heat loss (33) + (36) + (36a) = 68.0925 (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	
	45.7360	45.3923	45.0554	43.4731	43.1771	41.7989	41.7989	41.5437	42.3297	43.1771	43.7760	44.4021	(38)
Heat transfer coeff	113.8285	113.4848	113.1480	111.5656	111.2696	109.8914	109.8914	109.6362	110.4223	111.2696	111.8685	112.4946	(39)
Average = Sum(39)m / 12 =												111.5642	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	1.2755	1.2717	1.2679	1.2502	1.2469	1.2314	1.2314	1.2286	1.2374	1.2469	1.2536	1.2606	(40)
HLP (average)												1.2502	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6152 (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	29.3945	28.9580	28.3432	27.2097	26.3610	25.4199	24.9115	25.5220	26.1866	27.1937	28.3505	29.2952	(42b)
Hot water usage for other uses	41.4120	39.9061	38.4002	36.8943	35.3884	33.8825	33.8825	35.3884	36.8943	38.4002	39.9061	41.4120	(42c)
Average daily hot water use (litres/day)												64.9006	(43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	70.8065	68.8641	66.7434	64.1041	61.7494	59.3024	58.7941	60.9104	63.0810	65.5939	68.2566	70.7072	(44)
Energy conte	112.1402	98.0615	102.5822	87.7553	83.1266	72.9192	71.1063	75.4198	77.7851	89.0103	97.2441	110.7103	(45)
Energy content (annual)										Total = Sum(45)m =		1077.8609	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
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	(57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Total heat required for water heating calculated for each month	95.3192	83.3523	87.1949	74.5920	70.6576	61.9813	60.4404	64.1068	66.1174	75.6587	82.6575	94.1038	(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	95.3192	83.3523	87.1949	74.5920	70.6576	61.9813	60.4404	64.1068	66.1174	75.6587	82.6575	94.1038	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		916.1818	(64)
Electric shower(s)	54.5108	48.5696	53.0361	50.6117	51.5614	49.1846	50.8241	51.5614	50.6117	53.0361	52.0389	54.5108	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												620.0575	(64a)
Heat gains from water heating, kWh/month	37.4575	32.9805	35.0577	31.3009	30.5548	27.7915	27.8161	28.9171	29.1823	32.1737	33.6741	37.1536	(65)

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

6. Solar gains

Solar gains	161.6441	288.1216	422.7358	562.7062	659.3715	665.6843	637.3057	564.6303	471.7188	326.6493	196.0718	136.6709 (83)
Total gains	631.7471	772.2647	885.8646	1012.9522	1086.5152	1078.6570	1034.5845	960.9226	879.8852	746.7647	640.4095	595.8788 (84)

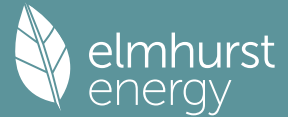
Temperature during heating periods in the living area from Table 9. Th1 (C)	21.0000 (85)
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8. Space heating requirement

8c. Space cooling requirement

[illegible]

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 25			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	93 A	DER	12.16	TER	12.23		
Environmental	90 B	% DER < TER				0.57	
CO ₂ Emissions (t/year)	1.04	DFEE	38.46	TFEE	41.84		
Compliance Check	See BREL	% DFEE < TFEE				8.08	
% DPER < TPER	0.26	DPER	63.75	TPER	63.92		
Assessor Details	Miss Victoria Gartside				Assessor ID	AL30-0001	
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	44.6200 (1b)	x 2.3900 (2b)	= 106.6418 (1b) - (3b)
First floor	44.6200 (1c)	x 2.6200 (2c)	= 116.9044 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 223.5462 (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	5 * 10 = 50.0000 (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) =	50.0000 / (5) = 0.2237 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.4237 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.4237 (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	0.5402	0.5296	0.5190	0.4660	0.4554	0.4025	0.4025	0.3919	0.4237	0.4554	0.4766	0.4978 (22b)
Effective ac	0.6459	0.6402	0.6347	0.6086	0.6037	0.5810	0.5810	0.5768	0.5897	0.6037	0.6136	0.6239 (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
Windows (Uw = 1.30)			21.6300	1.2357	26.7291		(27)
Door			2.1400	1.3000	2.7820		(26a)
Ground Floor			44.6200	0.1300	5.8006	75.0000	3346.5000 (28a)
External Wall	138.5000	23.7700	114.7300	0.1900	21.7987	110.0000	12620.3000 (29a)
Plane Roof	44.6200		44.6200	0.0900	4.0158	9.0000	401.5800 (30)
Total net area of external elements Aum(A, m ²)			227.7400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	61.1262		(33)
Studs			189.8400			9.0000	1708.5600 (32c)
Block			33.8400			75.0000	2538.0000 (32c)
Internal Floor 1			44.6200			18.0000	803.1600 (32d)
Internal Ceiling 1			44.6200			9.0000	401.5800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	21819.6800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							244.5056 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				16.6300	0.0240	0.3991	
E3 Sill				13.8000	0.0210	0.2898	
E4 Jamb				36.3000	0.0160	0.5808	

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E5 Ground floor (normal)	27.7000	0.0920	2.5484
E10 Eaves (insulation at ceiling level)	17.5000	0.0580	1.0150
E16 Corner (normal)	20.0400	0.0470	0.9419
E6 Intermediate floor within a dwelling	27.7000	0.0010	0.0277
E12 Gable (insulation at ceiling level)	10.2000	0.0570	0.5814
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.3841 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	67.5103 (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	47.6478	47.2299	46.8203	44.8961	44.5361	42.8603	42.8603	42.5499	43.5058	44.5361	45.2644	46.0258 (38)
Average = Sum(39)m / 12 =	115.1581	114.7402	114.3305	112.4064	112.0464	110.3706	110.3706	110.0602	111.0161	112.0464	112.7747	113.5361 (39)
												112.4047
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2904	1.2857	1.2812	1.2596	1.2556	1.2368	1.2368	1.2333	1.2440	1.2556	1.2637	1.2723 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

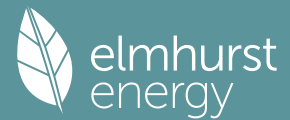
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.6152 (42)
Hot water usage for mixer showers												67.8068 (42a)
Hot water usage for baths												29.2952 (42b)
Hot water usage for other uses												41.4120 (42c)
Average daily hot water use (litres/day)												127.6567 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	138.8742	135.9088	132.2975	126.8062	122.3468	117.5527	115.7102	119.3059	123.0980	128.1311	133.7071	138.5140 (44)
Energy content (annual)	219.9427	193.5323	203.3364	173.5913	164.7023	144.5447	139.9415	147.7256	151.7922	173.8727	190.4902	216.8794 (45)
Distribution loss (46)m = 0.15 x (45)m												2120.3514
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
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 (57)
Combi loss	19.4094	17.4793	19.2416	18.3868	18.8514	18.0934	18.6014	18.6800	18.1666	18.9441	18.5575	19.3784 (61)
Total heat required for water heating calculated for each month	239.3521	211.0116	222.5781	191.9781	183.5538	162.6381	158.5428	166.4056	169.9588	192.8167	209.0477	236.2579 (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	239.3521	211.0116	222.5781	191.9781	183.5538	162.6381	158.5428	166.4056	169.9588	192.8167	209.0477	236.2579 (64)
12Total per year (kWh/year)												2344.1411 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Heat gains from water heating, kWh/month	77.9833	68.7193	72.4198	62.3158	59.4764	52.5845	51.1809	53.7887	55.0126	62.5487	67.9774	76.9570 (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	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	119.8785	132.7226	119.8785	123.8745	119.8785	123.8745	119.8785	119.8785	123.8745	119.8785	123.8745	119.8785 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	237.6726	240.1389	233.9239	220.6929	203.9912	188.2939	177.8071	175.3408	181.5558	194.7868	211.4885	227.1858 (68)
Pumps, fans	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070 (71)
Total internal gains	104.8163	102.2609	97.3384	86.5497	79.9414	73.0340	68.7915	72.2967	76.4063	84.0708	94.4130	103.4369 (72)
	527.5950	540.3500	516.3684	496.3447	469.0387	447.4300	428.7048	429.7437	444.0642	463.9637	495.0036	515.7288 (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				3.7500	10.6334		0.7300		0.7000		0.7700	14.1207 (74)
East				10.4700	19.6403		0.7300		0.7000		0.7700	72.8196 (76)
South				6.5000	46.7521		0.7300		0.7000		0.7700	107.6139 (78)
West				0.9100	19.6403		0.7300		0.7000		0.7700	6.3291 (80)
Solar gains	200.8833	358.0609	525.3438	699.2735	819.3843	827.2222	791.9601	701.6591	586.2115	405.9389	243.6680	169.8481 (83)
Total gains	728.4783	898.4109	1041.7122	1195.6182	1288.4230	1274.6522	1220.6648	1131.4028	1030.2757	869.9026	738.6716	685.5769 (84)

