

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 10:34:31

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 28
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	11.48 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	11.42 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	59.94 kWh _{PE} /m ²		
Dwelling primary energy	59.81 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	36.9 kWh/m ²		
Dwelling fabric energy efficiency	34.1 kWh/m ²		OK

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.19	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	North	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

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 28	Prop Type Ref	SAP VG 21-0282
Property			

SAP Rating	93 A	DER	11.42	TER	11.48
Environmental	90 B	% DER < TER			0.52
CO ₂ Emissions (t/year)	0.93	DFEE	34.06	TFEE	36.91
Compliance Check	See BREL	% DFEE < TFEE			7.73
% DPER < TPER	0.21	DPER	59.81	TPER	59.94

Assessor Details	Miss Victoria Gartside	Assessor ID	AL30-0001
Client			

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

Orientation	West
Property Tenture	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	Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
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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	North	0.71	0

14.0 Conservatory

15.0 Draught Proofing

%

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
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 W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present

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

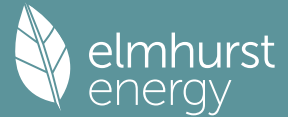
Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout



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Property							
SAP Rating	93 A	DER	11.42	TER	11.48		
Environmental	90 B	% DER < TER				0.52	
CO ₂ Emissions (t/year)	0.93	DFEE	34.06	TFEE	36.91		
Compliance Check	See BREL	% DFEE < TFEE				7.73	
% DPER < TPER	0.21	DPER	59.81	TPER	59.94		
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

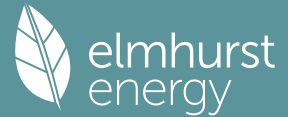
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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 (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	
E3 Sill				8.3700	0.0210	0.1758	
E4 Jamb				25.5000	0.0160	0.4080	

Full SAP Calculation Printout



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
												1.0676
												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)
12Total per year (kWh/year)									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)

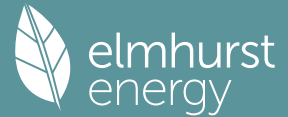
5. Internal gains (see Table 5 and 5a)												

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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)

6. Solar gains												

[Jan]				Area	Solar flux	g	FF	Access	Gains			
				m2	Table 6a	Specific data	Specific data	factor	W			
					W/m2	or Table 6b	or Table 6c	Table 6d				
North				0.7100	10.6334	0.7300	0.7000	0.7700	2.6735			(74)
East				8.0200	19.6403	0.7300	0.7000	0.7700	55.7797			(76)
West				5.5900	19.6403	0.7300	0.7000	0.7700	38.8788			(80)
Solar gains	97.3320	190.2813	313.6339	458.6997	563.8488	578.0797	549.9851	471.1972	365.1103	225.8042	121.3261	80.0713 (83)
Total gains	615.0471	720.7187	820.3529	945.9796	1024.4513	1017.6795	971.2549	893.5327	801.5096	681.5646	607.4426	586.2756 (84)

