

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 10:34:33

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

Dwelling Details			
Assessment Type	As designed	Total Floor Area	85 m ²
Site Reference	SAP VG 21-0282	Plot Reference	Plot 22
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	11.38 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	11.3 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	59.42 kWh _{PE} /m ²		
Dwelling primary energy	59.18 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	36.5 kWh/m ²		
Dwelling fabric energy efficiency	33.6 kWh/m ²		OK

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.19	Walls (1) (0.19)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	0.13	Ground Floor (0.13)	OK
Roofs	0.16	0.09	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)	76.23	0.19	
Party wall: Party Wall (1)	43.59	0 (!)	
Ground floor: Ground Floor, Ground Floor	42.63	0.13	
Exposed roof: Roof (1)	42.63	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	5.59	West	0.7	1.3
Rear , Windows	8.02	East	0.7	1.3
Front Door, Door	2.14	West	N/A	1.3
Side , Windows	0.71	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
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.038 (!)	E18-04
Party wall	P1: Ground floor	Calculated by person with suitable expertise	0.069	Manufacturer Declaration
Party wall	P2: Intermediate floor within a dwelling	SAP table default	0 (!)	
Party wall	P4: Roof (insulation at ceiling level)	Calculated by person with suitable expertise	0.101	MPW-P4-01

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

Maximum permitted air permeability at 50Pa	8 m ³ /hm ²	
Dwelling air permeability at 50Pa	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

3 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	1.62 kWp	
Orientation	East	
Pitch	45°	
Overshading	None or very little	
Manufacturer		
MCS certificate		
Technology type: Photovoltaic system (2)		
Peak power	0.85 kWp	
Orientation	West	
Pitch	30°	
Overshading	None or very little	
Manufacturer	PV	
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 22	Prop Type Ref	SAP VG 21-0282
Property			

SAP Rating	93 A	DER	11.30	TER	11.38
Environmental	91 B	% DER < TER			0.70
CO ₂ Emissions (t/year)	0.92	DFEE	33.59	TFEE	36.48
Compliance Check	See BREL	% DFEE < TFEE			7.92
% DPER < TPER	0.41	DPER	59.18	TPER	59.42

Assessor Details	Miss Victoria Gartside	Assessor ID	AL30-0001
Client			

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

Orientation	West
Property Tenure	ND
Transaction Type	6
Terrain Type	Suburban
1.0 Property Type	House, Semi-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	1
5.0 Sunlight/Shade	Average or unknown
6.0 Thermal Mass Parameter	Precise calculation
Thermal Mass	227.01 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:	18.50 m	42.63 m ²	2.39 m
1st Storey:	18.50 m	42.63 m ²	2.62 m
2nd Storey:	32.20 m	60.31 m ²	2.28 m

8.0 Living Area	12.42 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	92.69	76.23	0.00	None	16.46	Enter Gross Area

9.1 Party Walls	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)	Shelter Res	Shelter
	Party Wall	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	43.59	0.00	None

9.2 Internal Walls	Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
	Studs	Plasterboard on timber frame	9.00	160.34

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	42.63	42.63	None	0.00	Enter Gross Area	0.00

10.2 Internal Ceilings

Summary for Input Data

Description	Storey	Construction	Area (m²)
Internal Ceiling 1	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	42.63

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.13	None	0.00	75.00	42.63

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1		Plasterboard ceiling, carpeted chipboard floor	9.00	42.63

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	West	5.59	0
Rear	Windows	External Wall	East	8.02	0
Front Door	Door	External Wall	West	2.14	0
Side	Windows	External Wall	South	0.71	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	11.20	0.02	0.02 MFF-150-E2-02	No
E3 Sill	Independently assessed	8.37	0.02	0.02 E3-01	No
E4 Jamb	Independently assessed	25.50	0.02	0.02 E4-01 RCD	No
E5 Ground floor (normal)	Independently assessed	18.50	0.09	0.09 Manufacturer Declaration	No
E10 Eaves (insulation at ceiling level)	Independently assessed	9.80	0.06	0.06 E10-01	No
E16 Corner (normal)	Independently assessed	10.02	0.05	0.05 E16-01 RCD	No
E6 Intermediate floor within a dwelling	Independently assessed	18.50	0.00	0.00 E6-01 RCD	No
E12 Gable (insulation at ceiling level)	Independently assessed	8.70	0.06	0.06 E12-01 RCD	No
E18 Party wall between dwellings	Independently assessed	10.02	0.04	0.04 E18-04	No
P1 Party wall - Ground floor	Independently assessed	8.70	0.07	0.07 Manufacturer Declaration	No
P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	8.70	0.00	0.00	No
P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	8.70	0.10	0.10 MPW-P4-01	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 Kitchen	0
0.15	In Room Fan Other Wet Room	2
0.00	In Duct Fan Kitchen	0
0.00	In Duct Fan Other Wet Room	0
0.11	Through Wall Fan Kitchen	1
0.14	Through Wall Fan Other Wet Room	2

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

4

Number of passive vents

0

Number of flueless gas fires

0

Summary for Input Data

21.0 Fixed Cooling System		No	
22.0 Pressure Testing		Yes	
Designed AP ₅₀	4.00	m³/(h.m²) @ 50 Pa	
Property Tested?	Yes		
Test Method	Blower Door		
22.0 Lighting		No	
No Fixed Lighting	No		
	Name	Efficacy	Power
	Lighting 1	85.00	10.00
			Capacity
			850.00
			Count
			16
24.0 Main Heating 1		Database	
Percentage of Heat	100.00	%	
Database Ref. No.	18119		
Fuel Type	Mains gas		
SAP Code	0		
In Winter	88.50		
In Summer	87.00		
Model Name	ecoTEC sustain 28		
Manufacturer	Vaillant		
System Type	Combi boiler		
Controls SAP Code	2110		
Delayed Start Stat	Yes		
Burner Control	Modulating		
HETAS approved System	No		
Flue Type	Balanced		
Fan Assisted Flue	Yes		
Is MHS Pumped	Pump in heated space		
Heating Pump Age	2013 or later		
Heat Emitter	Radiators and Underfloor		
Underfloor Heating	Yes - Pipes in thin screed		
Flow Temperature	Unknown		
Flow Temperature Value	45.00		
Boiler Interlock	Yes		
Combi boiler type	Standard Combi		
25.0 Main Heating 2		None	
26.0 Heat Networks		None	
	Heat Source	Fuel Type	Heating Use
	Efficiency	Percentage Of Heat	Heat
			Heat Power Ratio
	Electrical	Fuel Factor	Efficiency type
Heat source 1	None		
Heat source 2	None		
Heat source 3	None		
Heat source 4	None		
Heat source 5	None		
27.0 Secondary Heating		None	
28.0 Water Heating		Main Heating 1	
Water Heating	Main Heating 1		
SAP Code	901		
Flue Gas Heat Recovery System	No		
Waste Water Heat Recovery Instantaneous System 1	No		
Waste Water Heat Recovery Instantaneous System 2	No		

Summary for Input Data

Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Immersion Heater	Single
Summer Immersion	No
Cold Water Source	From mains
Bath Count	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	None			
Cylinder Stat	Yes			
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

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
1.62	East	45°	None Or Little	No	No	1.00		
0.85	West	30°	None Or Little	No	No	1.00		PV

34.0 Small-scale Hydro

None	
Electricity Generated	0.00
Apportioned	0.00
Connected to dwelling's electricity meter	Yes
Electricity Generation	Annual

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

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout



Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024
Assessment Reference	Plot 22		Prop Type Ref	SAP VG 21-0282		
Property						
SAP Rating	93 A	DER	11.30	TER	11.38	
Environmental	91 B	% DER < TER				0.70
CO ₂ Emissions (t/year)	0.92	DFEE	33.59	TFEE	36.48	
Compliance Check	See BREL	% DFEE < TFEE				7.92
% DPER < TPER	0.41	DPER	59.18	TPER	59.42	
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	42.6300 (1b)	x 2.3900 (2b)	= 101.8857 (1b) - (3b)
First floor	42.6300 (1c)	x 2.6200 (2c)	= 111.6906 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.5763 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1873 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3873 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3582 (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	0.4568	0.4478	0.4388	0.3941	0.3851	0.3403	0.3403	0.3314	0.3582	0.3851	0.4030	0.4209 (22b)
Effective ac	0.6043	0.6003	0.5963	0.5776	0.5742	0.5579	0.5579	0.5549	0.5642	0.5742	0.5812	0.5886 (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 (U _w = 1.30)			14.3200	1.2357	17.6958		(27)
Door			2.1400	1.3000	2.7820		(26a)
Ground Floor			42.6300	0.1300	5.5419	75.0000	3197.2500 (28a)
External Wall	92.6900	16.4600	76.2300	0.1900	14.4837	110.0000	8385.3000 (29a)
Plane Roof	42.6300		42.6300	0.0900	3.8367	9.0000	383.6700 (30)
Total net area of external elements A _{um} (A, m ²)			177.9500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	44.3401			(33)
Party Wall			43.5900	0.0000	0.0000	110.0000	4794.9000 (32)
Studs			160.3400			9.0000	1443.0600 (32c)
Internal Floor 1			42.6300			18.0000	767.3400 (32d)
Internal Ceiling 1			42.6300			9.0000	383.6700 (32e)
Heat capacity C _m = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =				19355.1900 (34)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							227.0137 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				11.2000	0.0240	0.2688	
E3 Sill				8.3700	0.0210	0.1758	
E4 Jamb				25.5000	0.0160	0.4080	

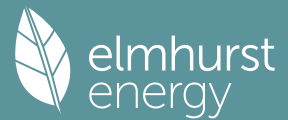
Ventilation heat loss calculated monthly (39)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	42.5921	42.3066	42.0268	40.7124	40.4665	39.3217	39.3217	39.1097	39.7627	40.4665	40.9640	41.4841 (38)
Heat transfer coeff	92.9003	92.6148	92.3350	91.0206	90.7747	89.6299	89.6299	89.4179	90.0709	90.7747	91.2722	91.7923 (39)
Average = Sum(39)m / 12 =												91.0194
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1.0896	1.0863	1.0830	1.0676	1.0647	1.0513	1.0513	1.0488	1.0564	1.0647	1.0705	1.0766 (40)
HLP (average)												1.0676
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

Assumed occupancy													2.5551 (42)
Hot water usage for mixer showers	67.0609	66.0531	64.5845	61.7747	59.7011	57.3887	56.0743	57.5318	59.1294	61.6122	64.4824	66.8039 (42a)	
Hot water usage for baths	28.9616	28.5315	27.9258	26.8090	25.9727	25.0455	24.5446	25.1461	25.8009	26.7932	27.9330	28.8637 (42b)	
Hot water usage for other uses	40.7971	39.3136	37.8300	36.3465	34.8630	33.3794	33.3794	34.8630	36.3465	37.8300	39.3136	40.7971 (42c)	
Average daily hot water use (litres/day)												125.7681 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	136.8196	133.8981	130.3403	124.9302	120.5369	115.8136	113.9984	117.5408	121.2769	126.2354	131.7289	136.4647 (44)	
Energy content (annual)	216.6888	190.6692	200.3283	171.0232	162.2658	142.4064	137.8712	145.5401	149.5465	171.3003	187.6720	213.6708 (45)	
Distribution loss (46)m = 0.15 x (45)m	32.5033	28.6004	30.0492	25.6535	24.3399	21.3610	20.6807	21.8310	22.4320	25.6950	28.1508	32.0506 (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	19.3765	17.4504	19.2113	18.3608	18.8268	18.0718	18.5804	18.6579	18.1439	18.9181	18.5290	19.3460 (61)	
Total heat required for water heating calculated for each month	236.0653	208.1195	219.5395	189.3840	181.0926	160.4782	156.4516	164.1980	167.6904	190.2184	206.2010	233.0168 (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	236.0653	208.1195	219.5395	189.3840	181.0926	160.4782	156.4516	164.1980	167.6904	190.2184	206.2010	233.0168 (64)	
12Total per year (kWh/year)												2312.4553 (64)	
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
												0.0000 (64a)	
Heat gains from water heating, kWh/month	76.8931	67.7601	71.4120	61.4554	58.6601	51.8681	50.4873	53.0566	54.2602	61.6869	67.0332	75.8820 (65)	

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.9548	132.8070	119.9548	123.9532	119.9548	123.9532	119.9548	119.9548	123.9532	119.9548	123.9532	119.9548 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	230.0824	232.4699	226.4534	213.6450	197.4766	182.2806	172.1288	169.7413	175.7578	188.5662	204.7346	219.9306 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757 (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)	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052 (71)
Water heating gains (Table 5)	103.3510	100.8335	95.9838	85.3548	78.8442	72.0390	67.8592	71.3126	75.3614	82.9125	93.1017	101.9920 (72)
Total internal gains	517.7151	530.4374	506.7190	487.2800	460.6025	439.5998	421.2698	422.3356	436.3994	455.7604	486.1164	506.2043 (73)

[Jan]					Area m2	Solar flux Table 6a	g Specific data or Table 6b		FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East					8.0200	19.6403	0.7300		0.7000	0.7700	55.7797 (76)	
South					0.7100	46.7521	0.7300		0.7000	0.7700	11.7547 (78)	
West					5.5900	19.6403	0.7300		0.7000	0.7700	38.8788 (80)	
Solar gains	106.4132	204.4233	329.4747	472.4703	573.9449	585.7639	558.3666	482.6744	380.2887	240.4866	131.9614	87.9997 (83)
Total gains	624.1284	734.8607	836.1937	959.7503	1034.5475	1025.3638	979.6363	905.0099	816.6880	696.2470	618.0778	594.2040 (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	57.8733	58.0516	58.2276	59.0684	59.2284	59.9849	59.9849	60.1271	59.6913	59.2284	58.9056	58.5718
alpha	4.8582	4.8701	4.8818	4.9379	4.9486	4.9990	4.9990	5.0085	4.9794	4.9486	4.9270	4.9048
util living area	0.9928	0.9836	0.9598	0.8833	0.7378	0.5455	0.4000	0.4497	0.7030	0.9305	0.9850	0.9943 (86)
MIT	19.9774	20.1452	20.3839	20.6751	20.8537	20.9232	20.9354	20.9336	20.8887	20.6310	20.2555	19.9553 (87)
Th 2	20.0093	20.0121	20.0148	20.0274	20.0298	20.0408	20.0408	20.0429	20.0366	20.0298	20.0250	20.0200 (88)
util rest of house	0.9907	0.9789	0.9484	0.8532	0.6816	0.4695	0.3141	0.3585	0.6249	0.9051	0.9799	0.9926 (89)
MIT 2	18.8169	19.0316	19.3319	19.6896	19.8817	19.9529	19.9605	19.9619	19.9244	19.6498	19.1834	18.7973 (90)
Living area fraction									fLA = Living area /	(4) =		0.1457 (91)
MIT	18.9859	19.1938	19.4852	19.8332	20.0233	20.0943	20.1025	20.1034	20.0649	19.7927	19.3396	18.9660 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.8359	19.0438	19.3352	19.6832	19.8733	19.9443	19.9525	19.9534	19.9149	19.6427	19.1896	18.8160 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9872	0.9728	0.9384	0.8408	0.6717	0.4616	0.3062	0.3499	0.6142	0.8924	0.9739	0.9897 (94)
Useful gains	616.1438	714.8661	784.7122	806.9244	694.9316	473.2649	299.9162	316.6474	501.6315	621.3073	601.9186	588.0577 (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	1350.3925	1309.9291	1185.1342	981.4907	741.9313	479.0078	300.4829	317.7396	523.7508	820.8490	1103.4396	1341.6315 (97)
Space heating kWh	546.2810	399.8823	297.9139	125.6878	34.9677	0.0000	0.0000	0.0000	0.0000	148.4590	361.0951	560.6589 (98a)
Space heating requirement - total per year (kWh/year)												2474.9459
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	546.2810	399.8823	297.9139	125.6878	34.9677	0.0000	0.0000	0.0000	0.0000	148.4590	361.0951	560.6589 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2474.9459
Space heating per m2										(98c) / (4) =		29.0282 (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	546.2810	399.8823	297.9139	125.6878	34.9677	0.0000	0.0000	0.0000	0.0000	148.4590	361.0951	560.6589 (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)	617.2667	451.8445	336.6259	142.0201	39.5115	0.0000	0.0000	0.0000	0.0000	167.7503	408.0171	633.5129 (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	236.0653	208.1195	219.5395	189.3840	181.0926	160.4782	156.4516	164.1980	167.6904	190.2184	206.2010	233.0168 (64)
Efficiency of water heater (217)m	88.0420	87.9808	87.8573	87.5922	87.2393	87.0000	87.0000	87.0000	87.0000	87.6512	87.9488	88.0543 (216)
Fuel for water heating, kWh/month	268.1281	236.5512	249.8819	216.2110	207.5814	184.4577	179.8294	188.7333	192.7476	217.0174	234.4556	264.6286 (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	24.4148	19.5865	17.6354	12.9205	9.9801	8.1539	9.1042	11.8340	15.3712	20.1679	22.7795	25.0934 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-26.9270	-41.9242	-66.8198	-81.1507	-90.9213	-85.8976	-84.4524	-77.7695	-65.8603	-50.3220	-30.6708	-22.6373 (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	-11.5352	-27.8364	-65.4233	-113.3011	-162.5898	-168.3776	-164.3657	-131.0831	-85.5095	-42.6428	-16.0844	-8.7660 (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												2796.5490 (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												2640.2233 (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)												197.0413 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1722.8677 (233)