7. Mean internal temperature (heating season)												
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Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	52.6322	52.8239	53.0132	53.9206	54.0939	54.9152	54.9152	55.0701	54.5959	54.0939	53.7445	53.3841
alpha	4.5088	4.5216	4.5342	4.5947	4.6063	4.6610	4.6610	4.6713	4.6397	4.6063	4.5830	4.5589
util living area	0.9922	0.9799	0.9511	0.8698	0.7251	0.5378	0.3946	0.4416	0.6841	0.9182	0.9829	0.9939 (86)
MIT	19.8588	20.0668	20.3347	20.6450	20.8359	20.9148	20.9300	20.9278	20.8782	20.6032	20.1769	19.8330 (87)
Th 2	19.8483	19.8520	19.8556	19.8726	19.8758	19.8907	19.8907	19.8934	19.8849	19.8758	19.8694	19.8626 (88)
util rest of house	0.9896	0.9737	0.9362	0.8338	0.6609	0.4515	0.2968	0.3384	0.5952	0.8862	0.9766	0.9920 (89)
MIT 2	18.5339	18.7993	19.1344	19.5135	19.7151	19.7957	19.8045	19.8065	19.7658	19.4799	18.9547	18.5122 (90)
Living area fraction									fLA = Living area / (4) =			0.1272 (91)
MIT	18.7024	18.9605	19.2871	19.6574	19.8577	19.9381	19.9476	19.9491	19.9073	19.6228	19.1101	18.6802 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.5524	18.8105	19.1371	19.5074	19.7077	19.7881	19.7976	19.7991	19.7573	19.4728	18.9601	18.5302 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9856	0.9661	0.9243	0.8201	0.6504	0.4432	0.2885	0.3294	0.5841	0.8718	0.9694	0.9887 (94)
Useful gains	717.9578	867.9224	962.8628	980.5636	837.9961	564.9596	352.1486	372.6833	601.7695	758.3509	716.0860	677.7979 (95)
Ext temp.	4.3000	4.9200	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	1641.2781	1596.0944	1444.8026	1192.3421	897.2310	572.6100	352.9212	374.1101	628.0510	994.1629	1337.5212	1626.9917 (97)
Space heating kWh	686.9503	489.3316	358.5633	152.4805	44.0708	0.0000	0.0000	0.0000	0.0000	175.4442	447.4333	706.2002 (98a)
Space heating requirement - total per year (kWh/year)												3060.4740
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	686.9503	489.3316	358.5633	152.4805	44.0708	0.0000	0.0000	0.0000	0.0000	175.4442	447.4333	706.2002 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3060.4740
Space heating per m2										(98c) / (4) =		34.2949 (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 %)													88.5000 (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	686.9503	489.3316	358.5633	152.4805	44.0708	0.0000	0.0000	0.0000	0.0000	175.4442	447.4333	706.2002	(98)
Space heating efficiency (main heating system 1)	88.5000	88.5000	88.5000	88.5000	88.5000	0.0000	0.0000	0.0000	0.0000	88.5000	88.5000	88.5000	(210)
Space heating fuel (main heating system)	776.2150	552.9170	405.1562	172.2943	49.7975	0.0000	0.0000	0.0000	0.0000	198.2420	505.5744	797.9663	(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	239.3521	211.0116	222.5781	191.9781	183.5538	162.6381	158.5428	166.4056	169.9588	192.8167	209.0477	236.2579	(64)
Efficiency of water heater (217)m	88.1075	88.0426	87.9194	87.6577	87.2864	87.0000	87.0000	87.0000	87.0000	87.7082	88.0168	88.1191	(217)
Fuel for water heating, kWh/month	271.6592	239.6698	253.1614	219.0088	210.2890	186.9404	182.2331	191.2708	195.3549	219.8388	237.5089	268.1119	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.3993	19.5740	17.6242	12.9123	9.9738	8.1487	9.0984	11.8265	15.3614	20.1550	22.7651	25.0774	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-29.6624	-45.7979	-72.3148	-87.0055	-96.8193	-91.2246	-89.7042	-82.9422	-70.7644	-54.6690	-33.6686	-24.9819	(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)	-13.3821	-32.0932	-74.8774	-128.7797	-183.9535	-190.1695	-185.7447	-148.6166	-97.5031	-49.0071	-18.6217	-10.1861	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												3458.1627	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.0000	
Water heating fuel used												2675.0471	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												196.9161	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1912.4894	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)

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Appendix Q - special features

Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4503.6365 (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	3458.1627	0.2100	726.2142 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2675.0471	0.2100	561.7599 (264)
Space and water heating			1287.9741 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	196.9161	0.1443	28.4211 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-779.5547	0.1332	-103.8666
PV Unit electricity exported	-1132.9346	0.1227	-138.9673
Total			-242.8339 (269)
Total CO2, kg/year			1085.4905 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.1600 (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	3458.1627	1.1300	3907.7238 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2675.0471	1.1300	3022.8032 (278)
Space and water heating			6930.5270 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	196.9161	1.5338	302.0365 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-779.5547	1.4924	-1163.3748
PV Unit electricity exported	-1132.9346	0.4501	-509.9321
Total			-1673.3069 (283)
Total Primary energy kWh/year			5689.3575 (286)
Dwelling Primary energy Rate (DPER)			63.7500 (287)

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

1. Overall dwelling characteristics

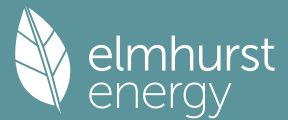
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	44.6200 (1b)	x 2.3900 (2b)	= 106.6418 (1b) - (3b)
First floor	44.6200 (1c)	x 2.6200 (2c)	= 116.9044 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 223.5462 (5)

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	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) = 0.1342 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3842 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3842 (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	0.4899	0.4803	0.4706	0.4226	0.4130	0.3650	0.3650	0.3554	0.3842	0.4130	0.4322	0.4514 (22b)
Effective ac	0.6200	0.6153	0.6108	0.5893	0.5853	0.5666	0.5666	0.5631	0.5738	0.5853	0.5934	0.6019 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Semi-glazed door			2.1400	1.0000	2.1400			(26a)
TER Opening Type (Uw = 1.20)			20.1700	1.1450	23.0954			(27)
Ground Floor			44.6200	0.1300	5.8006			(28a)
External Wall	138.5000	22.3100	116.1900	0.1800	20.9142			(29a)
Plane Roof	44.6200		44.6200	0.1100	4.9082			(30)
Total net area of external elements Aum(A, m2)			227.7400					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	56.8584		(33)

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

244.5056 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element	16.6300	0.0500	0.8315	
E2 Other lintels (including other steel lintels)	13.8000	0.0500	0.6900	
E3 Sill	36.3000	0.0500	1.8150	
E4 Jamb	27.7000	0.1600	4.4320	
E5 Ground floor (normal)	17.5000	0.0600	1.0500	
E10 Eaves (insulation at ceiling level)	20.0400	0.0900	1.8036	
E16 Corner (normal)	27.7000	0.0000	0.0000	
E6 Intermediate floor within a dwelling	10.2000	0.0600	0.6120	
E12 Gable (insulation at ceiling level)				

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

11.2341 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 68.0925 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	45.7360	45.3923	45.0554	43.4731	43.1771	41.7989	41.7989	41.5437	42.3297	43.1771	43.7760	44.4021	(38)
Heat transfer coeff	113.8285	113.4848	113.1480	111.5656	111.2696	109.8914	109.8914	109.6362	110.4223	111.2696	111.8685	112.4946	(39)
Average = Sum(39)m / 12 =												111.5642	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2755	1.2717	1.2679	1.2502	1.2469	1.2314	1.2314	1.2286	1.2374	1.2469	1.2536	1.2606	(40)
HLP (average)												1.2502	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

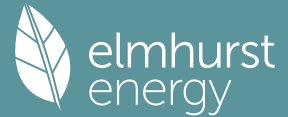
Assumed occupancy													2.6152 (42)
Hot water usage for mixer showers													
68.0676	67.0447	65.5541	62.7021	60.5974	58.2503	56.9161	58.3955	60.0171	62.5372	65.4504	67.8068	(42a)	
Hot water usage for baths													
29.3945	28.9580	28.3432	27.2097	26.3610	25.4199	24.9115	25.5220	26.1866	27.1937	28.3505	29.2952	(42b)	
Hot water usage for other uses													
41.4120	39.9061	38.4002	36.8943	35.3884	33.8825	33.8825	35.3884	36.8943	38.4002	39.9061	41.4120	(42c)	
Average daily hot water use (litres/day)												127.6567	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.8742	135.9088	132.2975	126.8062	122.3468	117.5527	115.7102	119.3059	123.0980	128.1311	133.7071	138.5140	(44)
Energy conte	219.9427	193.5323	203.3364	173.5913	164.7023	144.5447	139.9415	147.7256	151.7922	173.8727	190.4902	216.8794	(45)
Energy content (annual)										Total = Sum(45)m =		2120.3514	
Distribution loss (46)m = 0.15 x (45)m	32.9914	29.0298	30.5005	26.0387	24.7054	21.6817	20.9912	22.1588	22.7688	26.0809	28.5735	32.5319	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	270.9016	239.5597	254.2953	222.9064	215.6612	193.8598	190.9004	198.6845	201.1073	224.8316	239.8053	267.8383	(62)
WWHRS	-31.1177	-27.5207	-28.8181	-23.8625	-22.2390	-19.0301	-17.8377	-18.9686	-19.6893	-23.2115	-26.2958	-30.5414	(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	239.7839	212.0390	225.4772	199.0438	193.4222	174.8297	173.0627	179.7159	181.4180	201.6201	213.5095	237.2969	(64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				2431.2189	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)
Heat gains from water heating, kWh/month	85.8707	75.8563	80.3491	70.0479	67.5033	60.3899	59.2703	61.8585	62.7997	70.5524	75.6668	84.8521	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.8567	132.6985	119.8567	123.8520	119.8567	123.8520	119.8567	119.8567	123.8520	119.8567	123.8520	119.8567	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	237.6726	240.1389	233.9239	220.6929	203.9912	188.2939	177.8071	175.3408	181.5558	194.7868	211.4885	227.1858	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	(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)	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	(71)
Water heating gains (Table 5)	115.4176	112.8815	107.9961	97.2887	90.7302	83.8748	79.6643	83.1431	87.2218	94.8285	105.0927	114.0486	(72)
Total internal gains	538.1745	550.9465	527.0043	507.0612	479.8057	458.2483	439.5558	440.5683	454.8572	474.6996	505.6609	526.3187	(73)