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7. Mean internal temperature (heating season)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, nil,m (see Table 9a)													21.0000 (85)
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	0.9932	0.9848	0.9625	0.8880	0.7427	0.5492	0.4034	0.4552	0.7126	0.9352	0.9860	0.9946	(86)
MIT	19.9684	20.1318	20.3705	20.6672	20.8512	20.9228	20.9353	20.9334	20.8857	20.6203	20.2453	19.9474	(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													
	0.9913	0.9805	0.9517	0.8587	0.6866	0.4728	0.3168	0.3631	0.6347	0.9111	0.9812	0.9930	(89)
MIT 2	18.8055	19.0148	19.3157	19.6809	19.8795	19.9527	19.9604	19.9618	19.9222	19.6376	19.1706	18.7872	(90)
Living area fraction													
MIT	18.9749	19.1775	19.4693	19.8246	20.0211	20.0940	20.1024	20.1033	20.0625	19.7807	19.3272	18.9562	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.8249	19.0275	19.3193	19.6746	19.8711	19.9440	19.9524	19.9533	19.9125	19.6307	19.1772	18.8062	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9879	0.9746	0.9420	0.8462	0.6767	0.4648	0.3088	0.3543	0.6237	0.8986	0.9755	0.9902	(94)
Useful gains	607.6116	702.4284	772.8049	800.5068	693.2107	473.0569	299.8897	316.5727	499.9069	612.4274	592.5329	580.5253	(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	1349.3632	1308.4171	1183.6723	980.7109	741.7245	478.9817	300.4790	317.7289	523.5377	819.7620	1102.3114	1340.7333	(97)
Space heating kWh	551.8632	407.2244	305.6853	129.7469	36.0943	0.0000	0.0000	0.0000	0.0000	154.2569	367.0405	565.5948	(98a)
Space heating requirement - total per year (kWh/year)												2517.5064	
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	551.8632	407.2244	305.6853	129.7469	36.0943	0.0000	0.0000	0.0000	0.0000	154.2569	367.0405	565.5948	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2517.5064	
Space heating per m2										(98c) / (4) =		29.5274	(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	551.8632	407.2244	305.6853	129.7469	36.0943	0.0000	0.0000	0.0000	0.0000	154.2569	367.0405	565.5948	(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)	623.5742	460.1406	345.4072	146.6067	40.7845	0.0000	0.0000	0.0000	0.0000	174.3016	414.7351	639.0902	(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	88.0452	87.9869	87.8668	87.6037	87.2458	87.0000	87.0000	87.0000	87.0000	87.6654	87.9545	88.0570	(216)
Fuel for water heating, kWh/month	268.1183	236.5346	249.8550	216.1828	207.5661	184.4577	179.8294	188.7333	192.7476	216.9824	234.4405	264.6204	(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												2844.6400	(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												2640.0681	(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	4044.8818 (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	2844.6400	0.2100	597.3744 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2640.0681	0.2100	554.4143 (264)
Space and water heating			1151.7887 (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			973.4342 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.4200 (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	2844.6400	1.1300	3214.4432 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2640.0681	1.1300	2983.2769 (278)
Space and water heating			6197.7201 (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			5099.6250 (286)
Dwelling Primary energy Rate (DPER)			59.8100 (287)

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

1. Overall dwelling characteristics

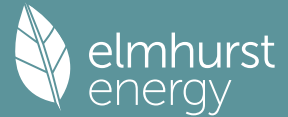
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	42.6300 (1b)	x 2.3900 (2b)	= 101.8857 (1b) - (3b)
First floor	42.6300 (1c)	x 2.6200 (2c)	= 111.6906 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.5763 (5)

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)+(6g)+(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	

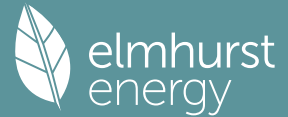
4. Water heating energy requirements (kWh/year)