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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	3996.9460 (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	2796.5490	0.2100	587.2753 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2640.2233	0.2100	554.4469 (264)
Space and water heating			1141.7222 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	197.0413	0.1443	28.4392 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-725.3529	0.1331	-96.5186
PV Unit electricity exported	-997.5147	0.1225	-122.2043
Total			-218.7229 (269)
Total CO2, kg/year			963.3677 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.3000 (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	2796.5490	1.1300	3160.1004 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2640.2233	1.1300	2983.4523 (278)
Space and water heating			6143.5527 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	197.0413	1.5338	302.2286 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-725.3529	1.4917	-1082.0121
PV Unit electricity exported	-997.5147	0.4495	-448.4124
Total			-1530.4245 (283)
Total Primary energy kWh/year			5045.4576 (286)
Dwelling Primary energy Rate (DPER)			59.1800 (287)

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

1. Overall dwelling characteristics

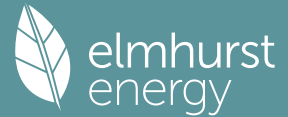
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	42.6300 (1b)	x 2.3900 (2b)	= 101.8857 (1b) - (3b)
First floor	42.6300 (1c)	x 2.6200 (2c)	= 111.6906 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.5763 (5)

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)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1405 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3905 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3612 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.4605	0.4515	0.4424	0.3973	0.3883	0.3431	0.3431	0.3341	0.3612	0.3883	0.4063	0.4244 (22b)
Effective ac	0.6060	0.6019	0.5979	0.5789	0.5754	0.5589	0.5589	0.5558	0.5652	0.5754	0.5826	0.5901 (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)			14.3200	1.1450	16.3969			(27)
Ground Floor			42.6300	0.1300	5.5419			(28a)
External Wall	92.6900	16.4600	76.2300	0.1800	13.7214			(29a)
Plane Roof	42.6300		42.6300	0.1100	4.6893			(30)
Total net area of external elements Aum(A, m2)			177.9500					(31)
Fabric heat loss, W/K = Sum (A x U)						42.4895		(33)
Party Wall			43.5900	0.0000	0.0000			(32)

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

227.0137 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	11.2000	0.0500	0.5600	
E3 Sill	8.3700	0.0500	0.4185	
E4 Jamb	25.5000	0.0500	1.2750	
E5 Ground floor (normal)	18.5000	0.1600	2.9600	
E10 Eaves (insulation at ceiling level)	9.8000	0.0600	0.5880	
E16 Corner (normal)	10.0200	0.0900	0.9018	
E6 Intermediate floor within a dwelling	18.5000	0.0000	0.0000	
E12 Gable (insulation at ceiling level)	8.7000	0.0600	0.5220	
E18 Party wall between dwellings	10.0200	0.0600	0.6012	
P1 Party wall - Ground floor	8.7000	0.0800	0.6960	
P2 Party wall - Intermediate floor within a dwelling	8.7000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	8.7000	0.1200	1.0440	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				9.5665 (36)
Point Thermal bridges				0.0000
Total fabric heat loss				(33) + (36) + (36a) = 52.0560 (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	42.7133	42.4231	42.1386	40.8026	40.5526	39.3890	39.3890	39.1735	39.8372	40.5526	41.0583	41.5870	(38)
Average = Sum(39)m / 12 =	94.7693	94.4791	94.1947	92.8586	92.6087	91.4450	91.4450	91.2295	91.8932	92.6087	93.1144	93.6430	(39)
												92.8574	
HLP	1.1115	1.1081	1.1048	1.0891	1.0862	1.0725	1.0725	1.0700	1.0778	1.0862	1.0921	1.0983	(40)
HLP (average)												1.0891	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

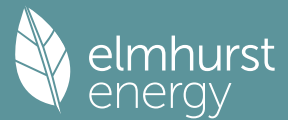
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5551 (42)
Hot water usage for mixer showers													
67.0609	66.0531	64.5845	61.7747	59.7011	57.3887	56.0743	57.5318	59.1294	61.6122	64.4824	66.8039	66.8039	(42a)
Hot water usage for baths													
28.9616	28.5315	27.9258	26.8090	25.9727	25.0455	24.5446	25.1461	25.8009	26.7932	27.9330	28.8637	28.8637	(42b)
Hot water usage for other uses													
40.7971	39.3136	37.8300	36.3465	34.8630	33.3794	33.3794	34.8630	36.3465	37.8300	39.3136	40.7971	40.7971	(42c)
Average daily hot water use (litres/day)													125.7681 (43)
Daily hot water use													
136.8196	133.8981	130.3403	124.9302	120.5369	115.8136	113.9984	117.5408	121.2769	126.2354	131.7289	136.4647	136.4647	(44)
Energy conte	216.6888	190.6692	200.3283	171.0232	162.2658	142.4064	137.8712	145.5401	149.5465	171.3003	187.6720	213.6708	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													2088.9824
32.5033	28.6004	30.0492	25.6535	24.3399	21.3610	20.6807	21.8310	22.4320	25.6950	28.1508	32.0506	32.0506	(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													
267.6477	236.6966	251.2872	220.3383	213.2247	191.7214	188.8301	196.4990	198.8616	222.2592	236.9871	264.6297	264.6297	(62)
WWHRS	-30.6574	-27.1137	-28.3919	-23.5096	-21.9101	-18.7486	-17.5739	-18.6880	-19.3981	-22.8682	-25.9069	-30.0897	(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	236.9902	209.5829	222.8953	196.8287	191.3146	172.9728	171.2562	177.8109	179.4635	199.3910	211.0802	234.5400	(64)
12Total per year (kWh/year)													2404.1263 (64)
Electric shower(s)													2404 (64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month													
84.7887	74.9043	79.3489	69.1940	66.6931	59.6789	58.5819	61.1318	62.0530	69.6971	74.7297	83.7853	83.7853	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
119.9548	132.8070	119.9548	123.9532	119.9548	123.9532	119.9548	119.9548	123.9532	119.9548	123.9532	119.9548	119.9548	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
230.0824	232.4699	226.4534	213.6450	197.4766	182.2806	172.1288	169.7413	175.7578	188.5662	204.7346	219.9306	219.9306	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	(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)													
-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	(71)
Water heating gains (Table 5)													
113.9634	111.4648	106.6517	96.1028	89.6413	82.8873	78.7391	82.1664	86.1847	93.6789	103.7913	112.6146	112.6146	(72)
Total internal gains													

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528.3275 541.0688 517.3869 498.0279 471.3996 450.4482 432.1496 433.1894 447.2227 466.5268 496.8061 516.8269 (73)

6. Solar gains

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

East					8.0200	19.6403	0.6300	0.7000			0.7700	48.1386 (76)
South					0.7100	46.7521	0.6300	0.7000			0.7700	10.1445 (78)
West					5.5900	19.6403	0.6300	0.7000			0.7700	33.5530 (80)

Solar gains	91.8361	176.4201	284.3412	407.7484	495.3223	505.5223	481.8780	416.5546	328.1943	207.5432	113.8845	75.9450 (83)
Total gains	620.1636	717.4889	801.7281	905.7763	966.7219	955.9705	914.0276	849.7440	775.4170	674.0700	610.6906	592.7718 (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	56.7319	56.9061	57.0780	57.8992	58.0555	58.7942	58.7942	58.9331	58.5075	58.0555	57.7402	57.4142
alpha	4.7821	4.7937	4.8052	4.8599	4.8704	4.9196	4.9196	4.9289	4.9005	4.8704	4.8493	4.8276
util living area	0.9931	0.9854	0.9666	0.9051	0.7785	0.5897	0.4358	0.4860	0.7377	0.9398	0.9860	0.9944 (86)
MIT	19.6792	19.8871	20.1916	20.5832	20.8507	20.9704	20.9945	20.9908	20.9147	20.5474	20.0508	19.6525 (87)
Th 2	19.9914	19.9942	19.9969	20.0097	20.0121	20.0233	20.0233	20.0254	20.0190	20.0121	20.0073	20.0022 (88)
util rest of house	0.9910	0.9812	0.9567	0.8785	0.7237	0.5087	0.3413	0.3869	0.6594	0.9168	0.9812	0.9927 (89)
MIT 2	18.4620	18.7275	19.1117	19.5943	19.8886	20.0063	20.0214	20.0220	19.9615	19.5652	18.9467	18.4356 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.6393	18.8964	19.2690	19.7384	20.0287	20.1467	20.1632	20.1631	20.1003	19.7083	19.1076	18.6129 (91)
Temperature adjustment	0.0000											
adjusted MIT	18.6393	18.8964	19.2690	19.7384	20.0287	20.1467	20.1632	20.1631	20.1003	19.7083	19.1076	18.6129 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9871	0.9749	0.9475	0.8699	0.7247	0.5193	0.3550	0.4012	0.6665	0.9079	0.9751	0.9894 (94)
Useful gains	612.1601	699.4599	759.6663	787.9497	700.6299	496.4314	324.5218	340.9465	516.8026	611.9986	595.4912	586.4592 (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	1358.9244	1322.3677	1202.7705	1006.4345	771.3144	507.2199	325.8362	343.3064	551.3913	843.5045	1118.0755	1349.6647 (97)
Space heating kWh	555.5926	418.5940	329.6695	157.3090	52.5893	0.0000	0.0000	0.0000	0.0000	172.2404	376.2607	567.8249 (98a)
Space heating requirement - total per year (kWh/year)	2630.0804											
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	555.5926	418.5940	329.6695	157.3090	52.5893	0.0000	0.0000	0.0000	0.0000	172.2404	376.2607	567.8249 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2630.0804											
Space heating per m2	(98c) / (4) = 30.8478 (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	555.5926	418.5940	329.6695	157.3090	52.5893	0.0000	0.0000	0.0000	0.0000	172.2404	376.2607	567.8249 (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)	601.2907	453.0238	356.7851	170.2479	56.9148	0.0000	0.0000	0.0000	0.0000	186.4074	407.2085	614.5291 (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	236.9902	209.5829	222.8953	196.8287	191.3146	172.9728	171.2562	177.8109	179.4635	199.3910	211.0802	234.5400 (64)
Efficiency of water heater	86.1414	85.8330	85.2184	83.9055	82.0106	80.3000	80.3000	80.3000	80.3000	84.0693	85.6051	86.2014 (216)
Fuel for water heating, kWh/month	275.1175	244.1751	261.5576	234.5837	233.2803	215.4082	213.2705	221.4333	223.4913	237.1747	246.5743	272.0838 (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	24.9242	19.9951	18.0034	13.1901	10.1884	8.3240	9.2942	12.0809	15.6919	20.5887	23.2549	25.6169 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-39.5521	-55.5898	-79.6604	-89.2796	-96.0212	-89.5226	-88.3991	-83.5651	-75.0104	-63.4136	-43.4155	-34.2139 (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	-22.8666	-48.0457	-95.3950	-143.1404	-189.1456	-190.0165	-187.7959	-159.0755	-116.6790	-68.6830	-30.5202	-18.0880 (233b)

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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	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	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	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													2846.4073	(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													2878.1504	(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)													201.1528	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-2107.0946	(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													3904.6160	(238)

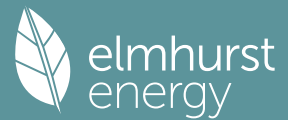
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2846.4073	0.2100	597.7455 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2878.1504	0.2100	604.4116 (264)
Space and water heating			1202.1571 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	201.1528	0.1443	29.0326 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-837.6432	0.1347	-112.7936
PV Unit electricity exported	-1269.4513	0.1259	-159.8521
Total			-272.6457 (269)
Total CO2, kg/year			970.4732 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.3800 (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	2846.4073	1.1300	3216.4403 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2878.1504	1.1300	3252.3099 (278)
Space and water heating			6468.7502 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	201.1528	1.5338	308.5349 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-837.6432	1.4977	-1254.5125
PV Unit electricity exported	-1269.4513	0.4622	-586.7685
Total			-1841.2810 (283)
Total Primary energy kWh/year			5066.1049 (286)
Target Primary Energy Rate (TPER)			59.4200 (287)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 22			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	93 A		DER	11.30		TER	11.38
Environmental	91 B		% DER < TER				0.70
CO ₂ Emissions (t/year)	0.92		DFEE	33.59		TFEE	36.48
Compliance Check	See BREL		% DFEE < TFEE				7.92
% DPER < TPER	0.41		DPER	59.18		TPER	59.42
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	42.6300 (1b)	x 2.3900 (2b)	= 101.8857 (1b) - (3b)
First floor	42.6300 (1c)	x 2.6200 (2c)	= 111.6906 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.5763 (5)

2. Ventilation rate

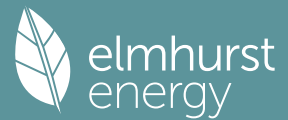
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1405 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	(17)
Infiltration rate	0.3405	(18)
Number of sides sheltered	1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3149 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750
	0.4015	0.3937	0.3858	0.3464	0.3385	0.2992	0.2992	0.2913	0.3149	0.3385	0.3543	0.3700
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000
Effective ac	0.5806	0.5775	0.5744	0.5600	0.5573	0.5448	0.5448	0.5424	0.5496	0.5573	0.5628	0.5685