6. Solar gains

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[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b		Specific data or Table 6c		FF	Access factor Table 6d		Gains W
North	3.5000				10.6334	0.6300		0.7000			0.7700	11.3740 (74)	
East	9.7600				19.6403	0.6300		0.7000			0.7700	58.5826 (76)	
South	6.0600				46.7521	0.6300		0.7000			0.7700	86.5855 (78)	
West	0.8500				19.6403	0.6300		0.7000			0.7700	5.1020 (80)	
Solar gains	161.6441	288.1216	422.7358	562.7062	659.3715	665.6843	637.3057	564.6303	471.7188	326.6493	196.0718	136.6709	(83)
Total gains	699.8186	839.0681	949.7401	1069.7674	1139.1772	1123.9326	1076.8616	1005.1986	926.5760	801.3489	701.7327	662.9896	(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	53.2469	53.4082	53.5672	54.3270	54.4715	55.1547	55.1547	55.2830	54.8895	54.4715	54.1799	53.8783	
alpha	4.5498	4.5605	4.5711	4.6218	4.6314	4.6770	4.6770	4.6855	4.6593	4.6314	4.6120	4.5919	
util living area	0.9933	0.9842	0.9637	0.9029	0.7808	0.5976	0.4431	0.4916	0.7346	0.9358	0.9859	0.9947	(86)
MIT	19.5594	19.8030	20.1322	20.5391	20.8254	20.9620	20.9923	20.9878	20.9022	20.5109	19.9647	19.5261	(87)
Th 2	19.8600	19.8631	19.8661	19.8801	19.8827	19.8950	19.8950	19.8972	19.8902	19.8827	19.8774	19.8718	(88)
util rest of house	0.9911	0.9793	0.9521	0.8729	0.7200	0.5059	0.3349	0.3788	0.6468	0.9090	0.9805	0.9930	(89)
MIT 2	18.2081	18.5186	18.9325	19.4317	19.7435	19.8745	19.8927	19.8932	19.8283	19.4136	18.7364	18.1738	(90)
Living area fraction	fLA = Living area / (4) =												
MIT	18.3800	18.6820	19.0851	19.5725	19.8811	20.0128	20.0325	20.0324	19.9649	19.5531	18.8926	18.3458	(91)
Temperature adjustment	0.0000												
adjusted MIT	18.3800	18.6820	19.0851	19.5725	19.8811	20.0128	20.0325	20.0324	19.9649	19.5531	18.8926	18.3458	(93)
8. Space heating requirement													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9869	0.9720	0.9416	0.8631	0.7199	0.5162	0.3486	0.3930	0.6533	0.8990	0.9738	0.9895	(94)
Useful gains	690.6388	815.6101	894.2668	923.3450	820.0630	580.1475	375.3879	395.0874	605.3021	720.3834	683.3302	655.9971	(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	1602.7061	1564.0472	1423.9768	1190.6862	910.3103	594.8225	377.2063	398.2442	647.6178	996.2110	1319.2226	1591.3264	(97)
Space heating kWh	678.5780	502.9497	394.1042	192.4857	67.1440	0.0000	0.0000	0.0000	0.0000	205.2157	457.8425	695.8850	(98a)
Space heating requirement - total per year (kWh/year)													3194.2048
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	678.5780	502.9497	394.1042	192.4857	67.1440	0.0000	0.0000	0.0000	0.0000	205.2157	457.8425	695.8850	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)													3194.2048
Space heating per m2	(98c) / (4) =												35.7934 (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 %)													92.4000 (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	678.5780	502.9497	394.1042	192.4857	67.1440	0.0000	0.0000	0.0000	0.0000	205.2157	457.8425	695.8850	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	734.3918	544.3179	426.5197	208.3178	72.6667	0.0000	0.0000	0.0000	0.0000	222.0950	495.5005	753.1223	(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	239.7839	212.0390	225.4772	199.0438	193.4222	174.8297	173.0627	179.7159	181.4180	201.6201	213.5095	237.2969	(64)
Efficiency of water heater	86.4817	86.1633	85.5651	84.3097	82.3529	80.3000	80.3000	80.3000	80.3000	84.4194	85.9718	86.5431	(216)
Fuel for water heating, kWh/month	277.2656	246.0896	263.5154	236.0866	234.8700	217.7207	215.5201	223.8056	225.9253	238.8316	248.3484	274.1951	(217)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.9039	19.9788	17.9887	13.1793	10.1801	8.3172	9.2866	12.0711	15.6791	20.5719	23.2359	25.5960	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-41.2241	-57.8560	-82.7938	-92.6615	-99.5485	-92.7656	-91.5854	-86.6149	-77.8255	-65.9147	-45.2138	-35.6687	(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	-24.1084	-50.6173	-100.4333	-150.6081	-198.9301	-199.8225	-197.5026	-167.3524	-122.8121	-72.3483	-32.1731	-19.0747	(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	3456.9317 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	80.3000
Water heating fuel used	2902.1738 (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)	200.9884 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2205.4553 (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	4440.6386 (238)

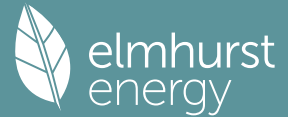
----- 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP -----

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3456.9317	0.2100	725.9556 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2902.1738	0.2100	609.4565 (264)
Space and water heating			1335.4122 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	200.9884	0.1443	29.0088 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-869.6725	0.1347	-117.1340
PV Unit electricity exported	-1335.7828	0.1259	-168.2269
Total			-285.3610 (269)
Total CO2, kg/year			1090.9893 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.2300 (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	3456.9317	1.1300	3906.3328 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2902.1738	1.1300	3279.4564 (278)
Space and water heating			7185.7892 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	200.9884	1.5338	308.2828 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-869.6725	1.4978	-1302.5851
PV Unit electricity exported	-1335.7828	0.4623	-617.5108
Total			-1920.0959 (283)
Total Primary energy kWh/year			5704.0769 (286)
Target Primary Energy Rate (TPER)			63.9200 (287)

Full SAP Calculation Printout



Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 25			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	93 A	DER	12.16	TER	12.23		
Environmental	90 B	% DER < TER				0.57	
CO ₂ Emissions (t/year)	1.04	DFEE	38.46	TFEE	41.84		
Compliance Check	See BREL	% DFEE < TFEE				8.08	
% DPER < TPER	0.26	DPER	63.75	TPER	63.92		
Assessor Details	Miss Victoria Gartside				Assessor ID	AL30-0001	
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	44.6200 (1b)	x 2.3900 (2b)	= 106.6418 (1b) - (3b)
First floor	44.6200 (1c)	x 2.6200 (2c)	= 116.9044 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 223.5462 (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	5 * 10 = 50.0000 (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) =	50.0000 / (5) = 0.2237 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.4237 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.4237 (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	0.5402	0.5296	0.5190	0.4660	0.4554	0.4025	0.4025	0.3919	0.4237	0.4554	0.4766	0.4978 (22b)
Effective ac	0.6459	0.6402	0.6347	0.6086	0.6037	0.5810	0.5810	0.5768	0.5897	0.6037	0.6136	0.6239 (25)

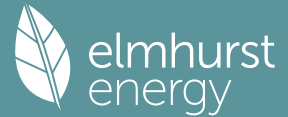
3. Heat losses and heat loss parameter

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
Windows (Uw = 1.30)			21.6300	1.2357	26.7291		(27)
Door			2.1400	1.3000	2.7820		(26a)
Ground Floor			44.6200	0.1300	5.8006	75.0000	3346.5000 (28a)
External Wall	138.5000	23.7700	114.7300	0.1900	21.7987	110.0000	12620.3000 (29a)
Plane Roof	44.6200		44.6200	0.0900	4.0158	9.0000	401.5800 (30)
Total net area of external elements Aum(A, m ²)			227.7400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	61.1262			(33)
Studs			189.8400			9.0000	1708.5600 (32c)
Block			33.8400			75.0000	2538.0000 (32c)
Internal Floor 1			44.6200			18.0000	803.1600 (32d)
Internal Ceiling 1			44.6200			9.0000	401.5800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	21819.6800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							244.5056 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				16.6300	0.0240	0.3991	
E3 Sill				13.8000	0.0210	0.2898	
E4 Jamb				36.3000	0.0160	0.5808	