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)												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	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
North					0.7100	10.6334	0.6300	0.7000	0.7700			2.3073 (74)
East					8.0200	19.6403	0.6300	0.7000	0.7700			48.1386 (76)
West					5.5900	19.6403	0.6300	0.7000	0.7700			33.5530 (80)
Solar gains	83.9989	164.2154	270.6704	395.8641	486.6092	498.8907	474.6447	406.6496	315.0952	194.8721	104.7061	69.1026 (83)
Total gains	612.3263	705.2841	788.0572	893.8921	958.0088	949.3389	906.7943	839.8390	762.3178	661.3989	601.5122	585.9295 (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	0.9934	0.9864	0.9686	0.9089	0.7827	0.5933	0.4391	0.4914	0.7461	0.9436	0.9868	0.9947 (86)
MIT	19.6689	19.8715	20.1758	20.5730	20.8470	20.9697	20.9943	20.9904	20.9102	20.5344	20.0390	19.6434 (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	0.9915	0.9824	0.9593	0.8829	0.7283	0.5120	0.3440	0.3914	0.6682	0.9216	0.9823	0.9931 (89)
MIT 2	18.4488	18.7080	19.0922	19.5829	19.8851	20.0058	20.0214	20.0218	19.9581	19.5503	18.9320	18.4240 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.6266	18.8775	19.2501	19.7271	20.0253	20.1462	20.1631	20.1629	20.0968	19.6937	19.0933	18.6016 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.6266	18.8775	19.2501	19.7271	20.0253	20.1462	20.1631	20.1629	20.0968	19.6937	19.0933	18.6016 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9877	0.9763	0.9503	0.8742	0.7291	0.5226	0.3578	0.4058	0.6750	0.9127	0.9764	0.9898 (94)
Useful gains	604.7904	688.5929	748.8834	781.4211	698.4597	496.0902	324.4677	340.8062	514.5507	603.6528	587.3208	579.9607 (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	1357.7190	1320.5802	1200.9900	1005.3902	770.9910	507.1724	325.8285	343.2867	551.0656	842.1555	1116.7474	1348.6138 (97)
Space heating kWh	560.1789	424.6955	336.3673	161.2577	53.9633	0.0000	0.0000	0.0000	0.0000	177.4460	381.1872	571.8779 (98a)
Space heating requirement - total per year (kWh/year)	2666.9738											
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	560.1789	424.6955	336.3673	161.2577	53.9633	0.0000	0.0000	0.0000	0.0000	177.4460	381.1872	571.8779 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2666.9738											
Space heating per m ²	(98c) / (4) = 31.2805 (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	560.1789	424.6955	336.3673	161.2577	53.9633	0.0000	0.0000	0.0000	0.0000	177.4460	381.1872	571.8779 (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)	606.2542	459.6272	364.0339	174.5213	58.4018	0.0000	0.0000	0.0000	0.0000	192.0411	412.5402	618.9155 (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	86.1568	85.8615	85.2607	83.9575	82.0462	80.3000	80.3000	80.3000	80.3000	84.1324	85.6315	86.2145 (216)
Fuel for water heating, kWh/month	275.0684	244.0941	261.4279	234.4383	233.1791	215.4082	213.2705	221.4333	223.4913	236.9967	246.4983	272.0423 (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													2886.3353	(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													2877.3483	(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													3943.7419	(238)

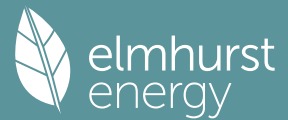
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2886.3353	0.2100	606.1304 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2877.3483	0.2100	604.2432 (264)
Space and water heating			1210.3736 (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			978.6897 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.4800 (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	2886.3353	1.1300	3261.5589 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2877.3483	1.1300	3251.4036 (278)
Space and water heating			6512.9625 (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			5110.3171 (286)
Target Primary Energy Rate (TPER)			59.9400 (287)

Full SAP Calculation Printout



Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 28			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	93 A	DER	11.42	TER	11.48		
Environmental	90 B	% DER < TER				0.52	
CO ₂ Emissions (t/year)	0.93	DFEE	34.06	TFEE	36.91		
Compliance Check	See BREL	% DFEE < TFEE				7.73	
% DPER < TPER	0.21	DPER	59.81	TPER	59.94		
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

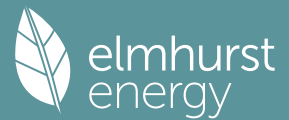
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)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