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)			14.3200	1.2357	17.6958		(27)
Door			2.1400	1.3000	2.7820		(26a)
Ground Floor			42.6300	0.1300	5.5419	75.0000	3197.2500 (28a)
External Wall	92.6900	16.4600	76.2300	0.1900	14.4837	110.0000	8385.3000 (29a)
Plane Roof	42.6300		42.6300	0.0900	3.8367	9.0000	383.6700 (30)
Total net area of external elements Aum(A, m ²)			177.9500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.3401		(33)
Party Wall			43.5900	0.0000	0.0000	110.0000	4794.9000 (32)
Studs			160.3400			9.0000	1443.0600 (32c)
Internal Floor 1			42.6300			18.0000	767.3400 (32d)
Internal Ceiling 1			42.6300			9.0000	383.6700 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	19355.1900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							227.0137 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				11.2000	0.0240	0.2688	

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E3 Sill	8.3700	0.0210	0.1758
E4 Jamb	25.5000	0.0160	0.4080
E5 Ground floor (normal)	18.5000	0.0920	1.7020
E10 Eaves (insulation at ceiling level)	9.8000	0.0580	0.5684
E16 Corner (normal)	10.0200	0.0470	0.4709
E6 Intermediate floor within a dwelling	18.5000	0.0010	0.0185
E12 Gable (insulation at ceiling level)	8.7000	0.0570	0.4959
E18 Party wall between dwellings	10.0200	0.0380	0.3808
P1 Party wall - Ground floor	8.7000	0.0690	0.6003
P2 Party wall - Intermediate floor within a dwelling	8.7000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	8.7000	0.1010	0.8787
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.9681 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	50.3082 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	40.9219	40.7013	40.4850	39.4692	39.2792	38.3945	38.3945	38.2306	38.7352	39.2792	39.6636	40.0656	(38)
Heat transfer coeff	91.2301	91.0094	90.7932	89.7774	89.5874	88.7026	88.7026	88.5388	89.0434	89.5874	89.9718	90.3738	(39)
Average = Sum(39)m / 12 =												89.7765	
HLP	1.0700	1.0674	1.0649	1.0530	1.0508	1.0404	1.0404	1.0385	1.0444	1.0508	1.0553	1.0600	(40)
HLP (average)												1.0530	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5551 (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	28.9616	28.5315	27.9258	26.8090	25.9727	25.0455	24.5446	25.1461	25.8009	26.7932	27.9330	28.8637	(42b)
Hot water usage for other uses	40.7971	39.3136	37.8300	36.3465	34.8630	33.3794	33.3794	34.8630	36.3465	37.8300	39.3136	40.7971	(42c)
Average daily hot water use (litres/day)												63.9402	(43)
Daily hot water use	69.7587	67.8450	65.7558	63.1555	60.8357	58.4249	57.9240	60.0090	62.1475	64.6232	67.2465	69.6608	(44)
Energy conte	110.4807	96.6104	101.0642	86.4567	81.8966	71.8402	70.0541	74.3037	76.6340	87.6931	95.8050	109.0720	(45)
Energy content (annual)										Total = Sum(45)m =		1061.9108	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	93.9086	82.1189	85.9046	73.4882	69.6121	61.0642	59.5460	63.1582	65.1389	74.5391	81.4342	92.7112	(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	93.9086	82.1189	85.9046	73.4882	69.6121	61.0642	59.5460	63.1582	65.1389	74.5391	81.4342	92.7112	(64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				902.6242	(64)
Electric shower(s)	53.7046	47.8512	52.2517	49.8632	50.7988	48.4572	50.0724	50.7988	49.8632	52.2517	51.2692	53.7046	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												610.8866	(64a)
Heat gains from water heating, kWh/month	36.9033	32.4925	34.5391	30.8378	30.1027	27.3803	27.4046	28.4893	28.7505	31.6977	33.1759	36.6039	(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	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.9548	132.8070	119.9548	123.9532	119.9548	123.9532	119.9548	119.9548	123.9532	119.9548	123.9532	119.9548	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	230.0824	232.4699	226.4534	213.6450	197.4766	182.2806	172.1288	169.7413	175.7578	188.5662	204.7346	219.9306	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	(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)	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	(71)
Water heating gains (Table 5)	49.6012	48.3520	46.4235	42.8303	40.4607	38.0283	36.8341	38.2920	39.9313	42.6044	46.0776	49.1988	(72)
Total internal gains	460.9653	474.9559	454.1586	441.7555	419.2190	405.5891	390.2447	389.3150	400.9693	412.4524	436.0924	450.4111	(73)

6. Solar gains

[Jan]			Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W				
East			8.0200	19.6403	0.7300	0.7000	0.7700	55.7797 (76)				
South			0.7100	46.7521	0.7300	0.7000	0.7700	11.7547 (78)				
West			5.5900	19.6403	0.7300	0.7000	0.7700	38.8788 (80)				
Solar gains	106.4132	204.4233	329.4747	472.4703	573.9449	585.7639	558.3666	482.6744	380.2887	240.4866	131.9614	87.9997 (83)
Total gains	567.3786	679.3793	783.6334	914.2259	993.1639	991.3530	948.6112	871.9894	781.2580	652.9389	568.0538	538.4108 (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	58.9328	59.0756	59.2164	59.8864	60.0134	60.6120	60.6120	60.7241	60.3800	60.0134	59.7569	59.4912
alpha	4.9289	4.9384	4.9478	4.9924	5.0009	5.0408	5.0408	5.0483	5.0253	5.0009	4.9838	4.9661
util living area	0.9952	0.9878	0.9674	0.8961	0.7527	0.5574	0.4087	0.4617	0.7208	0.9427	0.9892	0.9962 (86)
MIT	19.6791	19.9055	20.2300	20.6308	20.8817	20.9790	20.9964	20.9935	20.9290	20.5627	20.0485	19.6447 (87)
Th 2	20.0254	20.0275	20.0296	20.0394	20.0413	20.0498	20.0498	20.0514	20.0465	20.0413	20.0375	20.0337 (88)
util rest of house	0.9937	0.9843	0.9579	0.8682	0.6976	0.4809	0.3219	0.3692	0.6435	0.9207	0.9855	0.9951 (89)
MIT 2	18.8259	19.0517	19.3709	19.7542	19.9659	20.0405	20.0489	20.0495	20.0095	19.7030	19.2028	18.7981 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.9502	19.1761	19.4960	19.8819	20.0993	20.1772	20.1869	20.1870	20.1435	19.8282	19.3260	18.9214 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.9502	19.1761	19.4960	19.8819	20.0993	20.1772	20.1869	20.1870	20.1435	19.8282	19.3260	18.9214 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9915	0.9802	0.9514	0.8629	0.7011	0.4914	0.3345	0.3826	0.6520	0.9147	0.9817	0.9933 (94)
Useful gains	562.5640	665.9051	745.5562	788.9102	696.3401	487.1456	317.3067	333.6375	509.3657	597.2608	557.6566	534.8070 (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	1336.5350	1299.2569	1179.9506	985.9242	752.4715	494.7148	318.1663	335.2992	538.1298	826.7309	1099.9938	1330.4314 (97)
Space heating kWh	575.8344	425.6124	323.1895	141.8501	41.7618	0.0000	0.0000	0.0000	0.0000	170.7258	390.4828	591.9445 (98a)
Space heating requirement - total per year (kWh/year)	2661.4012											
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	575.8344	425.6124	323.1895	141.8501	41.7618	0.0000	0.0000	0.0000	0.0000	170.7258	390.4828	591.9445 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2661.4012											
Space heating per m2	(98c) / (4) = 31.2151 (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	833.8049	656.3996	672.8950	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9283	0.9642	0.9466	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	774.0329	632.9194	636.9608	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1109.2322	1061.7084	974.5318	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	241.3435	319.0190	251.1529	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											
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 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	60.3359	79.7548	62.7882	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	202.8788 (107)											
Energy for space heating	31.2151 (99)											
Energy for space cooling	2.3795 (108)											
Total	33.5947 (109)											
Fabric Energy Efficiency (DFEE)	33.6 (109)											

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

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

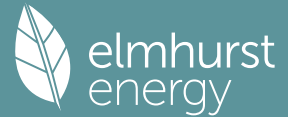
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	42.6300 (1b)	x 2.3900 (2b)	= 101.8857 (1b) - (3b)
First floor	42.6300 (1c)	x 2.6200 (2c)	= 111.6906 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.5763 (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)

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

Air changes per hour
30.0000 / (5) = 0.1405 (8)
Yes
Blower Door
5.0000 (17)
0.3905 (18)
1 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3612 (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	0.4605	0.4515	0.4424	0.3973	0.3883	0.3431	0.3431	0.3341	0.3612	0.3883	0.4063	0.4244	(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	0.6060	0.6019	0.5979	0.5789	0.5754	0.5589	0.5589	0.5558	0.5652	0.5754	0.5826	0.5901	(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)			14.3200	1.1450	16.3969			(27)
Ground Floor			42.6300	0.1300	5.5419			(28a)
External Wall	92.6900	16.4600	76.2300	0.1800	13.7214			(29a)
Plane Roof	42.6300		42.6300	0.1100	4.6893			(30)
Total net area of external elements Aum(A, m2)			177.9500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.4895			(33)
Party Wall			43.5900	0.0000	0.0000			(32)

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

227.0137 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	11.2000	0.0500	0.5600	
E3 Sill	8.3700	0.0500	0.4185	
E4 Jamb	25.5000	0.0500	1.2750	
E5 Ground floor (normal)	18.5000	0.1600	2.9600	
E10 Eaves (insulation at ceiling level)	9.8000	0.0600	0.5880	
E16 Corner (normal)	10.0200	0.0900	0.9018	
E6 Intermediate floor within a dwelling	18.5000	0.0000	0.0000	
E12 Gable (insulation at ceiling level)	8.7000	0.0600	0.5220	
E18 Party wall between dwellings	10.0200	0.0600	0.6012	
P1 Party wall - Ground floor	8.7000	0.0800	0.6960	
P2 Party wall - Intermediate floor within a dwelling	8.7000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	8.7000	0.1200	1.0440	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.5665	(36)
Point Thermal bridges			0.0000	(36a) =
Total fabric heat loss		(33) + (36) + (36a) =	52.0560	(37)

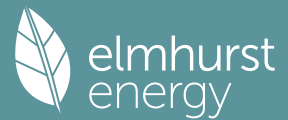
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	42.7133	42.4231	42.1386	40.8026	40.5526	39.3890	39.3890	39.1735	39.8372	40.5526	41.0583	41.5870	(38)
Heat transfer coeff	94.7693	94.4791	94.1947	92.8586	92.6087	91.4450	91.4450	91.2295	91.8932	92.6087	93.1144	93.6430	(39)
Average = Sum(39)m / 12 =												92.8574	
HLP	1.1115	1.1081	1.1048	1.0891	1.0862	1.0725	1.0725	1.0700	1.0778	1.0862	1.0921	1.0983	(40)
HLP (average)												1.0891	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5551	(42)
Hot water usage for mixer showers														(42a)
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		
Hot water usage for baths														(42b)
28.9616	28.5315	27.9258	26.8090	25.9727	25.0455	24.5446	25.1461	25.8009	26.7932	27.9330	28.8637			
Hot water usage for other uses														(42c)
40.7971	39.3136	37.8300	36.3465	34.8630	33.3794	33.3794	34.8630	36.3465	37.8300	39.3136	40.7971			
Average daily hot water use (litres/day)													63.9402	(43)
Daily hot water use														
69.7587	67.8450	65.7558	63.1555	60.8357	58.4249	57.9240	60.0090	62.1475	64.6232	67.2465	69.6608			(44)
Energy conte	110.4807	96.6104	101.0642	86.4567	81.8966	71.8402	70.0541	74.3037	76.6340	87.6931	95.8050	109.0720		(45)
Energy content (annual)										Total = Sum(45)m =		1061.9108		
Distribution loss (46)m = 0.15 x (45)m														(46)
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		
Water storage loss:														
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(56)
If cylinder contains dedicated solar storage														
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(61)
Total heat required for water heating calculated for each month														
93.9086	82.1189	85.9046	73.4882	69.6121	61.0642	59.5460	63.1582	65.1389	74.5391	81.4342	92.7112			(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														
93.9086	82.1189	85.9046	73.4882	69.6121	61.0642	59.5460	63.1582	65.1389	74.5391	81.4342	92.7112			(64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		902.6242		(64)
Electric shower(s)												903		(64)
53.7046	47.8512	52.2517	49.8632	50.7988	48.4572	50.0724	50.7988	49.8632	52.2517	51.2692	53.7046			(64a)

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Heat gains from water heating, kWh/month
36.9033 32.4925 34.5391 30.8378 30.1027 27.3803 27.4046 28.4893 28.7505 31.6977 33.1759 36.6039 (65)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 610.8866 (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	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.9548	132.8070	119.9548	123.9532	119.9548	123.9532	119.9548	119.9548	123.9532	119.9548	123.9532	119.9548	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	230.0824	232.4699	226.4534	213.6450	197.4766	182.2806	172.1288	169.7413	175.7578	188.5662	204.7346	219.9306	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	(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)	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	(71)
Water heating gains (Table 5)	49.6012	48.3520	46.4235	42.8303	40.4607	38.0283	36.8341	38.2920	39.9313	42.6044	46.0776	49.1988	(72)
Total internal gains	460.9653	474.9559	454.1586	441.7555	419.2190	405.5891	390.2447	389.3150	400.9693	412.4524	436.0924	450.4111	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
East				8.0200	19.6403	0.6300	0.7000			0.7700			48.1386 (76)
South				0.7100	46.7521	0.6300	0.7000			0.7700			10.1445 (78)
West				5.5900	19.6403	0.6300	0.7000			0.7700			33.5530 (80)
Solar gains	91.8361	176.4201	284.3412	407.7484	495.3223	505.5223	481.8780	416.5546	328.1943	207.5432	113.8845	75.9450	(83)
Total gains	552.8014	651.3761	738.4998	849.5039	914.5413	911.1114	872.1226	805.8696	729.1636	619.9956	549.9769	526.3561	(84)

7. Mean internal temperature (heating season)

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

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	56.7319	56.9061	57.0780	57.8992	58.0555	58.7942	58.7942	58.9331	58.5075	58.0555	57.7402	57.4142	
alpha	4.7821	4.7937	4.8052	4.8599	4.8704	4.9196	4.9196	4.9289	4.9005	4.8704	4.8493	4.8276	
util living area	0.9957	0.9901	0.9754	0.9222	0.8038	0.6143	0.4558	0.5105	0.7678	0.9549	0.9909	0.9966 (86)	
MIT	19.5898	19.8022	20.1170	20.5332	20.8268	20.9648	20.9933	20.9886	20.8979	20.4905	19.9723	19.5636 (87)	
Th 2	19.9914	19.9942	19.9969	20.0097	20.0121	20.0233	20.0233	20.0254	20.0190	20.0121	20.0073	20.0022 (88)	
util rest of house	0.9944	0.9872	0.9678	0.8989	0.7513	0.5315	0.3575	0.4074	0.6912	0.9365	0.9876	0.9956 (89)	
MIT 2	18.7109	18.9237	19.2355	19.6420	19.8985	20.0073	20.0215	20.0220	19.9641	19.6125	19.1039	18.6931 (90)	
Living area fraction	MIT	18.8389	19.0516	19.3639	19.7718	20.0338	20.1468	20.1631	20.1629	20.1001	19.7404	19.2304	18.8199 (91)
Temperature adjustment	adjusted MIT	18.8389	19.0516	19.3639	19.7718	20.0338	20.1468	20.1631	20.1629	20.1001	19.7404	19.2304	18.8199 (92)
												0.0000	18.8199 (93)