7. Mean internal temperature (heating season)

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

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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	52.6322	52.8239	53.0132	53.9206	54.0939	54.9152	54.9152	55.0701	54.5959	54.0939	53.7445	53.3841
alpha	4.5088	4.5216	4.5342	4.5947	4.6063	4.6610	4.6610	4.6713	4.6397	4.6063	4.5830	4.5589
util living area	0.9889	0.9752	0.9415	0.8573	0.7118	0.5297	0.3880	0.4331	0.6711	0.9058	0.9781	0.9914 (86)
MIT	19.9171	20.1098	20.3754	20.6650	20.8432	20.9159	20.9302	20.9282	20.8824	20.6281	20.2181	19.8884 (87)
Th 2	19.8483	19.8520	19.8556	19.8726	19.8758	19.8907	19.8907	19.8934	19.8849	19.8758	19.8694	19.8626 (88)
util rest of house	0.9854	0.9677	0.9244	0.8194	0.6472	0.4443	0.2917	0.3316	0.5823	0.8707	0.9702	0.9886 (89)
MIT 2	18.6077	18.8527	19.1828	19.5347	19.7212	19.7964	19.8045	19.8067	19.7687	19.5070	19.0058	18.5824 (90)
Living area fraction									FLA = Living area / (4) =			0.1272 (91)
MIT	18.7742	19.0126	19.3344	19.6784	19.8639	19.9388	19.9477	19.9493	19.9103	19.6496	19.1600	18.7485 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.6242	18.8626	19.1844	19.5284	19.7139	19.7888	19.7977	19.7993	19.7603	19.4996	19.0100	18.5985 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9802	0.9591	0.9118	0.8060	0.6371	0.4362	0.2836	0.3229	0.5715	0.8561	0.9620	0.9843 (94)
Useful gains	781.1361	913.1759	1003.5374	998.6507	843.4176	565.5241	352.2144	372.8217	604.3093	781.0701	759.2212	737.8670 (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	1649.5499	1602.0746	1450.2196	1194.7051	897.9290	572.6860	352.9318	374.1315	628.3873	997.1631	1343.1437	1634.7474 (97)
Space heating kWh	646.0999	462.9399	332.3315	141.1592	40.5565	0.0000	0.0000	0.0000	0.0000	160.7732	420.4242	667.2790 (98a)
Space heating requirement - total per year (kWh/year)												2871.5634
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	646.0999	462.9399	332.3315	141.1592	40.5565	0.0000	0.0000	0.0000	0.0000	160.7732	420.4242	667.2790 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2871.5634
Space heating per m2										(98c) / (4) =		32.1780 (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 %)												88.5000 (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	646.0999	462.9399	332.3315	141.1592	40.5565	0.0000	0.0000	0.0000	0.0000	160.7732	420.4242	667.2790 (98)
Space heating efficiency (main heating system 1)	88.5000	88.5000	88.5000	88.5000	88.5000	0.0000	0.0000	0.0000	0.0000	88.5000	88.5000	88.5000 (210)
Space heating fuel (main heating system)	730.0564	523.0960	375.5158	159.5019	45.8265	0.0000	0.0000	0.0000	0.0000	181.6647	475.0556	753.9876 (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	239.3521	211.0116	222.5781	191.9781	183.5538	162.6381	158.5428	166.4056	169.9588	192.8167	209.0477	236.2579 (64)
Efficiency of water heater (217)m	88.0894	88.0248	87.8922	87.6293	87.2677	87.0000	87.0000	87.0000	87.0000	87.6757	87.9961	87.0000 (216)
Fuel for water heating, kWh/month	271.7148	239.7183	253.2399	219.0797	210.3342	186.9404	182.2331	191.2708	195.3549	219.9204	237.5646	268.1616 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	24.3993	19.5740	17.6242	12.9123	9.9738	8.1487	9.0984	11.8265	15.3614	20.1550	22.7651	25.0774 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-29.6624	-45.7979	-72.3148	-87.0055	-96.8193	-91.2246	-89.7042	-82.9422	-70.7644	-54.6690	-33.6686	-24.9819 (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	-13.3821	-32.0932	-74.8774	-128.7797	-183.9535	-190.1695	-185.7447	-148.6166	-97.5031	-49.0071	-18.6217	-10.1861 (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												3244.7044 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												87.0000
Water heating fuel used												2675.5327 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												196.9161 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1912.4894 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												

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Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4290.6639 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3244.7044	3.6400	118.1072 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2675.5327	3.6400	97.3894 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814 (249)
Energy for lighting	196.9161	16.4900	32.4715 (250)
Additional standing charges			92.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-779.5547	16.4900	-128.5486
PV Unit electricity exported	-1132.9346	5.5900	-63.3310
Total			-191.8796 (252)
Total energy cost			162.2699 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.4352 (257)
SAP value		92.9459
SAP rating (Section 12)		93 (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	3244.7044	0.2100	681.3879 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2675.5327	0.2100	561.8619 (264)
Space and water heating			1243.2498 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	196.9161	0.1443	28.4211 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-779.5547	0.1332	-103.8666
PV Unit electricity exported	-1132.9346	0.1227	-138.9673
Total			-242.8339 (269)
Total CO2, kg/year			1040.7662 (272)
CO2 emissions per m2			11.6600 (273)
EI value			89.6109
EI rating			90 (274)
EI band			B

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

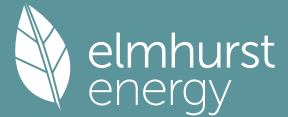
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	44.6200 (1b)	x 2.3900 (2b)	= 106.6418 (1b) - (3b)
First floor	44.6200 (1c)	x 2.6200 (2c)	= 116.9044 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	223.5462 (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	5 * 10 = 50.0000 (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) =	50.0000 / (5) = 0.2237 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.4237 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)

Full SAP Calculation Printout



Infiltration rate adjusted to include shelter factor

(21) = (18) x (20) = 0.4237 (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													
	0.5402	0.5296	0.5190	0.4660	0.4554	0.4025	0.4025	0.3919	0.4237	0.4554	0.4766	0.4978	(22b)
Effective ac	0.6459	0.6402	0.6347	0.6086	0.6037	0.5810	0.5810	0.5768	0.5897	0.6037	0.6136	0.6239	(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	
Windows (Uw = 1.30)			21.6300	1.2357	26.7291			(27)
Door			2.1400	1.3000	2.7820			(26a)
Ground Floor			44.6200	0.1300	5.8006	75.0000	3346.5000	(28a)
External Wall	138.5000	23.7700	114.7300	0.1900	21.7987	110.0000	12620.3000	(29a)
Plane Roof	44.6200		44.6200	0.0900	4.0158	9.0000	401.5800	(30)
Total net area of external elements Aum(A, m2)			227.7400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	61.1262			(33)
Studs			189.8400			9.0000	1708.5600	(32c)
Block			33.8400			75.0000	2538.0000	(32c)
Internal Floor 1			44.6200			18.0000	803.1600	(32d)
Internal Ceiling 1			44.6200			9.0000	401.5800	(32e)
Heat capacity Cm = Sum(A x k)								
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K					(28)...(30) + (32) + (32a)...(32e) =		21819.6800	(34)
							244.5056	(35)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6152 (42)
Hot water usage for mixer showers													
68.0676	67.0447	65.5541	62.7021	60.5974	58.2503	56.9161	58.3955	60.0171	62.5372	65.4504	67.8068	67.8068	(42a)
Hot water usage for baths													
29.3945	28.9580	28.3432	27.2097	26.3610	25.4199	24.9115	25.5220	26.1866	27.1937	28.3505	29.2952	29.2952	(42b)
Hot water usage for other uses													
41.4120	39.9061	38.4002	36.8943	35.3884	33.8825	33.8825	35.3884	36.8943	38.4002	39.9061	41.4120	41.4120	(42c)
Average daily hot water use (litres/day)												127.6567	(43)
Daily hot water use													
138.8742	135.9088	132.2975	126.8062	122.3468	117.5527	115.7102	119.3059	123.0980	128.1311	133.7071	138.5140	138.5140	(44)
Energy conte	219.9427	193.5323	203.3364	173.5913	164.7023	144.5447	139.9415	147.7256	151.7922	173.8727	190.4902	216.8794	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
32.9914	29.0298	30.5005	26.0387	24.7054	21.6817	20.9912	22.1588	22.7688	26.0809	28.5735	32.5319	32.5319	(46)
Water storage loss:													
Total storage loss													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	19.4094	17.4793	19.2416	18.3868	18.8514	18.0934	18.6014	18.6800	18.1666	18.9441	18.5575	19.3784	(61)
Total heat required for water heating calculated for each month													
239.3521	211.0116	222.5781	191.9781	183.5538	162.6381	158.5428	166.4056	169.9588	192.8167	209.0477	236.2579	236.2579	(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													
239.3521	211.0116	222.5781	191.9781	183.5538	162.6381	158.5428	166.4056	169.9588	192.8167	209.0477	236.2579	236.2579	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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													
77.9833	68.7193	72.4198	62.3158	59.4764	52.5845	51.1809	53.7887	55.0126	62.5487	67.9774	76.9570	76.9570	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
27.8755	24.7588	20.1352	15.2436	11.3948	9.6200	10.3947	13.5114	18.1350	23.0266	26.8754	28.6503	28.6503	(67)