	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	0.4015	0.3937	0.3858	0.3464	0.3385	0.2992	0.2992	0.2913	0.3149	0.3385	0.3543	0.3700 (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	0.5806	0.5775	0.5744	0.5600	0.5573	0.5448	0.5448	0.5424	0.5496	0.5573	0.5628	0.5685 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.30)			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 content (annual)	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)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Total heat required for water heating calculated for each month	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)												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			
North				0.7100	10.6334	0.7300	0.7000	0.7700	2.6735 (74)			
East				8.0200	19.6403	0.7300	0.7000	0.7700	55.7797 (76)			
West				5.5900	19.6403	0.7300	0.7000	0.7700	38.8788 (80)			
Solar gains	97.3320	190.2813	313.6339	458.6997	563.8488	578.0797	549.9851	471.1972	365.1103	225.8042	121.3261	80.0713 (83)
Total gains	558.2973	665.2373	767.7925	900.4552	983.0678	983.6688	940.2298	860.5122	766.0795	638.2566	557.4185	530.4824 (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	0.9955	0.9888	0.9699	0.9007	0.7578	0.5613	0.4122	0.4675	0.7308	0.9470	0.9900	0.9965 (86)
MIT	19.6669	19.8872	20.2115	20.6195	20.8780	20.9784	20.9962	20.9931	20.9244	20.5475	20.0347	19.6340 (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	0.9941	0.9856	0.9610	0.8736	0.7028	0.4844	0.3247	0.3740	0.6538	0.9264	0.9866	0.9954 (89)
MIT 2	18.8138	19.0337	19.3531	19.7444	19.9633	20.0402	20.0488	20.0494	20.0069	19.6893	19.1891	18.7874 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.9380	19.1580	19.4782	19.8719	20.0966	20.1769	20.1868	20.1869	20.1405	19.8143	19.3123	18.9108 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.9380	19.1580	19.4782	19.8719	20.0966	20.1769	20.1868	20.1869	20.1405	19.8143	19.3123	18.9108 (93)

8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9920	0.9817	0.9546	0.8682	0.7062	0.4950	0.3374	0.3876	0.6620	0.9203	0.9830	0.9937 (94)
Useful gains	553.8573	653.0435	732.9325	781.7521	694.2740	486.8693	317.2666	333.5238	507.1255	587.3993	547.9242	527.1417 (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	1335.4293	1297.6144	1178.3300	985.0288	752.2271	494.6832	318.1614	335.2857	537.8683	825.4830	1098.7632	1329.4667 (97)
Space heating kWh	581.4895	433.1516	331.3757	146.3592	43.1172	0.0000	0.0000	0.0000	0.0000	177.1342	396.6041	596.9299 (98a)
Space heating requirement - total per year (kWh/year)	2706.1614											
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	581.4895	433.1516	331.3757	146.3592	43.1172	0.0000	0.0000	0.0000	0.0000	177.1342	396.6041	596.9299 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2706.1614											
Space heating per m2	(98c) / (4) = 31.7401 (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	0.9264	0.9630	0.9439	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	772.4005	632.0861	635.1631	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1100.2506	1051.9120	961.1169	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	236.0520	312.3504	242.5096	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	59.0130	78.0876	60.6274	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	197.7280 (107)											
Energy for space heating	31.7401 (99)											
Energy for space cooling	2.3191 (108)											
Total	34.0592 (109)											
Fabric Energy Efficiency (DFEE)	34.1 (109)											

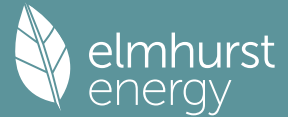
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics												
	Area (m2)	Storey height (m)	Volume (m3)									
Ground floor	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											
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		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	52.0560	(37)

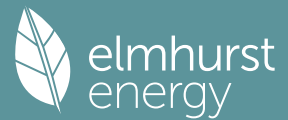
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	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														
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	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	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)													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	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	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	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	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	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	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	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	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	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	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	0.0000	(64d)
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	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	53.7046	(64a)