8. Space heating requirement

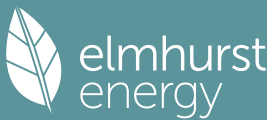
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9924	0.9834	0.9617	0.8923	0.7525	0.5424	0.3718	0.4223	0.6981	0.9300	0.9841	0.9939	(94)
Useful gains	548.5813	640.5755	710.1932	758.0280	688.2123	494.2139	324.2139	340.3277	509.0625	576.6136	541.2396	523.1347	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1377.8425	1337.0354	1211.7097	1009.5414	771.7791	507.2228	325.8266	343.2833	551.3685	846.4805	1129.5177	1369.0530	(97)
Space heating kWh	616.9704	468.0210	373.1283	181.0897	62.1737	0.0000	0.0000	0.0000	0.0000	200.7810	423.5602	629.3632	(98a)
Space heating requirement - total per year (kWh/year)												2955.0875	
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	616.9704	468.0210	373.1283	181.0897	62.1737	0.0000	0.0000	0.0000	0.0000	200.7810	423.5602	629.3632	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2955.0875	
Space heating per m ²												34.6597	(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	859.5832	676.6932	693.3445	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8922	0.9421	0.9186	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	766.8960	637.5236	636.8810	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1015.4432	972.3062	897.2490	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	178.9540	249.0782	193.7138	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	44.7385	62.2696	48.4284	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												155.4365	(107)
Energy for space heating												34.6597	(99)

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Energy for space cooling	1.8231 (108)
Total	36.4828 (109)
Fabric Energy Efficiency (TFEE)	36.5 (109)

Full SAP Calculation Printout



Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024
Assessment Reference	Plot 22		Prop Type Ref	SAP VG 21-0282		
Property						
SAP Rating	93 A	DER	11.30	TER	11.38	
Environmental	91 B	% DER < TER				0.70
CO ₂ Emissions (t/year)	0.92	DFEE	33.59	TFEE	36.48	
Compliance Check	See BREL	% DFEE < TFEE				7.92
% DPER < TPER	0.41	DPER	59.18	TPER	59.42	
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	42.6300 (1b)	x 2.3900 (2b)	= 101.8857 (1b) - (3b)
First floor	42.6300 (1c)	x 2.6200 (2c)	= 111.6906 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.5763 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1873 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3873 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3582 (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	0.4568	0.4478	0.4388	0.3941	0.3851	0.3403	0.3403	0.3314	0.3582	0.3851	0.4030	0.4209 (22b)
Effective ac	0.6043	0.6003	0.5963	0.5776	0.5742	0.5579	0.5579	0.5549	0.5642	0.5742	0.5812	0.5886 (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 (U _w = 1.30)			14.3200	1.2357	17.6958		(27)
Door			2.1400	1.3000	2.7820		(26a)
Ground Floor			42.6300	0.1300	5.5419	75.0000	3197.2500 (28a)
External Wall	92.6900	16.4600	76.2300	0.1900	14.4837	110.0000	8385.3000 (29a)
Plane Roof	42.6300		42.6300	0.0900	3.8367	9.0000	383.6700 (30)
Total net area of external elements A _{um} (A, m ²)			177.9500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	44.3401			(33)
Party Wall			43.5900	0.0000	0.0000	110.0000	4794.9000 (32)
Studs			160.3400			9.0000	1443.0600 (32c)
Internal Floor 1			42.6300			18.0000	767.3400 (32d)
Internal Ceiling 1			42.6300			9.0000	383.6700 (32e)
Heat capacity C _m = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =				19355.1900 (34)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							227.0137 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				11.2000	0.0240	0.2688	
E3 Sill				8.3700	0.0210	0.1758	
E4 Jamb				25.5000	0.0160	0.4080	

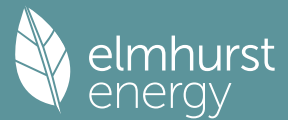
Ventilation heat loss calculated monthly (39)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	42.5921	42.3066	42.0268	40.7124	40.4665	39.3217	39.3217	39.1097	39.7627	40.4665	40.9640	41.4841 (38)
Heat transfer coeff	92.9003	92.6148	92.3350	91.0206	90.7747	89.6299	89.6299	89.4179	90.0709	90.7747	91.2722	91.7923 (39)
Average = Sum(39)m / 12 =												91.0194
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1.0896	1.0863	1.0830	1.0676	1.0647	1.0513	1.0513	1.0488	1.0564	1.0647	1.0705	1.0766 (40)
HLP (average)												1.0676
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

Assumed occupancy													2.5551 (42)
Hot water usage for mixer showers	67.0609	66.0531	64.5845	61.7747	59.7011	57.3887	56.0743	57.5318	59.1294	61.6122	64.4824	66.8039	(42a)
Hot water usage for baths	28.9616	28.5315	27.9258	26.8090	25.9727	25.0455	24.5446	25.1461	25.8009	26.7932	27.9330	28.8637	(42b)
Hot water usage for other uses	40.7971	39.3136	37.8300	36.3465	34.8630	33.3794	33.3794	34.8630	36.3465	37.8300	39.3136	40.7971	(42c)
Average daily hot water use (litres/day)												125.7681	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	136.8196	133.8981	130.3403	124.9302	120.5369	115.8136	113.9984	117.5408	121.2769	126.2354	131.7289	136.4647	(44)
Energy content (annual)	216.6888	190.6692	200.3283	171.0232	162.2658	142.4064	137.8712	145.5401	149.5465	171.3003	187.6720	213.6708	(45)
Distribution loss (46)m = 0.15 x (45)m	32.5033	28.6004	30.0492	25.6535	24.3399	21.3610	20.6807	21.8310	22.4320	25.6950	28.1508	32.0506	(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	19.3765	17.4504	19.2113	18.3608	18.8268	18.0718	18.5804	18.6579	18.1439	18.9181	18.5290	19.3460	(61)
Total heat required for water heating calculated for each month	236.0653	208.1195	219.5395	189.3840	181.0926	160.4782	156.4516	164.1980	167.6904	190.2184	206.2010	233.0168	(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	236.0653	208.1195	219.5395	189.3840	181.0926	160.4782	156.4516	164.1980	167.6904	190.2184	206.2010	233.0168	(64)
12Total per year (kWh/year)												2312.4553	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)
Heat gains from water heating, kWh/month	76.8931	67.7601	71.4120	61.4554	58.6601	51.8681	50.4873	53.0566	54.2602	61.6869	67.0332	75.8820	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.9548	132.8070	119.9548	123.9532	119.9548	123.9532	119.9548	119.9548	123.9532	119.9548	123.9532	119.9548 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	230.0824	232.4699	226.4534	213.6450	197.4766	182.2806	172.1288	169.7413	175.7578	188.5662	204.7346	219.9306 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757 (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)	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052 (71)
Water heating gains (Table 5)	103.3510	100.8335	95.9838	85.3548	78.8442	72.0390	67.8592	71.3126	75.3614	82.9125	93.1017	101.9920 (72)
Total internal gains	517.7151	530.4374	506.7190	487.2800	460.6025	439.5998	421.2698	422.3356	436.3994	455.7604	486.1164	506.2043 (73)

[Jan]					Area m2	Solar flux Table 6a	g Specific data or Table 6b		FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East					8.0200	19.6403	0.7300		0.7000	0.7700	55.7797 (76)	
South					0.7100	46.7521	0.7300		0.7000	0.7700	11.7547 (78)	
West					5.5900	19.6403	0.7300		0.7000	0.7700	38.8788 (80)	
Solar gains	106.4132	204.4233	329.4747	472.4703	573.9449	585.7639	558.3666	482.6744	380.2887	240.4866	131.9614	87.9997 (83)
Total gains	624.1284	734.8607	836.1937	959.7503	1034.5475	1025.3638	979.6363	905.0099	816.6880	696.2470	618.0778	594.2040 (84)

Full SAP Calculation Printout



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	57.8733	58.0516	58.2276	59.0684	59.2284	59.9849	59.9849	60.1271	59.6913	59.2284	58.9056	58.5718
alpha	4.8582	4.8701	4.8818	4.9379	4.9486	4.9990	4.9990	5.0085	4.9794	4.9486	4.9270	4.9048
util living area	0.9928	0.9836	0.9598	0.8833	0.7378	0.5455	0.4000	0.4497	0.7030	0.9305	0.9850	0.9943 (86)
MIT	19.9774	20.1452	20.3839	20.6751	20.8537	20.9232	20.9354	20.9336	20.8887	20.6310	20.2555	19.9553 (87)
Th 2	20.0093	20.0121	20.0148	20.0274	20.0298	20.0408	20.0408	20.0429	20.0366	20.0298	20.0250	20.0200 (88)
util rest of house	0.9907	0.9789	0.9484	0.8532	0.6816	0.4695	0.3141	0.3585	0.6249	0.9051	0.9799	0.9926 (89)
MIT 2	18.8169	19.0316	19.3319	19.6896	19.8817	19.9529	19.9605	19.9619	19.9244	19.6498	19.1834	18.7973 (90)
Living area fraction									fLA = Living area /	(4) =		0.1457 (91)
MIT	18.9859	19.1938	19.4852	19.8332	20.0233	20.0943	20.1025	20.1034	20.0649	19.7927	19.3396	18.9660 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.8359	19.0438	19.3352	19.6832	19.8733	19.9443	19.9525	19.9534	19.9149	19.6427	19.1896	18.8160 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9872	0.9728	0.9384	0.8408	0.6717	0.4616	0.3062	0.3499	0.6142	0.8924	0.9739	0.9897 (94)
Useful gains	616.1438	714.8661	784.7122	806.9244	694.9316	473.2649	299.9162	316.6474	501.6315	621.3073	601.9186	588.0577 (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	1350.3925	1309.9291	1185.1342	981.4907	741.9313	479.0078	300.4829	317.7396	523.7508	820.8490	1103.4396	1341.6315 (97)
Space heating kWh	546.2810	399.8823	297.9139	125.6878	34.9677	0.0000	0.0000	0.0000	0.0000	148.4590	361.0951	560.6589 (98a)
Space heating requirement - total per year (kWh/year)												2474.9459
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	546.2810	399.8823	297.9139	125.6878	34.9677	0.0000	0.0000	0.0000	0.0000	148.4590	361.0951	560.6589 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2474.9459
Space heating per m2										(98c) / (4) =		29.0282 (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	546.2810	399.8823	297.9139	125.6878	34.9677	0.0000	0.0000	0.0000	0.0000	148.4590	361.0951	560.6589 (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)	617.2667	451.8445	336.6259	142.0201	39.5115	0.0000	0.0000	0.0000	0.0000	167.7503	408.0171	633.5129 (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	236.0653	208.1195	219.5395	189.3840	181.0926	160.4782	156.4516	164.1980	167.6904	190.2184	206.2010	233.0168 (64)
Efficiency of water heater (217)m	88.0420	87.9808	87.8573	87.5922	87.2393	87.0000	87.0000	87.0000	87.0000	87.6512	87.9488	88.0543 (216)
Fuel for water heating, kWh/month	268.1281	236.5512	249.8819	216.2110	207.5814	184.4577	179.8294	188.7333	192.7476	217.0174	234.4556	264.6286 (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	24.4148	19.5865	17.6354	12.9205	9.9801	8.1539	9.1042	11.8340	15.3712	20.1679	22.7795	25.0934 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-26.9270	-41.9242	-66.8198	-81.1507	-90.9213	-85.8976	-84.4524	-77.7695	-65.8603	-50.3220	-30.6708	-22.6373 (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	-11.5352	-27.8364	-65.4233	-113.3011	-162.5898	-168.3776	-164.3657	-131.0831	-85.5095	-42.6428	-16.0844	-8.7660 (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												2796.5490 (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												2640.2233 (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)												197.0413 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1722.8677 (233)

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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	3996.9460 (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	2796.5490	0.2100	587.2753 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2640.2233	0.2100	554.4469 (264)
Space and water heating			1141.7222 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	197.0413	0.1443	28.4392 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-725.3529	0.1331	-96.5186
PV Unit electricity exported	-997.5147	0.1225	-122.2043
Total			-218.7229 (269)
Total CO2, kg/year			963.3677 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.3000 (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	2796.5490	1.1300	3160.1004 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2640.2233	1.1300	2983.4523 (278)
Space and water heating			6143.5527 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	197.0413	1.5338	302.2286 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-725.3529	1.4917	-1082.0121
PV Unit electricity exported	-997.5147	0.4495	-448.4124
Total			-1530.4245 (283)
Total Primary energy kWh/year			5045.4576 (286)
Dwelling Primary energy Rate (DPER)			59.1800 (287)

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

1. Overall dwelling characteristics

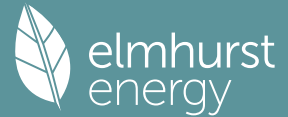
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	42.6300 (1b)	x 2.3900 (2b)	= 101.8857 (1b) - (3b)
First floor	42.6300 (1c)	x 2.6200 (2c)	= 111.6906 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.5763 (5)

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)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1405 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3905 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3612 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.4605	0.4515	0.4424	0.3973	0.3883	0.3431	0.3431	0.3341	0.3612	0.3883	0.4063	0.4244 (22b)
Effective ac	0.6060	0.6019	0.5979	0.5789	0.5754	0.5589	0.5589	0.5558	0.5652	0.5754	0.5826	0.5901 (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)			14.3200	1.1450	16.3969			(27)
Ground Floor			42.6300	0.1300	5.5419			(28a)
External Wall	92.6900	16.4600	76.2300	0.1800	13.7214			(29a)
Plane Roof	42.6300		42.6300	0.1100	4.6893			(30)
Total net area of external elements Aum(A, m2)			177.9500					(31)
Fabric heat loss, W/K = Sum (A x U)						42.4895		(33)
Party Wall			43.5900	0.0000	0.0000			(32)

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

227.0137 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	11.2000	0.0500	0.5600	
E3 Sill	8.3700	0.0500	0.4185	
E4 Jamb	25.5000	0.0500	1.2750	
E5 Ground floor (normal)	18.5000	0.1600	2.9600	
E10 Eaves (insulation at ceiling level)	9.8000	0.0600	0.5880	
E16 Corner (normal)	10.0200	0.0900	0.9018	
E6 Intermediate floor within a dwelling	18.5000	0.0000	0.0000	
E12 Gable (insulation at ceiling level)	8.7000	0.0600	0.5220	
E18 Party wall between dwellings	10.0200	0.0600	0.6012	
P1 Party wall - Ground floor	8.7000	0.0800	0.6960	
P2 Party wall - Intermediate floor within a dwelling	8.7000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	8.7000	0.1200	1.0440	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				9.5665 (36)
Point Thermal bridges				0.0000
Total fabric heat loss				(33) + (36) + (36a) = 52.0560 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	42.7133	42.4231	42.1386	40.8026	40.5526	39.3890	39.3890	39.1735	39.8372	40.5526	41.0583	41.5870	(38)
Heat transfer coeff	94.7693	94.4791	94.1947	92.8586	92.6087	91.4450	91.4450	91.2295	91.8932	92.6087	93.1144	93.6430	(39)
Average = Sum(39)m / 12 =												92.8574	
HLP	1.1115	1.1081	1.1048	1.0891	1.0862	1.0725	1.0725	1.0700	1.0778	1.0862	1.0921	1.0983	(40)
HLP (average)												1.0891	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