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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	354.7352	358.4162	349.1401	329.3924	304.4644	281.0357	265.3838	261.7028	270.9789	290.7266	315.6545	339.0833 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062 (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)	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070 (71)
Water heating gains (Table 5)	104.8163	102.2609	97.3384	86.5497	79.9414	73.0340	68.7915	72.2967	76.4063	84.0708	94.4130	103.4369 (72)
Total internal gains	596.0367	594.0456	575.2234	539.7955	504.4103	469.2993	450.1797	453.1206	471.1299	506.4337	545.5527	579.7801 (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						3.7500	10.6334	0.7300	0.7000	0.7700	14.1207 (74)	
East						10.4700	19.6403	0.7300	0.7000	0.7700	72.8196 (76)	
South						6.5000	46.7521	0.7300	0.7000	0.7700	107.6139 (78)	
West						0.9100	19.6403	0.7300	0.7000	0.7700	6.3291 (80)	
Solar gains	200.8833	358.0609	525.3438	699.2735	819.3843	827.2222	791.9601	701.6591	586.2115	405.9389	243.6680	169.8481 (83)
Total gains	796.9200	952.1065	1100.5672	1239.0690	1323.7946	1296.5215	1242.1398	1154.7797	1057.3414	912.3726	789.2207	749.6282 (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	52.6322	52.8239	53.0132	53.9206	54.0939	54.9152	54.9152	55.0701	54.5959	54.0939	53.7445	53.3841
alpha	4.5088	4.5216	4.5342	4.5947	4.6063	4.6610	4.6610	4.6713	4.6397	4.6063	4.5830	4.5589
util living area	0.9889	0.9752	0.9415	0.8573	0.7118	0.5297	0.3880	0.4331	0.6711	0.9058	0.9781	0.9914 (86)
MIT	19.9171	20.1098	20.3754	20.6650	20.8432	20.9159	20.9302	20.9282	20.8824	20.6281	20.2181	19.8884 (87)
Th 2	19.8483	19.8520	19.8556	19.8726	19.8758	19.8907	19.8907	19.8934	19.8849	19.8758	19.8694	19.8626 (88)
util rest of house	0.9854	0.9677	0.9244	0.8194	0.6472	0.4443	0.2917	0.3316	0.5823	0.8707	0.9702	0.9886 (89)
MIT 2	18.6077	18.8527	19.1828	19.5347	19.7212	19.7964	19.8045	19.8067	19.7687	19.5070	19.0058	18.5824 (90)
Living area fraction	18.7742	19.0126	19.3344	19.6784	19.8639	19.9388	19.9477	19.9493	19.9103	19.6496	19.1600	18.7485 (91)
MIT	18.7742	19.0126	19.3344	19.6784	19.8639	19.9388	19.9477	19.9493	19.9103	19.6496	19.1600	18.7485 (92)
Temperature adjustment	18.6242	18.8626	19.1844	19.5284	19.7139	19.7888	19.7977	19.7993	19.7603	19.4996	19.0100	-0.1500
adjusted MIT	18.6242	18.8626	19.1844	19.5284	19.7139	19.7888	19.7977	19.7993	19.7603	19.4996	19.0100	18.5985 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9802	0.9591	0.9118	0.8060	0.6371	0.4362	0.2836	0.3229	0.5715	0.8561	0.9620	0.9843 (94)
Ext temp.	781.1361	913.1759	1003.5374	998.6507	843.4176	565.5241	352.2144	372.8217	604.3093	781.0701	759.2212	737.8670 (95)
Heat loss rate W	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)
Space heating kWh	1649.5499	1602.0746	1450.2196	1194.7051	897.9290	572.6860	352.9318	374.1315	628.3873	997.1631	1343.1437	1634.7474 (97)
Space heating requirement - total per year (kWh/year)	646.0999	462.9399	332.3315	141.1592	40.5565	0.0000	0.0000	0.0000	0.0000	160.7732	420.4242	667.2790 (98a)
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)	646.0999	462.9399	332.3315	141.1592	40.5565	0.0000	0.0000	0.0000	0.0000	160.7732	420.4242	667.2790 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (99)
Space heating per m2	(98c) / (4) = 32.1780 (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 %)	88.5000 (206)											
Efficiency of main space heating system 2 (in %)	0.0000 (207)											
Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
646.0999	462.9399	332.3315	141.1592	40.5565	0.0000	0.0000	0.0000	0.0000	0.0000	160.7732	420.4242	667.2790 (98)
Space heating efficiency (main heating system 1)	88.5000	88.5000	88.5000	88.5000	88.5000	0.0000	0.0000	0.0000	0.0000	88.5000	88.5000	88.5000 (210)
Space heating fuel (main heating system)	730.0564	523.0960	375.5158	159.5019	45.8265	0.0000	0.0000	0.0000	0.0000	181.6647	475.0556	753.9876 (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	239.3521	211.0116	222.5781	191.9781	183.5538	162.6381	158.5428	166.4056	169.9588	192.8167	209.0477	236.2579 (64)
Water heating requirement	88.0894	88.0248	87.8922	87.6293	87.2677	87.0000	87.0000	87.0000	87.0000	87.6757	87.9961	87.0000 (216)
Efficiency of water heater (217)m	271.7148	239.7183	253.2399	219.0797	210.3342	186.9404	182.2331	191.2708	195.3549	219.9204	237.5646	268.1616 (219)
Fuel for water heating, kWh/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 (221)
Space cooling fuel requirement (221)m	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Pumps and Fa												

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Lighting	24.3993	19.5740	17.6242	12.9123	9.9738	8.1487	9.0984	11.8265	15.3614	20.1550	22.7651	25.0774	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-29.6624	-45.7979	-72.3148	-87.0055	-96.8193	-91.2246	-89.7042	-82.9422	-70.7644	-54.6690	-33.6686	-24.9819	(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	-13.3821	-32.0932	-74.8774	-128.7797	-183.9535	-190.1695	-185.7447	-148.6166	-97.5031	-49.0071	-18.6217	-10.1861	(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												3244.7044	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.0000	
Water heating fuel used												2675.5327	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												196.9161	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1912.4894	(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												4290.6639	(238)

10a. Fuel costs - using BEDF prices (554)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3244.7044	5.6000	181.7034 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2675.5327	5.6000	149.8298 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	86.0000	26.0600	22.4116 (249)
Energy for lighting	196.9161	26.0600	51.3163 (250)
Additional standing charges			99.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-779.5547	26.0600	-203.1520
PV Unit electricity exported	-1132.9346	5.8100	-65.8235
Total			-268.9755 (252)
Total energy cost			235.2857 (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	3244.7044	0.2100	681.3879 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2675.5327	0.2100	561.8619 (264)
Space and water heating			1243.2498 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	196.9161	0.1443	28.4211 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-779.5547	0.1332	-103.8666
PV Unit electricity exported	-1132.9346	0.1227	-138.9673
Total			-242.8339 (269)
Total CO2, kg/year			1040.7662 (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	3244.7044	1.1300	3666.5160 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2675.5327	1.1300	3023.3519 (278)
Space and water heating			6689.8679 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	196.9161	1.5338	302.0365 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-779.5547	1.4924	-1163.3748
PV Unit electricity exported	-1132.9346	0.4501	-509.9321
Total			-1673.3069 (283)
Total Primary energy kWh/year			5448.6983 (286)

SAP 10 EPC IMPROVEMENTS

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Current energy efficiency rating:
Current environmental impact rating:

A 93
B 90

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

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

Measures omitted - SAP change or cost saving too small:
N Solar water heating + 0.6 -£ 20 -135 kg (12.9%)

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

Potential energy efficiency rating: A 93
Potential environmental impact rating: B 90

Fuel prices for cost data on this page from database revision number 554 TEST (31 Oct 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, East Pennines):

	Current	Potential	Saving
Electricity	£74	£74	£0
Mains gas	£431	£431	£0
Space heating	£303	£303	£0
Water heating	£150	£150	£0
Lighting	£51	£51	£0
Generated (PV)	-£269	-£269	£0
Total cost of fuels	£236	£236	£0
Total cost of uses	£235	£235	£0
Delivered energy	48 kWh/m²	48 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.0 tonnes	1.0 tonnes	0.0 tonnes
CO2 emissions per m²	12 kg/m²	12 kg/m²	0 kg/m²
Primary energy	61 kWh/m²	61 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	44.6200 (1b)	x 2.3900 (2b)	= 106.6418 (1b) - (3b)
First floor	44.6200 (1c)	x 2.6200 (2c)	= 116.9044 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	223.5462 (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	5 * 10 = 50.0000 (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) =	50.0000 / (5) =	0.2237 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50		4.0000 (17)
Infiltration rate		0.4237 (18)
Number of sides sheltered		0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4237 (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	0.5402	0.5296	0.5190	0.4660	0.4554	0.4025	0.4025	0.3919	0.4237	0.4554	0.4766	0.4978 (22b)
Effective ac	0.6459	0.6402	0.6347	0.6086	0.6037	0.5810	0.5810	0.5768	0.5897	0.6037	0.6136	0.6239 (25)