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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
North					0.7100	10.6334		0.6300	0.7000	0.7700		2.3073 (74)
East					8.0200	19.6403		0.6300	0.7000	0.7700		48.1386 (76)
West					5.5900	19.6403		0.6300	0.7000	0.7700		33.5530 (80)
Solar gains	83.9989	164.2154	270.6704	395.8641	486.6092	498.8907	474.6447	406.6496	315.0952	194.8721	104.7061	69.1026 (83)
Total gains	544.9642	639.1713	724.8290	837.6196	905.8282	904.4798	864.8894	795.9646	716.0644	607.3245	540.7985	519.5138 (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	0.9960	0.9909	0.9771	0.9256	0.8081	0.6180	0.4594	0.5164	0.7764	0.9581	0.9915	0.9968 (86)
MIT	19.5794	19.7863	20.1004	20.5221	20.8225	20.9638	20.9931	20.9881	20.8925	20.4765	19.9603	19.5544 (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	0.9948	0.9881	0.9700	0.9031	0.7559	0.5351	0.3604	0.4123	0.7005	0.9407	0.9884	0.9958 (89)
MIT 2	18.7005	18.9080	19.2195	19.6321	19.8954	20.0068	20.0215	20.0219	19.9608	19.5998	19.0921	18.6839 (90)
Living area fraction	18.8285	19.0360	19.3478	19.7617	20.0304	20.1462	20.1630	20.1626	20.0965	19.7275	19.2186	18.8107 (92)
MIT	18.8285	19.0360	19.3478	19.7617	20.0304	20.1462	20.1630	20.1626	20.0965	19.7275	19.2186	18.8107 (93)
Temperature adjustment												0.0000
adjusted MIT	18.8285	19.0360	19.3478	19.7617	20.0304	20.1462	20.1630	20.1626	20.0965	19.7275	19.2186	18.8107 (93)

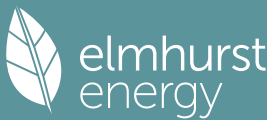
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9928	0.9845	0.9640	0.8964	0.7570	0.5459	0.3748	0.4273	0.7071	0.9343	0.9851	0.9942 (94)
Useful gains	541.0315	629.2923	698.7403	750.8226	685.6929	493.8007	324.1465	340.1488	506.3325	567.4271	532.7347	516.4974 (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	1376.8554	1335.5538	1210.1972	1008.6066	771.4680	507.1743	325.8183	343.2617	551.0381	845.2834	1128.4141	1368.1945 (97)
Space heating kWh	621.8530	474.6077	380.5240	185.6045	63.8167	0.0000	0.0000	0.0000	0.0000	206.7251	428.8892	633.6626 (98a)
Space heating requirement - total per year (kWh/year)												2995.6827
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	621.8530	474.6077	380.5240	185.6045	63.8167	0.0000	0.0000	0.0000	0.0000	206.7251	428.8892	633.6626 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2995.6827
Space heating per m ²												35.1359 (99)

8c. Space cooling requirement

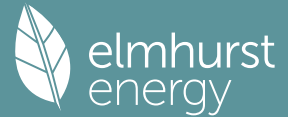
Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W												
	0.0000	0.0000	0.0000	0.0000	0.0000	859.5832	676.6932	693.3445	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8897	0.9404	0.9152	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	764.8028	636.3414	634.5203	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1007.6920	963.8517	885.6717	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	174.8802	243.6677	186.8566	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	43.7201	60.9169	46.7142	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												151.3511 (107)
Energy for space heating												35.1359 (99)

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Energy for space cooling	1.7752 (108)
Total	36.9110 (109)
Fabric Energy Efficiency (TFEE)	36.9 (109)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 28			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	93 A	DER	11.42	TER	11.48		
Environmental	90 B	% DER < TER				0.52	
CO ₂ Emissions (t/year)	0.93	DFEE	34.06	TFEE	36.91		
Compliance Check	See BREL	% DFEE < TFEE				7.73	
% DPER < TPER	0.21	DPER	59.81	TPER	59.94		
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

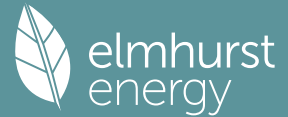
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)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

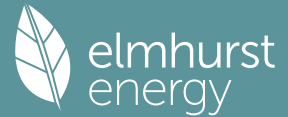
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	42.5921	42.3066	42.0268	40.7124	40.4665	39.3217	39.3217	39.1097	39.7627	40.4665	40.9640	41.4841 (38)
Average = Sum(39)m / 12 =	92.9003	92.6148	92.3350	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)	32.5033	28.6004	30.0492	25.6535	24.3399	21.3610	20.6807	21.8310	22.4320	25.6950	28.1508	32.0506 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	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)
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)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (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	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 (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)