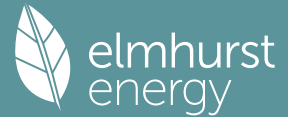
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5551 (42)
Hot water usage for mixer showers													
67.0609	66.0531	64.5845	61.7747	59.7011	57.3887	56.0743	57.5318	59.1294	61.6122	64.4824	66.8039	66.8039	(42a)
Hot water usage for baths													
28.9616	28.5315	27.9258	26.8090	25.9727	25.0455	24.5446	25.1461	25.8009	26.7932	27.9330	28.8637	28.8637	(42b)
Hot water usage for other uses													
40.7971	39.3136	37.8300	36.3465	34.8630	33.3794	33.3794	34.8630	36.3465	37.8300	39.3136	40.7971	40.7971	(42c)
Average daily hot water use (litres/day)												125.7681	(43)
Daily hot water use													
136.8196	133.8981	130.3403	124.9302	120.5369	115.8136	113.9984	117.5408	121.2769	126.2354	131.7289	136.4647	136.4647	(44)
Energy conte	216.6888	190.6692	200.3283	171.0232	162.2658	142.4064	137.8712	145.5401	149.5465	171.3003	187.6720	213.6708	(45)
Energy content (annual)												2088.9824	
Distribution loss (46)m = 0.15 x (45)m													
32.5033	28.6004	30.0492	25.6535	24.3399	21.3610	20.6807	21.8310	22.4320	25.6950	28.1508	32.0506	32.0506	(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													
267.6477	236.6966	251.2872	220.3383	213.2247	191.7214	188.8301	196.4990	198.8616	222.2592	236.9871	264.6297	264.6297	(62)
WWHRS	-30.6574	-27.1137	-28.3919	-23.5096	-21.9101	-18.7486	-17.5739	-18.6880	-19.3981	-22.8682	-25.9069	-30.0897	(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	236.9902	209.5829	222.8953	196.8287	191.3146	172.9728	171.2562	177.8109	179.4635	199.3910	211.0802	234.5400	(64)
12Total per year (kWh/year)												2404.1263	(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	84.7887	74.9043	79.3489	69.1940	66.6931	59.6789	58.5819	61.1318	62.0530	69.6971	74.7297	83.7853	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	127.7566	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
119.9548	132.8070	119.9548	123.9532	119.9548	123.9532	119.9548	119.9548	123.9532	119.9548	123.9532	119.9548	119.9548	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
230.0824	232.4699	226.4534	213.6450	197.4766	182.2806	172.1288	169.7413	175.7578	188.5662	204.7346	219.9306	219.9306	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	35.7757	(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)													
-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	(71)
Water heating gains (Table 5)													
113.9634	111.4648	106.6517	96.1028	89.6413	82.8873	78.7391	82.1664	86.1847	93.6789	103.7913	112.6146	112.6146	(72)
Total internal gains													

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528.3275 541.0688 517.3869 498.0279 471.3996 450.4482 432.1496 433.1894 447.2227 466.5268 496.8061 516.8269 (73)

6. Solar gains

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

East					8.0200	19.6403	0.6300	0.7000			0.7700	48.1386 (76)	
South					0.7100	46.7521	0.6300	0.7000			0.7700	10.1445 (78)	
West					5.5900	19.6403	0.6300	0.7000			0.7700	33.5530 (80)	

Solar gains	91.8361	176.4201	284.3412	407.7484	495.3223	505.5223	481.8780	416.5546	328.1943	207.5432	113.8845	75.9450 (83)	
Total gains	620.1636	717.4889	801.7281	905.7763	966.7219	955.9705	914.0276	849.7440	775.4170	674.0700	610.6906	592.7718 (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	56.7319	56.9061	57.0780	57.8992	58.0555	58.7942	58.7942	58.9331	58.5075	58.0555	57.7402	57.4142
alpha	4.7821	4.7937	4.8052	4.8599	4.8704	4.9196	4.9196	4.9289	4.9005	4.8704	4.8493	4.8276
util living area	0.9931	0.9854	0.9666	0.9051	0.7785	0.5897	0.4358	0.4860	0.7377	0.9398	0.9860	0.9944 (86)
MIT	19.6792	19.8871	20.1916	20.5832	20.8507	20.9704	20.9945	20.9908	20.9147	20.5474	20.0508	19.6525 (87)
Th 2	19.9914	19.9942	19.9969	20.0097	20.0121	20.0233	20.0233	20.0254	20.0190	20.0121	20.0073	20.0022 (88)
util rest of house	0.9910	0.9812	0.9567	0.8785	0.7237	0.5087	0.3413	0.3869	0.6594	0.9168	0.9812	0.9927 (89)
MIT 2	18.4620	18.7275	19.1117	19.5943	19.8886	20.0063	20.0214	20.0220	19.9615	19.5652	18.9467	18.4356 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.6393	18.8964	19.2690	19.7384	20.0287	20.1467	20.1632	20.1631	20.1003	19.7083	19.1076	18.6129 (91)
Temperature adjustment	0.0000											
adjusted MIT	18.6393	18.8964	19.2690	19.7384	20.0287	20.1467	20.1632	20.1631	20.1003	19.7083	19.1076	18.6129 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9871	0.9749	0.9475	0.8699	0.7247	0.5193	0.3550	0.4012	0.6665	0.9079	0.9751	0.9894 (94)
Useful gains	612.1601	699.4599	759.6663	787.9497	700.6299	496.4314	324.5218	340.9465	516.8026	611.9986	595.4912	586.4592 (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	1358.9244	1322.3677	1202.7705	1006.4345	771.3144	507.2199	325.8362	343.3064	551.3913	843.5045	1118.0755	1349.6647 (97)
Space heating kWh	555.5926	418.5940	329.6695	157.3090	52.5893	0.0000	0.0000	0.0000	0.0000	172.2404	376.2607	567.8249 (98a)
Space heating requirement - total per year (kWh/year)	2630.0804											
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	555.5926	418.5940	329.6695	157.3090	52.5893	0.0000	0.0000	0.0000	0.0000	172.2404	376.2607	567.8249 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2630.0804											
Space heating per m2	(98c) / (4) = 30.8478 (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	555.5926	418.5940	329.6695	157.3090	52.5893	0.0000	0.0000	0.0000	0.0000	172.2404	376.2607	567.8249 (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)	601.2907	453.0238	356.7851	170.2479	56.9148	0.0000	0.0000	0.0000	0.0000	186.4074	407.2085	614.5291 (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	236.9902	209.5829	222.8953	196.8287	191.3146	172.9728	171.2562	177.8109	179.4635	199.3910	211.0802	234.5400 (64)
Efficiency of water heater	86.1414	85.8330	85.2184	83.9055	82.0106	80.3000	80.3000	80.3000	80.3000	84.0693	85.6051	86.2014 (216)
Fuel for water heating, kWh/month	275.1175	244.1751	261.5576	234.5837	233.2803	215.4082	213.2705	221.4333	223.4913	237.1747	246.5743	272.0838 (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	24.9242	19.9951	18.0034	13.1901	10.1884	8.3240	9.2942	12.0809	15.6919	20.5887	23.2549	25.6169 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-39.5521	-55.5898	-79.6604	-89.2796	-96.0212	-89.5226	-88.3991	-83.5651	-75.0104	-63.4136	-43.4155	-34.2139 (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	-22.8666	-48.0457	-95.3950	-143.1404	-189.1456	-190.0165	-187.7959	-159.0755	-116.6790	-68.6830	-30.5202	-18.0880 (233b)

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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	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	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	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													2846.4073	(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													2878.1504	(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)													201.1528	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-2107.0946	(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													3904.6160	(238)

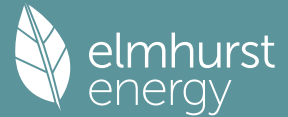
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2846.4073	0.2100	597.7455 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2878.1504	0.2100	604.4116 (264)
Space and water heating			1202.1571 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	201.1528	0.1443	29.0326 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-837.6432	0.1347	-112.7936
PV Unit electricity exported	-1269.4513	0.1259	-159.8521
Total			-272.6457 (269)
Total CO2, kg/year			970.4732 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.3800 (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	2846.4073	1.1300	3216.4403 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2878.1504	1.1300	3252.3099 (278)
Space and water heating			6468.7502 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	201.1528	1.5338	308.5349 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-837.6432	1.4977	-1254.5125
PV Unit electricity exported	-1269.4513	0.4622	-586.7685
Total			-1841.2810 (283)
Total Primary energy kWh/year			5066.1049 (286)
Target Primary Energy Rate (TPER)			59.4200 (287)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 22			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	93 A	DER	11.30	TER	11.38		
Environmental	91 B	% DER < TER				0.70	
CO ₂ Emissions (t/year)	0.92	DFEE	33.59	TFEE	36.48		
Compliance Check	See BREL	% DFEE < TFEE				7.92	
% DPER < TPER	0.41	DPER	59.18	TPER	59.42		
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	42.6300 (1b)	x 2.3900 (2b)	= 101.8857 (1b) - (3b)
First floor	42.6300 (1c)	x 2.6200 (2c)	= 111.6906 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.5763 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1873 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3873 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3582 (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	0.4568	0.4478	0.4388	0.3941	0.3851	0.3403	0.3403	0.3314	0.3582	0.3851	0.4030	0.4209 (22b)
Effective ac	0.6043	0.6003	0.5963	0.5776	0.5742	0.5579	0.5579	0.5549	0.5642	0.5742	0.5812	0.5886 (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 (U _w = 1.30)			14.3200	1.2357	17.6958		(27)
Door			2.1400	1.3000	2.7820		(26a)
Ground Floor			42.6300	0.1300	5.5419	75.0000	3197.2500 (28a)
External Wall	92.6900	16.4600	76.2300	0.1900	14.4837	110.0000	8385.3000 (29a)
Plane Roof	42.6300		42.6300	0.0900	3.8367	9.0000	383.6700 (30)
Total net area of external elements A _{um} (A, m ²)			177.9500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	44.3401			(33)
Party Wall			43.5900	0.0000	0.0000	110.0000	4794.9000 (32)
Studs			160.3400			9.0000	1443.0600 (32c)
Internal Floor 1			42.6300			18.0000	767.3400 (32d)
Internal Ceiling 1			42.6300			9.0000	383.6700 (32e)
Heat capacity C _m = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =				19355.1900 (34)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							227.0137 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				11.2000	0.0240	0.2688	
E3 Sill				8.3700	0.0210	0.1758	
E4 Jamb				25.5000	0.0160	0.4080	

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E5 Ground floor (normal)	18.5000	0.0920	1.7020
E10 Eaves (insulation at ceiling level)	9.8000	0.0580	0.5684
E16 Corner (normal)	10.0200	0.0470	0.4709
E6 Intermediate floor within a dwelling	18.5000	0.0010	0.0185
E12 Gable (insulation at ceiling level)	8.7000	0.0570	0.4959
E18 Party wall between dwellings	10.0200	0.0380	0.3808
P1 Party wall - Ground floor	8.7000	0.0690	0.6003
P2 Party wall - Intermediate floor within a dwelling	8.7000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	8.7000	0.1010	0.8787
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.9681 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	50.3082 (37)

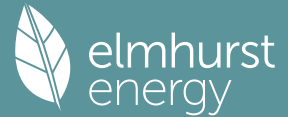
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	42.5921	42.3066	42.0268	40.7124	40.4665	39.3217	39.3217	39.1097	39.7627	40.4665	40.9640	41.4841 (38)
Average = Sum(39)m / 12 =	92.9003	92.6148	92.3350	91.0206	90.7747	89.6299	89.6299	89.4179	90.0709	90.7747	91.2722	91.7923 (39)
												91.0194
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0896	1.0863	1.0830	1.0676	1.0647	1.0513	1.0513	1.0488	1.0564	1.0647	1.0705	1.0766 (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												2.5551 (42)
Hot water usage for mixer showers												
	67.0609	66.0531	64.5845	61.7747	59.7011	57.3887	56.0743	57.5318	59.1294	61.6122	64.4824	66.8039 (42a)
Hot water usage for baths												
	28.9616	28.5315	27.9258	26.8090	25.9727	25.0455	24.5446	25.1461	25.8009	26.7932	27.9330	28.8637 (42b)
Hot water usage for other uses												
	40.7971	39.3136	37.8300	36.3465	34.8630	33.3794	33.3794	34.8630	36.3465	37.8300	39.3136	40.7971 (42c)
Average daily hot water use (litres/day)												125.7681 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	136.8196	133.8981	130.3403	124.9302	120.5369	115.8136	113.9984	117.5408	121.2769	126.2354	131.7289	136.4647 (44)
Energy conte	216.6888	190.6692	200.3283	171.0232	162.2658	142.4064	137.8712	145.5401	149.5465	171.3003	187.6720	213.6708 (45)
Energy content (annual)										Total = Sum(45)m =		2088.9824
Distribution loss (46)m = 0.15 x (45)m												
	32.5033	28.6004	30.0492	25.6535	24.3399	21.3610	20.6807	21.8310	22.4320	25.6950	28.1508	32.0506 (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	19.3765	17.4504	19.2113	18.3608	18.8268	18.0718	18.5804	18.6579	18.1439	18.9181	18.5290	19.3460 (61)
Total heat required for water heating calculated for each month												
	236.0653	208.1195	219.5395	189.3840	181.0926	160.4782	156.4516	164.1980	167.6904	190.2184	206.2010	233.0168 (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												
	236.0653	208.1195	219.5395	189.3840	181.0926	160.4782	156.4516	164.1980	167.6904	190.2184	206.2010	233.0168 (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												
	76.8931	67.7601	71.4120	61.4554	58.6601	51.8681	50.4873	53.0566	54.2602	61.6869	67.0332	75.8820 (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	153.3079	153.3079	153.3079	153.3079	153.3079	153.3079	153.3079	153.3079	153.3079	153.3079	153.3079	153.3079 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	27.8932	24.7745	20.1480	15.2533	11.4020	9.6261	10.4013	13.5200	18.1466	23.0412	26.8925	28.6685 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	343.4066	346.9701	337.9902	318.8731	294.7412	272.0607	256.9087	253.3452	262.3250	281.4421	305.5740	328.2546 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	52.8859	52.8859	52.8859	52.8859	52.8859	52.8859	52.8859	52.8859	52.8859	52.8859	52.8859	52.8859 (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)												
	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052 (71)
Water heating gains (Table 5)												
	103.3510	100.8335	95.9838	85.3548	78.8442	72.0390	67.8592	71.3126	75.3614	82.9125	93.1017	101.9920 (72)
Total internal gains												
	581.6394	579.5666	561.1106	526.4697	491.9760	457.7143	439.1578	442.1663	459.8215	494.3844	532.5567	565.9036 (73)