3. Heat losses and heat loss parameter

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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						
Windows (Uw = 1.30)			21.6300	1.2357	26.7291			(27)					
Door			2.1400	1.3000	2.7820			(26a)					
Ground Floor			44.6200	0.1300	5.8006	75.0000	3346.5000	(28a)					
External Wall	138.5000	23.7700	114.7300	0.1900	21.7987	110.0000	12620.3000	(29a)					
Plane Roof	44.6200		44.6200	0.0900	4.0158	9.0000	401.5800	(30)					
Total net area of external elements Aum(A, m2)			227.7400					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		61.1262			(33)					
Studs			189.8400			9.0000	1708.5600	(32c)					
Block			33.8400			75.0000	2538.0000	(32c)					
Internal Floor 1			44.6200			18.0000	803.1600	(32d)					
Internal Ceiling 1			44.6200			9.0000	401.5800	(32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		21819.6800	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							244.5056	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value		Total						
E2 Other lintels (including other steel lintels)				16.6300	0.0240		0.3991						
E3 Sill				13.8000	0.0210		0.2898						
E4 Jamb				36.3000	0.0160		0.5808						
E5 Ground floor (normal)				27.7000	0.0920		2.5484						
E10 Eaves (insulation at ceiling level)				17.5000	0.0580		1.0150						
E16 Corner (normal)				20.0400	0.0470		0.9419						
E6 Intermediate floor within a dwelling				27.7000	0.0010		0.0277						
E12 Gable (insulation at ceiling level)				10.2000	0.0570		0.5814						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								6.3841 (36)					
Point Thermal bridges								0.0000					
Total fabric heat loss						(33) + (36) + (36a) =		67.5103 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 47.6478	Feb 47.2299	Mar 46.8203	Apr 44.8961	May 44.5361	Jun 42.8603	Jul 42.8603	Aug 42.5499	Sep 43.5058	Oct 44.5361	Nov 45.2644	Dec 46.0258	(38)
Heat transfer coeff	115.1581	114.7402	114.3305	112.4064	112.0464	110.3706	110.3706	110.0602	111.0161	112.0464	112.7747	113.5361	(39)
Average = Sum(39)m / 12 =												112.4047	
HLP	Jan 1.2904	Feb 1.2857	Mar 1.2812	Apr 1.2596	May 1.2556	Jun 1.2368	Jul 1.2368	Aug 1.2333	Sep 1.2440	Oct 1.2556	Nov 1.2637	Dec 1.2723	(40)
HLP (average)												1.2596	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

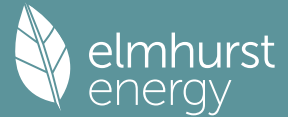
4. Water heating energy requirements (kWh/year)													

Assumed occupancy													2.6152 (42)
Hot water usage for mixer showers													
68.0676	67.0447	65.5541	62.7021	60.5974	58.2503	56.9161	58.3955	60.0171	62.5372	65.4504	67.8068	67.8068	(42a)
Hot water usage for baths													
29.3945	28.9580	28.3432	27.2097	26.3610	25.4199	24.9115	25.5220	26.1866	27.1937	28.3505	29.2952	29.2952	(42b)
Hot water usage for other uses													
41.4120	39.9061	38.4002	36.8943	35.3884	33.8825	33.8825	35.3884	36.8943	38.4002	39.9061	41.4120	41.4120	(42c)
Average daily hot water use (litres/day)													127.6567 (43)
Daily hot water use	Jan 138.8742	Feb 135.9088	Mar 132.2975	Apr 126.8062	May 122.3468	Jun 117.5527	Jul 115.7102	Aug 119.3059	Sep 123.0980	Oct 128.1311	Nov 133.7071	Dec 138.5140	(44)
Energy conte	219.9427	193.5323	203.3364	173.5913	164.7023	144.5447	139.9415	147.7256	151.7922	173.8727	190.4902	216.8794	(45)
Energy content (annual)										Total = Sum(45)m =		2120.3514	
Distribution loss (46)m = 0.15 x (45)m													
32.9914	29.0298	30.5005	26.0387	24.7054	21.6817	20.9912	22.1588	22.7688	26.0809	28.5735	32.5319	32.5319	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	19.4094	17.4793	19.2416	18.3868	18.8514	18.0934	18.6014	18.6800	18.1666	18.9441	18.5575	19.3784	(61)
Total heat required for water heating calculated for each month	239.3521	211.0116	222.5781	191.9781	183.5538	162.6381	158.5428	166.4056	169.9588	192.8167	209.0477	236.2579	(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	239.3521	211.0116	222.5781	191.9781	183.5538	162.6381	158.5428	166.4056	169.9588	192.8167	209.0477	236.2579	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Heat gains from water heating, kWh/month	77.9833	68.7193	72.4198	62.3158	59.4764	52.5845	51.1809	53.7887	55.0126	62.5487	67.9774	76.9570	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan 156.9105	Feb 156.9105	Mar 156.9105	Apr 156.9105	May 156.9105	Jun 156.9105	Jul 156.9105	Aug 156.9105	Sep 156.9105	Oct 156.9105	Nov 156.9105	Dec 156.9105	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.8755	24.7588	20.1352	15.2436	11.3948	9.6200	10.3947	13.5114	18.1350	23.0266	26.8754	28.6503	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	354.7352	358.4162	349.1401	329.3924	304.4644	281.0357	265.3838	261.7028	270.9789	290.7266	315.6545	339.0833	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	(71)
Water heating gains (Table 5)	104.8163	102.2609	97.3384	86.5497	79.9414	73.0340	68.7915	72.2967	76.4063	84.0708	94.4130	103.4369	(72)
Total internal gains	596.0367	594.0456	575.2234	539.7955	504.4103	469.2993	450.1797	453.1206	471.1299	506.4337	545.5527	579.7801	(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	
North					3.7500	10.6334	0.7300	0.7000			0.7700	14.1207 (74)	
East					10.4700	19.6403	0.7300	0.7000			0.7700	72.8196 (76)	
South					6.5000	46.7521	0.7300	0.7000			0.7700	107.6139 (78)	
West					0.9100	19.6403	0.7300	0.7000			0.7700	6.3291 (80)	

Solar gains	200.8833	358.0609	525.3438	699.2735	819.3843	827.2222	791.9601	701.6591	586.2115	405.9389	243.6680	169.8481	(83)
Total gains	796.9200	952.1065	1100.5672	1239.0690	1323.7946	1296.5215	1242.1398	1154.7797	1057.3414	912.3726	789.2207	749.6282	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	52.6322	52.8239	53.0132	53.9206	54.0939	54.9152	54.9152	55.0701	54.5959	54.0939	53.7445	53.3841
util living area	4.5088	4.5216	4.5342	4.5947	4.6063	4.6610	4.6610	4.6713	4.6397	4.6063	4.5830	4.5589
	0.9889	0.9752	0.9415	0.8573	0.7118	0.5297	0.3880	0.4331	0.6711	0.9058	0.9781	0.9914 (86)
MIT	19.9171	20.1098	20.3754	20.6650	20.8432	20.9159	20.9302	20.9282	20.8824	20.6281	20.2181	19.8884 (87)
Th 2	19.8483	19.8520	19.8556	19.8726	19.8758	19.8907	19.8907	19.8934	19.8849	19.8758	19.8694	19.8626 (88)
util rest of house	0.9854	0.9677	0.9244	0.8194	0.6472	0.4443	0.2917	0.3316	0.5823	0.8707	0.9702	0.9886 (89)
MIT 2	18.6077	18.8527	19.1828	19.5347	19.7212	19.7964	19.8045	19.8067	19.7687	19.5070	19.0058	18.5824 (90)
Living area fraction	18.7742	19.0126	19.3344	19.6784	19.8639	19.9388	19.9477	19.9493	19.9103	19.6496	19.1600	18.7485 (92)
Temperature adjustment	18.6242	18.8626	19.1844	19.5284	19.7139	19.7888	19.7977	19.7993	19.7603	19.4996	19.0100	-0.1500
adjusted MIT												18.5985 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9802	0.9591	0.9118	0.8060	0.6371	0.4362	0.2836	0.3229	0.5715	0.8561	0.9620	0.9843 (94)
Ext temp.	781.1361	913.1759	1003.5374	998.6507	843.4176	565.5241	352.2144	372.8217	604.3093	781.0701	759.2212	737.8670 (95)
Heat loss rate W	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)
Space heating kWh	1649.5499	1602.0746	1450.2196	1194.7051	897.9290	572.6860	352.9318	374.1315	628.3873	997.1631	1343.1437	1634.7474 (97)
Space heating requirement - total per year (kWh/year)	646.0999	462.9399	332.3315	141.1592	40.5565	0.0000	0.0000	0.0000	0.0000	160.7732	420.4242	667.2790 (98a)
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)	646.0999	462.9399	332.3315	141.1592	40.5565	0.0000	0.0000	0.0000	0.0000	160.7732	420.4242	667.2790 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2871.5634
Space heating per m2										(98c) / (4) =		32.1780 (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 %)												88.5000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating efficiency (main heating system 1)	646.0999	462.9399	332.3315	141.1592	40.5565	0.0000	0.0000	0.0000	0.0000	160.7732	420.4242	667.2790 (98)
Space heating fuel (main heating system)	88.5000	88.5000	88.5000	88.5000	88.5000	0.0000	0.0000	0.0000	0.0000	88.5000	88.5000	88.5000 (210)
Space heating efficiency (main heating system 2)	730.0564	523.0960	375.5158	159.5019	45.8265	0.0000	0.0000	0.0000	0.0000	181.6647	475.0556	753.9876 (211)
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 (212)
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 (213)
Water heating	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	239.3521	211.0116	222.5781	191.9781	183.5538	162.6381	158.5428	166.4056	169.9588	192.8167	209.0477	236.2579 (64)
Efficiency of water heater	88.0894	88.0248	87.8922	87.6293	87.2677	87.0000	87.0000	87.0000	87.0000	87.6757	87.9961	87.0000 (216)
Fuel for water heating, kWh/month	271.7148	239.7183	253.2399	219.0797	210.3342	186.9404	182.2331	191.2708	195.3549	219.9204	237.5646	268.1616 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	24.3993	19.5740	17.6242	12.9123	9.9738	8.1487	9.0984	11.8265	15.3614	20.1550	22.7651	25.0774 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-29.6624	-45.7979	-72.3148	-87.0055	-96.8193	-91.2246	-89.7042	-82.9422	-70.7644	-54.6690	-33.6686	-24.9819 (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)	-13.3821	-32.0932	-74.8774	-128.7797	-183.9535	-190.1695	-185.7447	-148.6166	-97.5031	-49.0071	-18.6217	-10.1861 (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)