6. Solar gains												
[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				0.7100	10.6334	0.7300	0.7000	0.7700	2.6735 (74)			
East				8.0200	19.6403	0.7300	0.7000	0.7700	55.7797 (76)			
West				5.5900	19.6403	0.7300	0.7000	0.7700	38.8788 (80)			
Solar gains	97.3320	190.2813	313.6339	458.6997	563.8488	578.0797	549.9851	471.1972	365.1103	225.8042	121.3261	80.0713 (83)
Total gains	615.0471	720.7187	820.3529	945.9796	1024.4513	1017.6795	971.2549	893.5327	801.5096	681.5646	607.4426	586.2756 (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	0.9932	0.9848	0.9625	0.8880	0.7427	0.5492	0.4034	0.4552	0.7126	0.9352	0.9860	0.9946 (86)
MIT	19.9684	20.1318	20.3705	20.6672	20.8512	20.9228	20.9353	20.9334	20.8857	20.6203	20.2453	19.9474 (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	0.9913	0.9805	0.9517	0.8587	0.6866	0.4728	0.3168	0.3631	0.6347	0.9111	0.9812	0.9930 (89)
MIT 2	18.8055	19.0148	19.3157	19.6809	19.8795	19.9527	19.9604	19.9618	19.9222	19.6376	19.1706	18.7872 (90)
Living area fraction									fLA = Living area /	(4) =		0.1457 (91)
MIT	18.9749	19.1775	19.4693	19.8246	20.0211	20.0940	20.1024	20.1033	20.0625	19.7807	19.3272	18.9562 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.8249	19.0275	19.3193	19.6746	19.8711	19.9440	19.9524	19.9533	19.9125	19.6307	19.1772	18.8062 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9879	0.9746	0.9420	0.8462	0.6767	0.4648	0.3088	0.3543	0.6237	0.8986	0.9755	0.9902 (94)
Useful gains	607.6116	702.4284	772.8049	800.5068	693.2107	473.0569	299.8897	316.5727	499.9069	612.4274	592.5329	580.5253 (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	1349.3632	1308.4171	1183.6723	980.7109	741.7245	478.9817	300.4790	317.7289	523.5377	819.7620	1102.3114	1340.7333 (97)
Space heating kWh	551.8632	407.2244	305.6853	129.7469	36.0943	0.0000	0.0000	0.0000	0.0000	154.2569	367.0405	565.5948 (98a)
Space heating requirement - total per year (kWh/year)												2517.5064
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	551.8632	407.2244	305.6853	129.7469	36.0943	0.0000	0.0000	0.0000	0.0000	154.2569	367.0405	565.5948 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2517.5064
Space heating per m2										(98c) / (4) =		29.5274 (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	551.8632	407.2244	305.6853	129.7469	36.0943	0.0000	0.0000	0.0000	0.0000	154.2569	367.0405	565.5948 (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)	623.5742	460.1406	345.4072	146.6067	40.7845	0.0000	0.0000	0.0000	0.0000	174.3016	414.7351	639.0902 (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	88.0452	87.9869	87.8668	87.6037	87.2458	87.0000	87.0000	87.0000	87.0000	87.6654	87.9545	88.0570 (216)
Fuel for water heating, kWh/month	268.1183	236.5346	249.8550	216.1828	207.5661	184.4577	179.8294	188.7333	192.7476	216.9824	234.4405	264.6204 (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												2844.6400 (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												2640.0681 (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	4044.8818 (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	2844.6400	0.2100	597.3744 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2640.0681	0.2100	554.4143 (264)
Space and water heating			1151.7887 (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			973.4342 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.4200 (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	2844.6400	1.1300	3214.4432 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2640.0681	1.1300	2983.2769 (278)
Space and water heating			6197.7201 (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			5099.6250 (286)
Dwelling Primary energy Rate (DPER)			59.8100 (287)

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

1. Overall dwelling characteristics

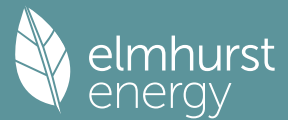
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	42.6300 (1b)	x 2.3900 (2b)	= 101.8857 (1b) - (3b)
First floor	42.6300 (1c)	x 2.6200 (2c)	= 111.6906 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.5763 (5)