6. Solar gains												
[Jan]												
			Area	Solar flux	g	FF	Access	Gains				
			m2	Table 6a	Specific data	Specific data	factor	W				
				W/m2	or Table 6b	or Table 6c	Table 6d					
East			8.0200	19.6403	0.7300	0.7000	0.7700	55.7797 (76)				
South			0.7100	46.7521	0.7300	0.7000	0.7700	11.7547 (78)				
West			5.5900	19.6403	0.7300	0.7000	0.7700	38.8788 (80)				
Solar gains	106.4132	204.4233	329.4747	472.4703	573.9449	585.7639	558.3666	482.6744	380.2887	240.4866	131.9614	87.9997 (83)
Total gains	688.0526	783.9899	890.5853	998.9401	1065.9209	1043.4782	997.5243	924.8407	840.1102	734.8709	664.5181	653.9033 (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	57.8733	58.0516	58.2276	59.0684	59.2284	59.9849	59.9849	60.1271	59.6913	59.2284	58.9056	58.5718
alpha	4.8582	4.8701	4.8818	4.9379	4.9486	4.9990	4.9990	5.0085	4.9794	4.9486	4.9270	4.9048
util living area												
	0.9892	0.9788	0.9497	0.8694	0.7227	0.5369	0.3930	0.4404	0.6884	0.9172	0.9799	0.9914 (86)
MIT	20.0401	20.1911	20.4285	20.6966	20.8611	20.9242	20.9356	20.9340	20.8931	20.6581	20.2992	20.0146 (87)
Th 2	20.0093	20.0121	20.0148	20.0274	20.0298	20.0408	20.0408	20.0429	20.0366	20.0298	20.0250	20.0200 (88)
util rest of house												
	0.9861	0.9729	0.9360	0.8373	0.6661	0.4617	0.3086	0.3510	0.6103	0.8885	0.9733	0.9889 (89)
MIT 2	18.8964	19.0890	19.3856	19.7129	19.8882	19.9535	19.9605	19.9620	19.9276	19.6800	19.2379	18.8725 (90)
Living area fraction												
									fLA =	Living area /	(4) =	0.1457 (91)
MIT	19.0630	19.2495	19.5375	19.8562	20.0299	20.0949	20.1026	20.1036	20.0682	19.8225	19.3925	19.0389 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.9130	19.0995	19.3875	19.7062	19.8799	19.9449	19.9526	19.9536	19.9182	19.6725	19.2425	18.8889 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9815	0.9658	0.9253	0.8251	0.6566	0.4540	0.3007	0.3425	0.6000	0.8755	0.9662	0.9850 (94)
Useful gains	675.3184	757.2072	824.0416	824.2111	699.9222	473.7265	299.9689	316.7652	504.0591	643.3909	642.0286	644.0869 (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	1357.5498	1315.0875	1189.9683	983.5881	742.5301	479.0660	300.4908	317.7565	524.0507	823.5521	1108.2733	1348.3279 (97)
Space heating kWh	507.5802	374.8956	272.2494	114.7514	31.7003	0.0000	0.0000	0.0000	0.0000	134.0400	335.6962	523.9553 (98a)
Space heating requirement - total per year (kWh/year)												2294.8684
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	507.5802	374.8956	272.2494	114.7514	31.7003	0.0000	0.0000	0.0000	0.0000	134.0400	335.6962	523.9553 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2294.8684
Space heating per m2										(98c) / (4) =		26.9161 (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	507.5802	374.8956	272.2494	114.7514	31.7003	0.0000	0.0000	0.0000	0.0000	134.0400	335.6962	523.9553 (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)	573.5369	423.6108	307.6265	129.6626	35.8195	0.0000	0.0000	0.0000	0.0000	151.4576	379.3177	592.0399 (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	236.0653	208.1195	219.5395	189.3840	181.0926	160.4782	156.4516	164.1980	167.6904	190.2184	206.2010	233.0168 (64)	
Efficiency of water heater	88.0183	87.9586	87.8240	87.5599	87.2202	87.0000	87.0000	87.0000	87.0000	87.6139	87.9232	88.0328 (216)	
Fuel for water heating, kWh/month	268.2003	236.6107	249.9766	216.2907	207.6268	184.4577	179.8294	188.7333	192.7476	217.1099	234.5241	264.6932 (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	24.4148	19.5865	17.6354	12.9205	9.9801	8.1539	9.1042	11.8340	15.3712	20.1679	22.7795	25.0934 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-26.9270	-41.9242	-66.8198	-81.1507	-90.9213	-85.8976	-84.4524	-77.7695	-65.8603	-50.3220	-30.6708	-22.6373 (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	-11.5352	-27.8364	-65.4233	-113.3011	-162.5898	-168.3776	-164.3657	-131.0831	-85.5095	-42.6428	-16.0844	-8.7660 (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													2593.0716 (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													2640.8004 (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)													197.0413 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-1722.8677 (233)
Wind generation													0.0000 (234)

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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	3794.0457 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2593.0716	3.6400	94.3878 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2640.8004	3.6400	96.1251 (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	197.0413	16.4900	32.4921 (250)
Additional standing charges			92.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-725.3529	16.4900	-119.6107
PV Unit electricity exported	-997.5147	5.5900	-55.7611
Total			-175.3718 (252)
Total energy cost			153.8147 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.4251 (257)
SAP value		93.1092
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	2593.0716	0.2100	544.5450 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2640.8004	0.2100	554.5681 (264)
Space and water heating			1099.1131 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	197.0413	0.1443	28.4392 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-725.3529	0.1331	-96.5186
PV Unit electricity exported	-997.5147	0.1225	-122.2043
Total			-218.7229 (269)
Total CO2, kg/year			920.7586 (272)
CO2 emissions per m2			10.8000 (273)
EI value			90.5280
EI rating			91 (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

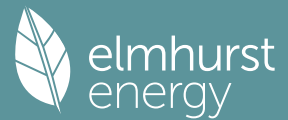
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	42.6300 (1b)	x 2.3900 (2b)	= 101.8857 (1b) - (3b)
First floor	42.6300 (1c)	x 2.6200 (2c)	= 111.6906 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	213.5763 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1873 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3873 (18)

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Number of sides sheltered

1 (19)

Shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.9250 \quad (20)$$

Infiltration rate adjusted to include shelter factor

$$(21) = (18) \times (20) = 0.3582 \quad (21)$$

Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4568	0.4478	0.4388	0.3941	0.3851	0.3403	0.3403	0.3314	0.3582	0.3851	0.4030	0.4209	(22b)
Effective ac	0.6043	0.6003	0.5963	0.5776	0.5742	0.5579	0.5579	0.5549	0.5642	0.5742	0.5812	0.5886	(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)			14.3200	1.2357	17.6958			(27)
Door			2.1400	1.3000	2.7820			(26a)
Ground Floor			42.6300	0.1300	5.5419	75.0000	3197.2500	(28a)
External Wall	92.6900	16.4600	76.2300	0.1900	14.4837	110.0000	8385.3000	(29a)
Plane Roof	42.6300		42.6300	0.0900	3.8367	9.0000	383.6700	(30)
Total net area of external elements Aum(A, m2)			177.9500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.3401			(33)
Party Wall			43.5900	0.0000	0.0000	110.0000	4794.9000	(32)
Studs			160.3400			9.0000	1443.0600	(32c)
Internal Floor 1			42.6300			18.0000	767.3400	(32d)
Internal Ceiling 1			42.6300			9.0000	383.6700	(32e)

Heat capacity Cm = Sum(A x k)

$$(28)...(30) + (32) + (32a)...(32e) = 19355.1900 \quad (34)$$

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

$$227.0137 \quad (35)$$

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.2000	0.0240	0.2688
E3 Sill	8.3700	0.0210	0.1758
E4 Jamb	25.5000	0.0160	0.4080
E5 Ground floor (normal)	18.5000	0.0920	1.7020
E10 Eaves (insulation at ceiling level)	9.8000	0.0580	0.5684
E16 Corner (normal)	10.0200	0.0470	0.4709
E6 Intermediate floor within a dwelling	18.5000	0.0010	0.0185
E12 Gable (insulation at ceiling level)	8.7000	0.0570	0.4959
E18 Party wall between dwellings	10.0200	0.0380	0.3808
P1 Party wall - Ground floor	8.7000	0.0690	0.6003
P2 Party wall - Intermediate floor within a dwelling	8.7000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	8.7000	0.1010	0.8787

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

$$5.9681 \quad (36)$$

Point Thermal Bridges

$$(36a) = 0.0000$$

Total fabric heat loss

$$(33) + (36) + (36a) = 50.3082 \quad (37)$$

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

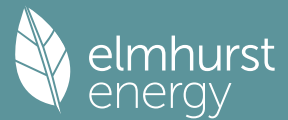
(38)m	Jan 42.5921	Feb 42.3066	Mar 42.0268	Apr 40.7124	May 40.4665	Jun 39.3217	Jul 39.3217	Aug 39.1097	Sep 39.7627	Oct 40.4665	Nov 40.9640	Dec 41.4841	(38)
Heat transfer coeff	92.9003	92.6148	92.3350	91.0206	90.7747	89.6299	89.6299	89.4179	90.0709	90.7747	91.2722	91.7923	(39)
Average = Sum(39)m / 12 =												91.0194	

HLP	Jan 1.0896	Feb 1.0863	Mar 1.0830	Apr 1.0676	May 1.0647	Jun 1.0513	Jul 1.0513	Aug 1.0488	Sep 1.0564	Oct 1.0647	Nov 1.0705	Dec 1.0766	(40)
HLP (average)												1.0676	
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5551 (42)
Hot water usage for mixer showers	67.0609	66.0531	64.5845	61.7747	59.7011	57.3887	56.0743	57.5318	59.1294	61.6122	64.4824	66.8039	(42a)
Hot water usage for baths	28.9616	28.5315	27.9258	26.8090	25.9727	25.0455	24.5446	25.1461	25.8009	26.7932	27.9330	28.8637	(42b)
Hot water usage for other uses	40.7971	39.3136	37.8300	36.3465	34.8630	33.3794	33.3794	34.8630	36.3465	37.8300	39.3136	40.7971	(42c)
Average daily hot water use (litres/day)													125.7681 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	136.8196	133.8981	130.3403	124.9302	120.5369	115.8136	113.9984	117.5408	121.2769	126.2354	131.7289	136.4647	(44)
Distribution loss (46)m = 0.15 x (45)m	216.6888	190.6692	200.3283	171.0232	162.2658	142.4064	137.8712	145.5401	149.5465	171.3003	187.6720	213.6708	(45)
Total storage loss	32.5033	28.6004	30.0492	25.6535	24.3399	21.3610	20.6807	21.8310	22.4320	25.6950	28.1508	32.0506	(46)
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	(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	19.3765	17.4504	19.2113	18.3608	18.8268	18.0718	18.5804	18.6579	18.1439	18.9181	18.5290	19.3460	(61)
Total heat required for water heating calculated for each month	236.0653	208.1195	219.5395	189.3840	181.0926	160.4782	156.4516	164.1980	167.6904	190.2184	206.2010	233.0168	(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	236.0653	208.1195	219.5395	189.3840	181.0926	160.4782	156.4516	164.1980	167.6904	190.2184	206.2010	233.0168	(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)
													(64a)
Heat gains from water heating, kWh/month	76.8931	67.7601	71.4120	61.4554	58.6601	51.8681	50.4873	53.0566	54.2602	61.6869	67.0332	75.8820	(65)

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	153.3079	153.3079	153.3079	153.3079	153.3079	153.3079	153.3079	153.3079	153.3079	153.3079	153.3079	153.3079 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.8932	24.7745	20.1480	15.2533	11.4020	9.6261	10.4013	13.5200	18.1466	23.0412	26.8925	28.6685 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	343.4066	346.9701	337.9902	318.8731	294.7412	272.0607	256.9087	253.3452	262.3250	281.4421	305.5740	328.2546 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8859	52.8859	52.8859	52.8859	52.8859	52.8859	52.8859	52.8859	52.8859	52.8859	52.8859	52.8859 (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)	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052 (71)
Water heating gains (Table 5)	103.3510	100.8335	95.9838	85.3548	78.8442	72.0390	67.8592	71.3126	75.3614	82.9125	93.1017	101.9920 (72)
Total internal gains	581.6394	579.5666	561.1106	526.4697	491.9760	457.7143	439.1578	442.1663	459.8215	494.3844	532.5567	565.9036 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
East				8.0200	19.6403		0.7300	0.7000	0.7700		55.7797 (76)	
South				0.7100	46.7521		0.7300	0.7000	0.7700		11.7547 (78)	
West				5.5900	19.6403		0.7300	0.7000	0.7700		38.8788 (80)	
Solar gains	106.4132	204.4233	329.4747	472.4703	573.9449	585.7639	558.3666	482.6744	380.2887	240.4866	131.9614	87.9997 (83)
Total gains	688.0526	783.9899	890.5853	998.9401	1065.9209	1043.4782	997.5243	924.8407	840.1102	734.8709	664.5181	653.9033 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												
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	57.8733	58.0516	58.2276	59.0684	59.2284	59.9849	59.9849	60.1271	59.6913	59.2284	58.9056	58.5718
alpha	4.8582	4.8701	4.8818	4.9379	4.9486	4.9990	4.9990	5.0085	4.9794	4.9486	4.9270	4.9048
util living area	0.9892	0.9788	0.9497	0.8694	0.7227	0.5369	0.3930	0.4404	0.6884	0.9172	0.9799	0.9914 (86)
MIT	20.0401	20.1911	20.4285	20.6966	20.8611	20.9242	20.9356	20.9340	20.8931	20.6581	20.2992	20.0146 (87)
Th 2	20.0093	20.0121	20.0148	20.0274	20.0298	20.0408	20.0408	20.0429	20.0366	20.0298	20.0250	20.0200 (88)
util rest of house	0.9861	0.9729	0.9360	0.8373	0.6661	0.4617	0.3086	0.3510	0.6103	0.8885	0.9733	0.9889 (89)
MIT 2	18.8964	19.0890	19.3856	19.7129	19.8882	19.9535	19.9605	19.9620	19.9276	19.6800	19.2379	18.8725 (90)
Living area fraction	19.0630	19.2495	19.5375	19.8562	20.0299	20.0949	20.1026	20.1036	20.0682	19.8225	19.3925	19.0389 (92)
Temperature adjustment	18.9130	19.0995	19.3875	19.7062	19.8799	19.9449	19.9526	19.9536	19.9182	19.6725	19.2425	18.8889 (93)
adjusted MIT	18.9130	19.0995	19.3875	19.7062	19.8799	19.9449	19.9526	19.9536	19.9182	19.6725	19.2425	18.8889 (93)

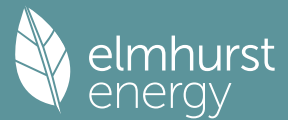
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9815	0.9658	0.9253	0.8251	0.6566	0.4540	0.3007	0.3425	0.6000	0.8755	0.9662	0.9850 (94)
Useful gains	675.3184	757.2072	824.0416	824.2111	699.9222	473.7265	299.9689	316.7652	504.0591	643.3909	642.0286	644.0869 (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	1357.5498	1315.0875	1189.9683	983.5881	742.5301	479.0660	300.4908	317.7565	524.0507	823.5521	1108.2733	1348.3279 (97)
Space heating kWh	507.5802	374.8956	272.2494	114.7514	31.7003	0.0000	0.0000	0.0000	0.0000	134.0400	335.6962	523.9553 (98a)
Space heating requirement - total per year (kWh/year)												2294.8684
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	507.5802	374.8956	272.2494	114.7514	31.7003	0.0000	0.0000	0.0000	0.0000	134.0400	335.6962	523.9553 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2294.8684
Space heating per m ²										(98c) / (4) =		26.9161 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												
Efficiency of main space heating system 1 (in %)												
Efficiency of main space heating system 2 (in %)												
Efficiency of secondary/supplementary heating system, %												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	507.5802	374.8956	272.2494	114.7514	31.7003	0.0000	0.0000	0.0000	0.0000	134.0400	335.6962	523.9553 (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)	573.5369	423.6108	307.6265	129.6626	35.8195	0.0000	0.0000	0.0000	0.0000	151.4576	379.3177	592.0399 (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	236.0653	208.1195	219.5395	189.3840	181.0926	160.4782	156.4516	164.1980	167.6904	190.2184	206.2010	233.0168 (214)
Efficiency of water heater												87.0000 (216)