10a. Fuel costs - using Table 12 prices

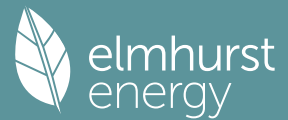
11a. SAP rating - Individual heating systems12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

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

2. Ventilation rate

Full SAP Calculation Printout



											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											5 * 10 =	50.0000 (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) =											50.0000 / (5) =	0.2237 (8)
Pressure test											Yes	
Pressure Test Method											Blower Door	
Measured/design AP50											4.0000 (17)	
Infiltration rate											0.4237 (18)	
Number of sides sheltered											0 (19)	
Shelter factor											(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.4237 (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	0.5402	0.5296	0.5190	0.4660	0.4554	0.4025	0.4025	0.3919	0.4237	0.4554	0.4766	0.4978 (22b)
Effective ac	0.6459	0.6402	0.6347	0.6086	0.6037	0.5810	0.5810	0.5768	0.5897	0.6037	0.6136	0.6239 (25)

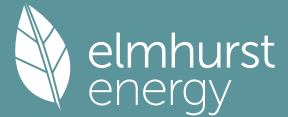
3. Heat losses and heat loss parameter

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	
Windows (Uw = 1.30)			21.6300	1.2357	26.7291			(27)
Door			2.1400	1.3000	2.7820			(26a)
Ground Floor			44.6200	0.1300	5.8006	75.0000	3346.5000	(28a)
External Wall	138.5000	23.7700	114.7300	0.1900	21.7987	110.0000	12620.3000	(29a)
Plane Roof	44.6200		44.6200	0.0900	4.0158	9.0000	401.5800	(30)
Total net area of external elements Aum(A, m2)			227.7400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	61.1262			(33)
Studs			189.8400			9.0000	1708.5600	(32c)
Block			33.8400			75.0000	2538.0000	(32c)
Internal Floor 1			44.6200			18.0000	803.1600	(32d)
Internal Ceiling 1			44.6200			9.0000	401.5800	(32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	21819.6800	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							244.5056	(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		
E2 Other lintels (including other steel lintels)				16.6300	0.0240	0.3991		
E3 Sill				13.8000	0.0210	0.2898		
E4 Jamb				36.3000	0.0160	0.5808		
E5 Ground floor (normal)				27.7000	0.0920	2.5484		
E10 Eaves (insulation at ceiling level)				17.5000	0.0580	1.0150		
E16 Corner (normal)				20.0400	0.0470	0.9419		
E6 Intermediate floor within a dwelling				27.7000	0.0010	0.0277		
E12 Gable (insulation at ceiling level)				10.2000	0.0570	0.5814		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.3841	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss						(33) + (36) + (36a) =	67.5103	(37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6152 (42)
Hot water usage for mixer showers	68.0676	67.0447	65.5541	62.7021	60.5974	58.2503	56.9161	58.3955	60.0171	62.5372	65.4504	67.8068	(42a)
Hot water usage for baths	29.3945	28.9580	28.3432	27.2097	26.3610	25.4199	24.9115	25.5220	26.1866	27.1937	28.3505	29.2952	(42b)
Hot water usage for other uses	41.4120	39.9061	38.4002	36.8943	35.3884	33.8825	33.8825	35.3884	36.8943	38.4002	39.9061	41.4120	(42c)
Average daily hot water use (litres/day)													127.6567 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	138.8742	135.9088	132.2975	126.8062	122.3468	117.5527	115.7102	119.3059	123.0980	128.1311	133.7071	138.5140	(44)
Energy content (annual)	219.9427	193.5323	203.3364	173.5913	164.7023	144.5447	139.9415	147.7256	151.7922	173.8727	190.4902	216.8794	(45)
Distribution loss (46)m = 0.15 x (45)m													
	32.9914	29.0298	30.5005	26.0387	24.7054	21.6817	20.9912	22.1588	22.7688	26.0809	28.5735	32.5319	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	19.4094	17.4793	19.2416	18.3868	18.8514	18.0934	18.6014	18.6800	18.1666	18.9441	18.5575	19.3784	(61)
Total heat required for water heating calculated for each month	239.3521	211.0116	222.5781	191.9781	183.5538	162.6381	158.5428	166.4056	169.9588	192.8167	209.0477	236.2579	(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)

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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	239.3521	211.0116	222.5781	191.9781	183.5538	162.6381	158.5428	166.4056	169.9588	192.8167	209.0477	236.2579 (64)
Total per year (kWh/year) = Sum(64)m =												2344.1411 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	77.9833	68.7193	72.4198	62.3158	59.4764	52.5845	51.1809	53.7887	55.0126	62.5487	67.9774	76.9570 (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	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.8755	24.7588	20.1352	15.2436	11.3948	9.6200	10.3947	13.5114	18.1350	23.0266	26.8754	28.6503	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	354.7352	358.4162	349.1401	329.3924	304.4644	281.0357	265.3838	261.7028	270.9789	290.7266	315.6545	339.0833	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	(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)	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	(71)
Water heating gains (Table 5)	104.8163	102.2609	97.3384	86.5497	79.9414	73.0340	68.7915	72.2967	76.4063	84.0708	94.4130	103.4369	(72)
Total internal gains	596.0367	594.0456	575.2234	539.7955	504.4103	469.2993	450.1797	453.1206	471.1299	506.4337	545.5527	579.7801	(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				3.7500	10.6334		0.7300		0.7000		0.7700		14.1207 (74)
East				10.4700	19.6403		0.7300		0.7000		0.7700		72.8196 (76)
South				6.5000	46.7521		0.7300		0.7000		0.7700		107.6139 (78)
West				0.9100	19.6403		0.7300		0.7000		0.7700		6.3291 (80)
Solar gains	200.8833	358.0609	525.3438	699.2735	819.3843	827.2222	791.9601	701.6591	586.2115	405.9389	243.6680	169.8481	(83)
Total gains	796.9200	952.1065	1100.5672	1239.0690	1323.7946	1296.5215	1242.1398	1154.7797	1057.3414	912.3726	789.2207	749.6282	(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	52.6322	52.8239	53.0132	53.9206	54.0939	54.9152	54.9152	55.0701	54.5959	54.0939	53.7445	53.3841	
alpha	4.5088	4.5216	4.5342	4.5947	4.6063	4.6610	4.6610	4.6713	4.6397	4.6063	4.5830	4.5589	
util living area	0.9889	0.9752	0.9415	0.8573	0.7118	0.5297	0.3880	0.4331	0.6711	0.9058	0.9781	0.9914	(86)
MIT	19.9171	20.1098	20.3754	20.6650	20.8432	20.9159	20.9302	20.9282	20.8824	20.6281	20.2181	19.8884	(87)
Th 2	19.8483	19.8520	19.8556	19.8726	19.8758	19.8907	19.8907	19.8934	19.8849	19.8758	19.8694	19.8626	(88)
util rest of house	0.9854	0.9677	0.9244	0.8194	0.6472	0.4443	0.2917	0.3316	0.5823	0.8707	0.9702	0.9886	(89)
MIT 2	18.6077	18.8527	19.1828	19.5347	19.7212	19.7964	19.8045	19.8067	19.7687	19.5070	19.0058	18.5824	(90)
Living area fraction	18.7742	19.0126	19.3344	19.6784	19.8639	19.9388	19.9477	19.9493	19.9103	19.6496	19.1600	18.7485	(91)
MIT	18.7742	19.0126	19.3344	19.6784	19.8639	19.9388	19.9477	19.9493	19.9103	19.6496	19.1600	18.7485	(92)
Temperature adjustment	18.6242	18.8626	19.1844	19.5284	19.7139	19.7888	19.7977	19.7993	19.7603	19.4996	19.0100	18.5985	(93)
adjusted MIT	18.6242	18.8626	19.1844	19.5284	19.7139	19.7888	19.7977	19.7993	19.7603	19.4996	19.0100	18.5985	(93)