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)								(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	

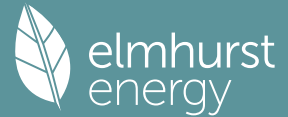
4. Water heating energy requirements (kWh/year)

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)												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	
North					0.7100	10.6334	0.6300	0.7000	0.7700	2.3073 (74)		
East					8.0200	19.6403	0.6300	0.7000	0.7700	48.1386 (76)		
West					5.5900	19.6403	0.6300	0.7000	0.7700	33.5530 (80)		
Solar gains	83.9989	164.2154	270.6704	395.8641	486.6092	498.8907	474.6447	406.6496	315.0952	194.8721	104.7061	69.1026 (83)
Total gains	612.3263	705.2841	788.0572	893.8921	958.0088	949.3389	906.7943	839.8390	762.3178	661.3989	601.5122	585.9295 (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	0.9934	0.9864	0.9686	0.9089	0.7827	0.5933	0.4391	0.4914	0.7461	0.9436	0.9868	0.9947 (86)
MIT	19.6689	19.8715	20.1758	20.5730	20.8470	20.9697	20.9943	20.9904	20.9102	20.5344	20.0390	19.6434 (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	0.9915	0.9824	0.9593	0.8829	0.7283	0.5120	0.3440	0.3914	0.6682	0.9216	0.9823	0.9931 (89)
MIT 2	18.4488	18.7080	19.0922	19.5829	19.8851	20.0058	20.0214	20.0218	19.9581	19.5503	18.9320	18.4240 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.6266	18.8775	19.2501	19.7271	20.0253	20.1462	20.1631	20.1629	20.0968	19.6937	19.0933	18.6016 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.6266	18.8775	19.2501	19.7271	20.0253	20.1462	20.1631	20.1629	20.0968	19.6937	19.0933	18.6016 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9877	0.9763	0.9503	0.8742	0.7291	0.5226	0.3578	0.4058	0.6750	0.9127	0.9764	0.9898 (94)
Useful gains	604.7904	688.5929	748.8834	781.4211	698.4597	496.0902	324.4677	340.8062	514.5507	603.6528	587.3208	579.9607 (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	1357.7190	1320.5802	1200.9900	1005.3902	770.9910	507.1724	325.8285	343.2867	551.0656	842.1555	1116.7474	1348.6138 (97)
Space heating kWh	560.1789	424.6955	336.3673	161.2577	53.9633	0.0000	0.0000	0.0000	0.0000	177.4460	381.1872	571.8779 (98a)
Space heating requirement - total per year (kWh/year)	2666.9738											
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	560.1789	424.6955	336.3673	161.2577	53.9633	0.0000	0.0000	0.0000	0.0000	177.4460	381.1872	571.8779 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2666.9738											
Space heating per m ²	(98c) / (4) = 31.2805 (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	560.1789	424.6955	336.3673	161.2577	53.9633	0.0000	0.0000	0.0000	0.0000	177.4460	381.1872	571.8779 (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)	606.2542	459.6272	364.0339	174.5213	58.4018	0.0000	0.0000	0.0000	0.0000	192.0411	412.5402	618.9155 (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	86.1568	85.8615	85.2607	83.9575	82.0462	80.3000	80.3000	80.3000	80.3000	84.1324	85.6315	86.2145 (216)
Fuel for water heating, kWh/month	275.0684	244.0941	261.4279	234.4383	233.1791	215.4082	213.2705	221.4333	223.4913	236.9967	246.4983	272.0423 (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													2886.3353	(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													2877.3483	(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													3943.7419	(238)