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(217)m	88.0183	87.9586	87.8240	87.5599	87.2202	87.0000	87.0000	87.0000	87.0000	87.6139	87.9232	88.0328	(217)
Fuel for water heating, kWh/month	268.2003	236.6107	249.9766	216.2907	207.6268	184.4577	179.8294	188.7333	192.7476	217.1099	234.5241	264.6932	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	(231)
Lighting	24.4148	19.5865	17.6354	12.9205	9.9801	8.1539	9.1042	11.8340	15.3712	20.1679	22.7795	25.0934	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-26.9270	-41.9242	-66.8198	-81.1507	-90.9213	-85.8976	-84.4524	-77.7695	-65.8603	-50.3220	-30.6708	-22.6373	(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	-11.5352	-27.8364	-65.4233	-113.3011	-162.5898	-168.3776	-164.3657	-131.0831	-85.5095	-42.6428	-16.0844	-8.7660	(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												2593.0716	(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												2640.8004	(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)												197.0413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1722.8677	(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												3794.0457	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2593.0716	5.6000	145.2120	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2640.8004	5.6000	147.8848	(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	197.0413	26.0600	51.3490	(250)
Additional standing charges			99.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-725.3529	26.0600	-189.0270	
PV Unit electricity exported	-997.5147	5.8100	-57.9556	
Total			-246.9826	(252)
Total energy cost			218.8748	(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	2593.0716	0.2100	544.5450	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2640.8004	0.2100	554.5681	(264)
Space and water heating			1099.1131	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	197.0413	0.1443	28.4392	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-725.3529	0.1331	-96.5186	
PV Unit electricity exported	-997.5147	0.1225	-122.2043	
Total			-218.7229	(269)
Total CO2, kg/year			920.7586	(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	2593.0716	1.1300	2930.1709	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2640.8004	1.1300	2984.1045	(278)
Space and water heating			5914.2754	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	197.0413	1.5338	302.2286	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-725.3529	1.4917	-1082.0121	
PV Unit electricity exported	-997.5147	0.4495	-448.4124	
Total			-1530.4245	(283)
Total Primary energy kWh/year			4816.1803	(286)

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SAP 10 EPC IMPROVEMENTS

Plot 22

Current energy efficiency rating: A 93
Current environmental impact rating: B 91

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 -134 kg (14.6%)

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 91

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	£392	£392	£0
Space heating	£267	£267	£0
Water heating	£148	£148	£0
Lighting	£51	£51	£0
Generated (PV)	-£247	-£247	£0
Total cost of fuels	£219	£219	£0
Total cost of uses	£219	£219	£0
Delivered energy	44 kWh/m²	44 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.9 tonnes	0.0 tonnes
CO2 emissions per m²	11 kg/m²	11 kg/m²	0 kg/m²
Primary energy	56 kWh/m²	56 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

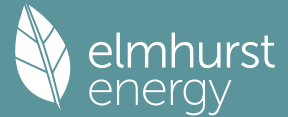
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	42.6300 (1b)	x 2.3900 (2b)	= 101.8857 (1b) - (3b)
First floor	42.6300 (1c)	x 2.6200 (2c)	= 111.6906 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	213.5763 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1873 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3873 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3582 (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	0.4568	0.4478	0.4388	0.3941	0.3851	0.3403	0.3403	0.3314	0.3582	0.3851	0.4030	0.4209 (22b)
Effective ac	0.6043	0.6003	0.5963	0.5776	0.5742	0.5579	0.5579	0.5549	0.5642	0.5742	0.5812	0.5886 (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	
Windows (Uw = 1.30)			14.3200	1.2357	17.6958			(27)
Door			2.1400	1.3000	2.7820			(26a)
Ground Floor			42.6300	0.1300	5.5419	75.0000	3197.2500	(28a)
External Wall	92.6900	16.4600	76.2300	0.1900	14.4837	110.0000	8385.3000	(29a)
Plane Roof	42.6300		42.6300	0.0900	3.8367	9.0000	383.6700	(30)
Total net area of external elements Aum(A, m2)			177.9500					(31)
Fabric heat loss, W/K = Sum (A x U)								(32)
Party Wall			43.5900	0.0000	0.0000	110.0000	4794.9000	(32c)
Studs			160.3400			9.0000	1443.0600	(32d)
Internal Floor 1			42.6300			18.0000	767.3400	(32e)
Internal Ceiling 1			42.6300			9.0000	383.6700	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19355.1900 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 227.0137 (35)

List of Thermal Bridges	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	11.2000	0.0240	0.2688	
E3 Sill	8.3700	0.0210	0.1758	
E4 Jamb	25.5000	0.0160	0.4080	
E5 Ground floor (normal)	18.5000	0.0920	1.7020	
E10 Eaves (insulation at ceiling level)	9.8000	0.0580	0.5684	
E16 Corner (normal)	10.0200	0.0470	0.4709	
E6 Intermediate floor within a dwelling	18.5000	0.0010	0.0185	
E12 Gable (insulation at ceiling level)	8.7000	0.0570	0.4959	
E18 Party wall between dwellings	10.0200	0.0380	0.3808	
P1 Party wall - Ground floor	8.7000	0.0690	0.6003	
P2 Party wall - Intermediate floor within a dwelling	8.7000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	8.7000	0.1010	0.8787	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				5.9681 (36)
Point Thermal bridges				(36a) = 0.0000
Total fabric heat loss				(33) + (36) + (36a) = 50.3082 (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	42.5921	42.3066	42.0268	40.7124	40.4665	39.3217	39.3217	39.1097	39.7627	40.4665	40.9640	41.4841	(38)
Average = Sum(39)m / 12 =	92.9003	92.6148	92.3350	91.0206	90.7747	89.6299	89.6299	89.4179	90.0709	90.7747	91.2722	91.7923	(39)
													91.0194

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0896	1.0863	1.0830	1.0676	1.0647	1.0513	1.0513	1.0488	1.0564	1.0647	1.0705	1.0766	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

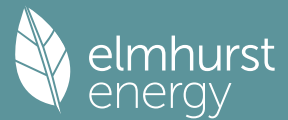
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5551 (42)
Hot water usage for mixer showers													
67.0609	66.0531	64.5845	61.7747	59.7011	57.3887	56.0743	57.5318	59.1294	61.6122	64.4824	66.8039		(42a)
Hot water usage for baths													
28.9616	28.5315	27.9258	26.8090	25.9727	25.0455	24.5446	25.1461	25.8009	26.7932	27.9330	28.8637		(42b)
Hot water usage for other uses													
40.7971	39.3136	37.8300	36.3465	34.8630	33.3794	33.3794	34.8630	36.3465	37.8300	39.3136	40.7971		(42c)
Average daily hot water use (litres/day)													125.7681 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
136.8196	133.8981	130.3403	124.9302	120.5369	115.8136	113.9984	117.5408	121.2769	126.2354	131.7289	136.4647		(44)
Energy conte	216.6888	190.6692	200.3283	171.0232	162.2658	142.4064	137.8712	145.5401	149.5465	171.3003	187.6720	213.6708	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													2088.9824
32.5033	28.6004	30.0492	25.6535	24.3399	21.3610	20.6807	21.8310	22.4320	25.6950	28.1508	32.0506		(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	19.3765	17.4504	19.2113	18.3608	18.8268	18.0718	18.5804	18.6579	18.1439	18.9181	18.5290	19.3460	(61)
Total heat required for water heating calculated for each month	236.0653	208.1195	219.5395	189.3840	181.0926	160.4782	156.4516	164.1980	167.6904	190.2184	206.2010	233.0168	(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	236.0653	208.1195	219.5395	189.3840	181.0926	160.4782	156.4516	164.1980	167.6904	190.2184	206.2010	233.0168	(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	76.8931	67.7601	71.4120	61.4554	58.6601	51.8681	50.4873	53.0566	54.2602	61.6869	67.0332	75.8820	(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	153.3079	153.3079	153.3079	153.3079	153.3079	153.3079	153.3079	153.3079	153.3079	153.3079	153.3079	153.3079	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.8932	24.7745	20.1480	15.2533	11.4020	9.6261	10.4013	13.5200	18.1466	23.0412	26.8925	28.6685	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	343.4066	346.9701	337.9902	318.8731	294.7412	272.0607	256.9087	253.3452	262.3250	281.4421	305.5740	328.2546	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8859	52.8859	52.8859	52.8859	52.8859	52.8859	52.8859	52.8859	52.8859	52.8859	52.8859	52.8859	(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)

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Losses e.g. evaporation (negative values) (Table 5)	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052 (71)
Water heating gains (Table 5)	103.3510	100.8335	95.9838	85.3548	78.8442	72.0390	67.8592	71.3126	75.3614	82.9125	93.1017	101.9920 (72)
Total internal gains	581.6394	579.5666	561.1106	526.4697	491.9760	457.7143	439.1578	442.1663	459.8215	494.3844	532.5567	565.9036 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
East				8.0200	19.6403	0.7300	0.7000			0.7700			55.7797 (76)
South				0.7100	46.7521	0.7300	0.7000			0.7700			11.7547 (78)
West				5.5900	19.6403	0.7300	0.7000			0.7700			38.8788 (80)
Solar gains	106.4132	204.4233	329.4747	472.4703	573.9449	585.7639	558.3666	482.6744	380.2887	240.4866	131.9614	87.9997	(83)
Total gains	688.0526	783.9899	890.5853	998.9401	1065.9209	1043.4782	997.5243	924.8407	840.1102	734.8709	664.5181	653.9033	(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	57.8733	58.0516	58.2276	59.0684	59.2284	59.9849	59.9849	60.1271	59.6913	59.2284	58.9056	58.5718
alpha	4.8582	4.8701	4.8818	4.9379	4.9486	4.9990	4.9990	5.0085	4.9794	4.9486	4.9270	4.9048
util living area	0.9892	0.9788	0.9497	0.8694	0.7227	0.5369	0.3930	0.4404	0.6884	0.9172	0.9799	0.9914 (86)
MIT	20.0401	20.1911	20.4285	20.6966	20.8611	20.9242	20.9356	20.9340	20.8931	20.6581	20.2992	20.0146 (87)
Th 2	20.0093	20.0121	20.0148	20.0274	20.0298	20.0408	20.0408	20.0429	20.0366	20.0298	20.0250	20.0200 (88)
util rest of house	0.9861	0.9729	0.9360	0.8373	0.6661	0.4617	0.3086	0.3510	0.6103	0.8885	0.9733	0.9889 (89)
MIT 2	18.8964	19.0890	19.3856	19.7129	19.8882	19.9535	19.9605	19.9620	19.9276	19.6800	19.2379	18.8725 (90)
Living area fraction	19.0630	19.2495	19.5375	19.8562	20.0299	20.0949	20.1026	20.1036	20.0682	19.8225	19.3925	19.0389 (92)
MIT	18.9130	19.0995	19.3875	19.7062	19.8799	19.9449	19.9526	19.9536	19.9182	19.6725	19.2425	-0.1500
Temperature adjustment												18.8889 (93)
adjusted MIT												

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9815	0.9658	0.9253	0.8251	0.6566	0.4540	0.3007	0.3425	0.6000	0.8755	0.9662	0.9850 (94)
Ext temp.	675.3184	757.2072	824.0416	824.2111	699.9222	473.7265	299.9689	316.7652	504.0591	643.3909	642.0286	644.0869 (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	1357.5498	1315.0875	1189.9683	983.5881	742.5301	479.0660	300.4908	317.7565	524.0507	823.5521	1108.2733	1348.3279 (97)
Space heating requirement - total per year (kWh/year)	507.5802	374.8956	272.2494	114.7514	31.7003	0.0000	0.0000	0.0000	0.0000	134.0400	335.6962	523.9553 (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)	507.5802	374.8956	272.2494	114.7514	31.7003	0.0000	0.0000	0.0000	0.0000	134.0400	335.6962	523.9553 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2294.8684
Space heating per m ²										(98c) / (4) =		26.9161 (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	507.5802	374.8956	272.2494	114.7514	31.7003	0.0000	0.0000	0.0000	0.0000	134.0400	335.6962	523.9553 (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)	573.5369	423.6108	307.6265	129.6626	35.8195	0.0000	0.0000	0.0000	0.0000	151.4576	379.3177	592.0399 (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	236.0653	208.1195	219.5395	189.3840	181.0926	160.4782	156.4516	164.1980	167.6904	190.2184	206.2010	233.0168 (64)
Efficiency of water heater (217)m	88.0183	87.9586	87.8240	87.5599	87.2202	87.0000	87.0000	87.0000	87.0000	87.6139	87.9232	87.0000 (216)
Fuel for water heating, kWh/month	268.2003	236.6107	249.9766	216.2907	207.6268	184.4577	179.8294	188.7333	192.7476	217.1099	234.5241	264.6932 (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	24.4148	19.5865	17.6354	12.9205	9.9801	8.1539	9.1042	11.8340	15.3712	20.1679	22.7795	25.0934 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-26.9270	-41.9242	-66.8198	-81.1507	-90.9213	-85.8976	-84.4524	-77.7695	-65.8603	-50.3220	-30.6708	-22.6373 (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)												

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(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	-11.5352	-27.8364	-65.4233	-113.3011	-162.5898	-168.3776	-164.3657	-131.0831	-85.5095	-42.6428	-16.0844	-8.7660	(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												2593.0716	(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												2640.8004	(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)												197.0413	(232)

Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1722.8677	(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												3794.0457	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2593.0716	3.6400	94.3878	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2640.8004	3.6400	96.1251	(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	197.0413	16.4900	32.4921	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-725.3529	16.4900	-119.6107	
PV Unit electricity exported	-997.5147	5.5900	-55.7611	
Total			-175.3718	(252)
Total energy cost			153.8147	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.4251	(257)
SAP value		93.1092	
SAP rating (Section 12)		93	(258)
SAP band		A	

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

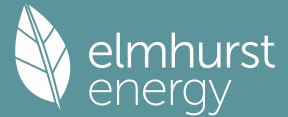
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2593.0716	0.2100	544.5450	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2640.8004	0.2100	554.5681	(264)
Space and water heating			1099.1131	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	197.0413	0.1443	28.4392	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-725.3529	0.1331	-96.5186	
PV Unit electricity exported	-997.5147	0.1225	-122.2043	
Total			-218.7229	(269)
Total CO2, kg/year			920.7586	(272)
CO2 emissions per m2			10.8000	(273)
EI value			90.5280	
EI rating			91	(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 FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	42.6300 (1b)	x 2.3900 (2b)	= 101.8857 (1b) - (3b)	

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First floor
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 85.2600 42.6300 (1c) x 2.6200 (2c) = 111.6906 (1c) - (3c)
Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 213.5763 (4)
(5)