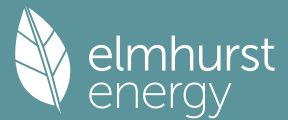
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9802	0.9591	0.9118	0.8060	0.6371	0.4362	0.2836	0.3229	0.5715	0.8561	0.9620	0.9843	(94)
Ext temp.	781.1361	913.1759	1003.5374	998.6507	843.4176	565.5241	352.2144	372.8217	604.3093	781.0701	759.2212	737.8670	(95)
Heat loss rate W	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)
Space heating kWh	1649.5499	1602.0746	1450.2196	1194.7051	897.9290	572.6860	352.9318	374.1315	628.3873	997.1631	1343.1437	1634.7474	(97)
Space heating requirement - total per year (kWh/year)	646.0999	462.9399	332.3315	141.1592	40.5565	0.0000	0.0000	0.0000	0.0000	160.7732	420.4242	667.2790	(98a)
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)	646.0999	462.9399	332.3315	141.1592	40.5565	0.0000	0.0000	0.0000	0.0000	160.7732	420.4242	667.2790	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)	646.0999	462.9399	332.3315	141.1592	40.5565	0.0000	0.0000	0.0000	0.0000	160.7732	420.4242	667.2790	(98c)
Space heating per m2	2871.5634	2871.5634	2871.5634	2871.5634	2871.5634	2871.5634	2871.5634	2871.5634	2871.5634	2871.5634	2871.5634	2871.5634	(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 %)												88.5000 (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												

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Space heating efficiency (main heating system 1)	646.0999	462.9399	332.3315	141.1592	40.5565	0.0000	0.0000	0.0000	0.0000	160.7732	420.4242	667.2790 (98)
Space heating fuel (main heating system)	88.5000	88.5000	88.5000	88.5000	88.5000	0.0000	0.0000	0.0000	0.0000	88.5000	88.5000	88.5000 (210)
Space heating efficiency (main heating system 2)	730.0564	523.0960	375.5158	159.5019	45.8265	0.0000	0.0000	0.0000	0.0000	181.6647	475.0556	753.9876 (211)
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 (212)
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 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	239.3521	211.0116	222.5781	191.9781	183.5538	162.6381	158.5428	166.4056	169.9588	192.8167	209.0477	236.2579 (64)
Efficiency of water heater (217)m	88.0894	88.0248	87.8922	87.6293	87.2677	87.0000	87.0000	87.0000	87.0000	87.6757	87.9961	87.0000 (216)
Fuel for water heating, kWh/month	271.7148	239.7183	253.2399	219.0797	210.3342	186.9404	182.2331	191.2708	195.3549	219.9204	237.5646	268.1616 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	24.3993	19.5740	17.6242	12.9123	9.9738	8.1487	9.0984	11.8265	15.3614	20.1550	22.7651	25.0774 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-29.6624	-45.7979	-72.3148	-87.0055	-96.8193	-91.2246	-89.7042	-82.9422	-70.7644	-54.6690	-33.6686	-24.9819 (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	-13.3821	-32.0932	-74.8774	-128.7797	-183.9535	-190.1695	-185.7447	-148.6166	-97.5031	-49.0071	-18.6217	-10.1861 (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												3244.7044 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												87.0000
Water heating fuel used												2675.5327 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												196.9161 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1912.4894 (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												4290.6639 (238)

10a. Fuel costs - using BEDF prices (554)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3244.7044	5.6000	181.7034 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2675.5327	5.6000	149.8298 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	86.0000	26.0600	22.4116 (249)
Energy for lighting	196.9161	26.0600	51.3163 (250)
Additional standing charges			99.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-779.5547	26.0600	-203.1520
PV Unit electricity exported	-1132.9346	5.8100	-65.8235
Total			-268.9755 (252)
Total energy cost			235.2857 (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	3244.7044	0.2100	681.3879 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2675.5327	0.2100	561.8619 (264)
Space and water heating			1243.2498 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	196.9161	0.1443	28.4211 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-779.5547	0.1332	-103.8666
PV Unit electricity exported	-1132.9346	0.1227	-138.9673
Total			-242.8339 (269)
Total CO2, kg/year			1040.7662 (272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
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Space heating - main system 1	3244.7044	1.1300	3666.5160 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2675.5327	1.1300	3023.3519 (278)
Space and water heating			6689.8679 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	196.9161	1.5338	302.0365 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-779.5547	1.4924	-1163.3748
PV Unit electricity exported	-1132.9346	0.4501	-509.9321
Total			-1673.3069 (283)
Total Primary energy kWh/year			5448.6983 (286)

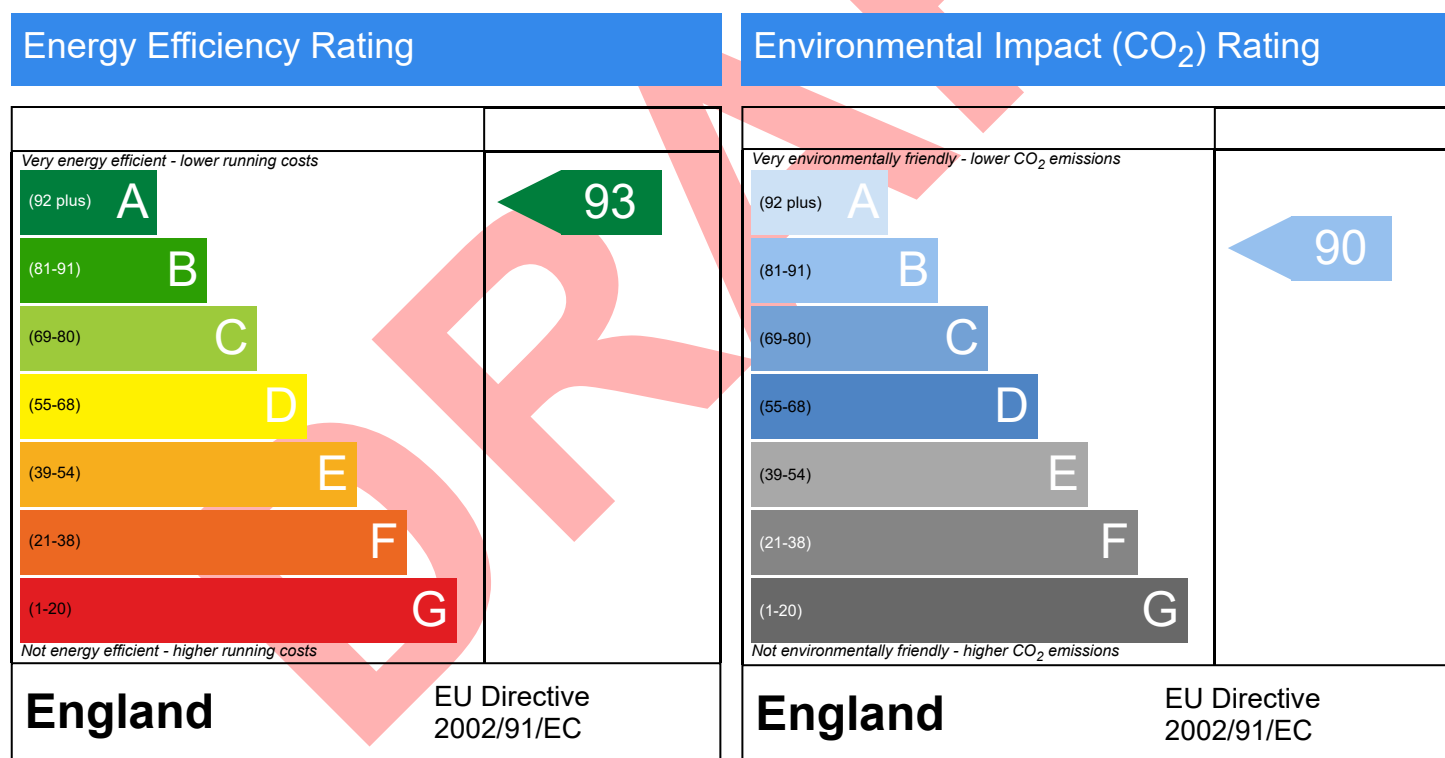
Predicted Energy Assessment



Dwelling type: House, Detached
Date of assessment: 15/11/2024
Produced by: Victoria Gartside
Total floor area: 89.24 m²
DRRN:

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

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



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

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