2. Ventilation rate

m3 per hour

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

Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 40.0000 / (5) = 0.1873 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 4.0000 (17)
Infiltration rate 0.3873 (18)
Number of sides sheltered 1 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3582 (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	0.4568	0.4478	0.4388	0.3941	0.3851	0.3403	0.3403	0.3314	0.3582	0.3851	0.4030	0.4209 (22b)
Effective ac	0.6043	0.6003	0.5963	0.5776	0.5742	0.5579	0.5579	0.5549	0.5642	0.5742	0.5812	0.5886 (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)			14.3200	1.2357	17.6958		(27)
Door			2.1400	1.3000	2.7820		(26a)
Ground Floor			42.6300	0.1300	5.5419	75.0000	3197.2500 (28a)
External Wall	92.6900	16.4600	76.2300	0.1900	14.4837	110.0000	8385.3000 (29a)
Plane Roof	42.6300		42.6300	0.0900	3.8367	9.0000	383.6700 (30)
Total net area of external elements Aum(A, m2)			177.9500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.3401		(33)
Party Wall			43.5900	0.0000	0.0000	110.0000	4794.9000 (32)
Studs			160.3400			9.0000	1443.0600 (32c)
Internal Floor 1			42.6300			18.0000	767.3400 (32d)
Internal Ceiling 1			42.6300			9.0000	383.6700 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	19355.1900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							227.0137 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				11.2000	0.0240	0.2688	
E3 Sill				8.3700	0.0210	0.1758	
E4 Jamb				25.5000	0.0160	0.4080	
E5 Ground floor (normal)				18.5000	0.0920	1.7020	
E10 Eaves (insulation at ceiling level)				9.8000	0.0580	0.5684	
E16 Corner (normal)				10.0200	0.0470	0.4709	
E6 Intermediate floor within a dwelling				18.5000	0.0010	0.0185	
E12 Gable (insulation at ceiling level)				8.7000	0.0570	0.4959	
E18 Party wall between dwellings				10.0200	0.0380	0.3808	
P1 Party wall - Ground floor				8.7000	0.0690	0.6003	
P2 Party wall - Intermediate floor within a dwelling				8.7000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)				8.7000	0.1010	0.8787	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.9681 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	50.3082 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	42.5921	42.3066	42.0268	40.7124	40.4665	39.3217	39.3217	39.1097	39.7627	40.4665	40.9640	41.4841 (38)
Heat transfer coeff	92.9003	92.6148	92.3350	91.0206	90.7747	89.6299	89.6299	89.4179	90.0709	90.7747	91.2722	91.7923 (39)
Average = Sum(39)m / 12 =												91.0194

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0896	1.0863	1.0830	1.0676	1.0647	1.0513	1.0513	1.0488	1.0564	1.0647	1.0705	1.0766 (40)
HLP (average)												1.0676
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5551 (42)

Hot water usage for mixer showers 67.0609 66.0531 64.5845 61.7747 59.7011 57.3887 56.0743 57.5318 59.1294 61.6122 64.4824 66.8039 (42a)

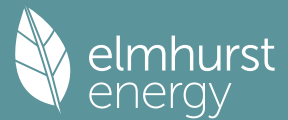
Hot water usage for baths 28.9616 28.5315 27.9258 26.8090 25.9727 25.0455 24.5446 25.1461 25.8009 26.7932 27.9330 28.8637 (42b)

Hot water usage for other uses 40.7971 39.3136 37.8300 36.3465 34.8630 33.3794 33.3794 34.8630 36.3465 37.8300 39.3136 40.7971 (42c)

Average daily hot water use (litres/day) 125.7681 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	136.8196	133.8981	130.3403	124.9302	120.5369	115.8136	113.9984	117.5408	121.2769	126.2354	131.7289	136.4647 (44)
Energy conte	216.6888	190.6692	200.3283	171.0232	162.2658	142.4064	137.8712	145.5401	149.5465	171.3003	187.6720	213.6708 (45)

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Energy content (annual)	Total = Sum(45)m = 2088.9824										
Distribution loss (46)m = 0.15 x (45)m											
32.5033	28.6004	30.0492	25.6535	24.3399	21.3610	20.6807	21.8310	22.4320	25.6950	28.1508	32.0506 (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 (59)
Combi loss	19.3765	17.4504	19.2113	18.3608	18.8268	18.0718	18.5804	18.6579	18.1439	18.9181	19.3460 (61)
Total heat required for water heating calculated for each month											
236.0653	208.1195	219.5395	189.3840	181.0926	160.4782	156.4516	164.1980	167.6904	190.2184	206.2010	233.0168 (62)
WWHRS	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 (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 (63c)
FGHRS	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											
236.0653	208.1195	219.5395	189.3840	181.0926	160.4782	156.4516	164.1980	167.6904	190.2184	206.2010	233.0168 (64)
Total per year (kWh/year) = Sum(64)m =											2312.4553 (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											
76.8931	67.7601	71.4120	61.4554	58.6601	51.8681	50.4873	53.0566	54.2602	61.6869	67.0332	75.8820 (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	153.3079	153.3079	153.3079	153.3079	153.3079	153.3079	153.3079	153.3079	153.3079	153.3079	153.3079	153.3079	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.8932	24.7745	20.1480	15.2533	11.4020	9.6261	10.4013	13.5200	18.1466	23.0412	26.8925	28.6685	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	343.4066	346.9701	337.9902	318.8731	294.7412	272.0607	256.9087	253.3452	262.3250	281.4421	305.5740	328.2546	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8859	52.8859	52.8859	52.8859	52.8859	52.8859	52.8859	52.8859	52.8859	52.8859	52.8859	52.8859	(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)	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	-102.2052	(71)
Water heating gains (Table 5)	103.3510	100.8335	95.9838	85.3548	78.8442	72.0390	67.8592	71.3126	75.3614	82.9125	93.1017	101.9920	(72)
Total internal gains	581.6394	579.5666	561.1106	526.4697	491.9760	457.7143	439.1578	442.1663	459.8215	494.3844	532.5567	565.9036	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W	
East				8.0200	19.6403		0.7300	0.7000		0.7700		55.7797 (76)	
South				0.7100	46.7521		0.7300	0.7000		0.7700		11.7547 (78)	
West				5.5900	19.6403		0.7300	0.7000		0.7700		38.8788 (80)	
Solar gains	106.4132	204.4233	329.4747	472.4703	573.9449	585.7639	558.3666	482.6744	380.2887	240.4866	131.9614	87.9997	(83)
Total gains	688.0526	783.9899	890.5853	998.9401	1065.9209	1043.4782	997.5243	924.8407	840.1102	734.8709	664.5181	653.9033	(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	57.8733	58.0516	58.2276	59.0684	59.2284	59.9849	59.9849	60.1271	59.6913	59.2284	58.9056	58.5718
alpha	4.8582	4.8701	4.8818	4.9379	4.9486	4.9990	4.9990	5.0085	4.9794	4.9486	4.9270	4.9048
util living area	0.9892	0.9788	0.9497	0.8694	0.7227	0.5369	0.3930	0.4404	0.6884	0.9172	0.9799	0.9914 (86)
MIT	20.0401	20.1911	20.4285	20.6966	20.8611	20.9242	20.9356	20.9340	20.8931	20.6581	20.2992	20.0146 (87)
Th 2	20.0093	20.0121	20.0148	20.0274	20.0298	20.0408	20.0408	20.0429	20.0366	20.0298	20.0250	20.0200 (88)
util rest of house	0.9861	0.9729	0.9360	0.8373	0.6661	0.4617	0.3086	0.3510	0.6103	0.8885	0.9733	0.9889 (89)
MIT 2	18.8964	19.0890	19.3856	19.7129	19.8882	19.9535	19.9605	19.9620	19.9276	19.6800	19.2379	18.8725 (90)
Living area fraction	19.0630	19.2495	19.5375	19.8562	20.0299	20.0949	20.1026	20.1036	20.0682	19.8225	19.3925	19.0389 (91)
MIT	18.9130	19.0995	19.3875	19.7062	19.8799	19.9449	19.9526	19.9536	19.9182	19.6725	19.2425	18.8889 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.9130	19.0995	19.3875	19.7062	19.8799	19.9449	19.9526	19.9536	19.9182	19.6725	19.2425	18.8889 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	675.3184	757.2072	824.0416	824.2111	699.9222	473.7265	299.9689	316.7652	504.0591	643.3909	642.0286	644.0869	(94)
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	1357.5498	1315.0875	1189.9683	983.5881	742.5301	479.0660	300.4908	317.7565	524.0507	823.5521	1108.2733	1348.3279	(97)
Space heating kWh	507.5802	374.8956	272.2494	114.7514	31.7003	0.0000	0.0000	0.0000	0.0000	134.0400	335.6962	523.9553	(98a)
Space heating requirement - total per year (kWh/year)												2294.8684	
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	507.5802	374.8956	272.2494	114.7514	31.7003	0.0000	0.0000	0.0000	0.0000	134.0400	335.6962	523.9553	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2294.8684	
Space heating per m ²												26.9161	(99)

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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	507.5802	374.8956	272.2494	114.7514	31.7003	0.0000	0.0000	0.0000	0.0000	134.0400	335.6962	523.9553	(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)	573.5369	423.6108	307.6265	129.6626	35.8195	0.0000	0.0000	0.0000	0.0000	151.4576	379.3177	592.0399	(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	236.0653	208.1195	219.5395	189.3840	181.0926	160.4782	156.4516	164.1980	167.6904	190.2184	206.2010	233.0168	(64)
Efficiency of water heater (217)m	88.0183	87.9586	87.8240	87.5599	87.2202	87.0000	87.0000	87.0000	87.0000	87.6139	87.9232	88.0328	(216)
Fuel for water heating, kWh/month	268.2003	236.6107	249.9766	216.2907	207.6268	184.4577	179.8294	188.7333	192.7476	217.1099	234.5241	264.6932	(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	24.4148	19.5865	17.6354	12.9205	9.9801	8.1539	9.1042	11.8340	15.3712	20.1679	22.7795	25.0934	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-26.9270	-41.9242	-66.8198	-81.1507	-90.9213	-85.8976	-84.4524	-77.7695	-65.8603	-50.3220	-30.6708	-22.6373	(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	-11.5352	-27.8364	-65.4233	-113.3011	-162.5898	-168.3776	-164.3657	-131.0831	-85.5095	-42.6428	-16.0844	-8.7660	(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												2593.0716	(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												2640.8004	(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)												197.0413	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1722.8677	(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												3794.0457	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2593.0716	5.6000	145.2120	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2640.8004	5.6000	147.8848	(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	197.0413	26.0600	51.3490	(250)
Additional standing charges			99.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-725.3529	26.0600	-189.0270	
PV Unit electricity exported	-997.5147	5.8100	-57.9556	
Total			-246.9826	(252)
Total energy cost			218.8748	(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	2593.0716	0.2100	544.5450	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2640.8004	0.2100	554.5681	(264)
Space and water heating			1099.1131	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	197.0413	0.1443	28.4392	(268)
Energy saving/generation technologies				

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PV Unit electricity used in dwelling	-725.3529	0.1331	-96.5186
PV Unit electricity exported	-997.5147	0.1225	-122.2043
Total			-218.7229 (269)
Total CO2, kg/year			920.7586 (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	2593.0716	1.1300	2930.1709 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2640.8004	1.1300	2984.1045 (278)
Space and water heating			5914.2754 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	197.0413	1.5338	302.2286 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-725.3529	1.4917	-1082.0121
PV Unit electricity exported	-997.5147	0.4495	-448.4124
Total			-1530.4245 (283)
Total Primary energy kWh/year			4816.1803 (286)

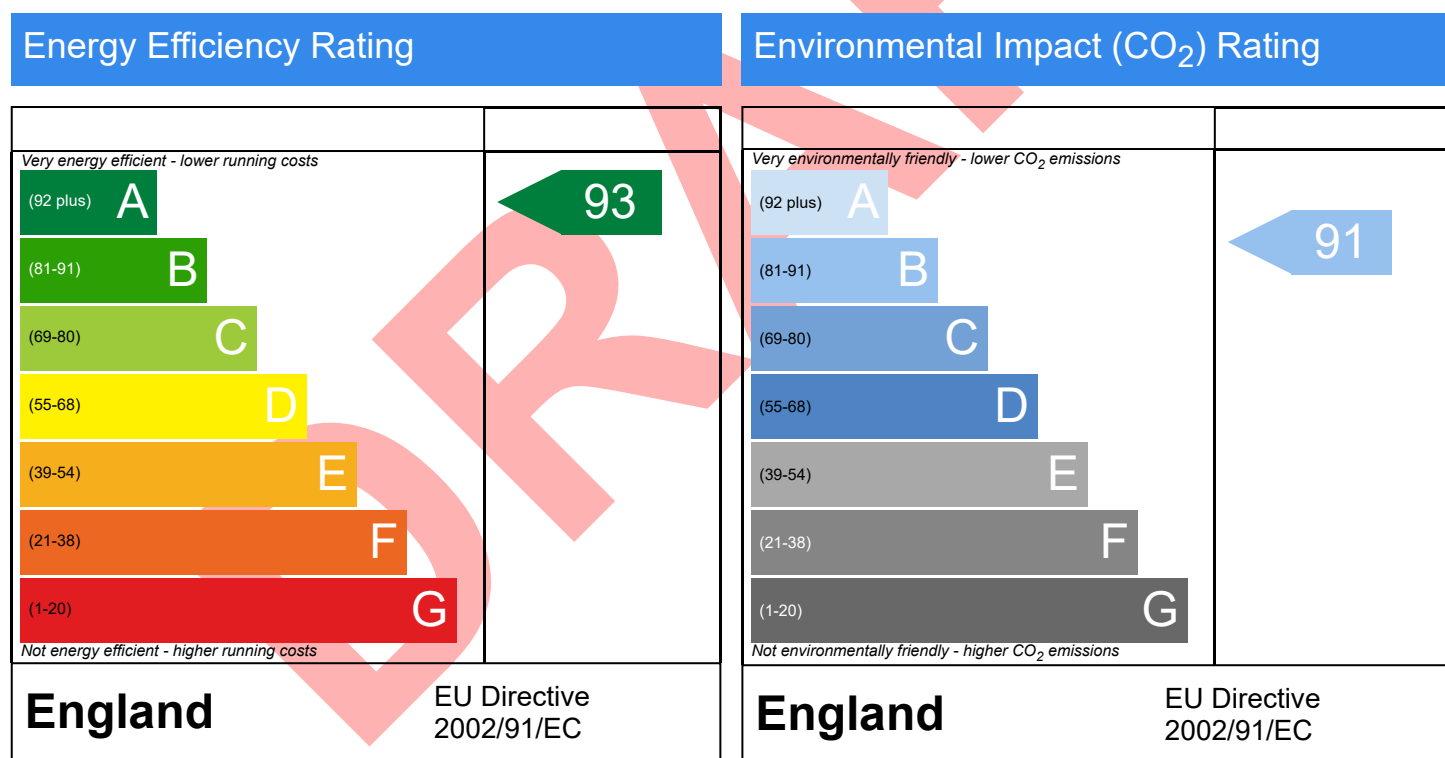
Predicted Energy Assessment



Dwelling type: House, Semi-Detached
Date of assessment: 15/11/2024
Produced by: Victoria Gartside
Total floor area: 85.26 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.