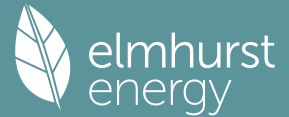
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2886.3353	0.2100	606.1304 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2877.3483	0.2100	604.2432 (264)
Space and water heating			1210.3736 (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			978.6897 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.4800 (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	2886.3353	1.1300	3261.5589 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2877.3483	1.1300	3251.4036 (278)
Space and water heating			6512.9625 (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			5110.3171 (286)
Target Primary Energy Rate (TPER)			59.9400 (287)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 28			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	93 A	DER	11.42	TER	11.48		
Environmental	90 B	% DER < TER				0.52	
CO ₂ Emissions (t/year)	0.93	DFEE	34.06	TFEE	36.91		
Compliance Check	See BREL	% DFEE < TFEE				7.73	
% DPER < TPER	0.21	DPER	59.81	TPER	59.94		
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 (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	
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	
												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													
	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)

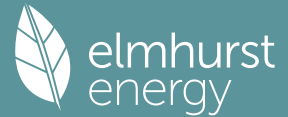
5. Internal gains (see Table 5 and 5a)													

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	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			
North				0.7100	10.6334		0.7300	0.7000		0.7700		2.6735	(74)
East				8.0200	19.6403		0.7300	0.7000		0.7700		55.7797	(76)
West				5.5900	19.6403		0.7300	0.7000		0.7700		38.8788	(80)
Solar gains	97.3320	190.2813	313.6339	458.6997	563.8488	578.0797	549.9851	471.1972	365.1103	225.8042	121.3261	80.0713	(83)
Total gains	678.9714	769.8479	874.7445	985.1694	1055.8248	1035.7940	989.1429	913.3635	824.9318	720.1885	653.8829	645.9749	(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	0.9898	0.9803	0.9527	0.8744	0.7276	0.5405	0.3963	0.4457	0.6978	0.9224	0.9811	0.9918 (86)
MIT	20.0313	20.1780	20.4157	20.6892	20.8588	20.9238	20.9355	20.9338	20.8903	20.6481	20.2893	20.0068 (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	0.9869	0.9748	0.9398	0.8429	0.6710	0.4650	0.3112	0.3553	0.6197	0.8949	0.9749	0.9895 (89)
MIT 2	18.8852	19.0727	19.3703	19.7050	19.8862	19.9533	19.9605	19.9619	19.9256	19.6688	19.2256	18.8626 (90)
Living area fraction									fLA = Living area /	(4) =		0.1457 (91)
MIT	19.0521	19.2337	19.5226	19.8483	20.0279	20.0947	20.1025	20.1035	20.0661	19.8115	19.3805	19.0293 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.9021	19.0837	19.3726	19.6983	19.8779	19.9447	19.9525	19.9535	19.9161	19.6615	19.2305	18.8793 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9824	0.9679	0.9292	0.8306	0.6614	0.4572	0.3032	0.3467	0.6092	0.8820	0.9680	0.9857 (94)
Useful gains	667.0128	745.1617	812.8392	818.2991	698.3732	473.5354	299.9449	316.6987	502.5170	635.2127	632.9733	636.7209 (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	1356.5432	1313.6182	1188.5907	982.8714	742.3444	479.0419	300.4872	317.7469	523.8601	822.5512	1107.1803	1347.4460 (97)
Space heating kWh	513.0106	382.0028	279.5591	118.4921	32.7145	0.0000	0.0000	0.0000	0.0000	139.3799	341.4291	528.7794 (98a)
Space heating requirement - total per year (kWh/year)												2335.3674
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	513.0106	382.0028	279.5591	118.4921	32.7145	0.0000	0.0000	0.0000	0.0000	139.3799	341.4291	528.7794 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2335.3674
Space heating per m2										(98c) / (4) =		27.3911 (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	513.0106	382.0028	279.5591	118.4921	32.7145	0.0000	0.0000	0.0000	0.0000	139.3799	341.4291	528.7794 (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)	579.6730	431.6416	315.8859	133.8893	36.9656	0.0000	0.0000	0.0000	0.0000	157.4914	385.7955	597.4909 (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	88.0217	87.9651	87.8339	87.5712	87.2262	87.0000	87.0000	87.0000	87.0000	87.6281	87.9292	88.0357 (217)	
Fuel for water heating, kWh/month	268.1898	236.5932	249.9486	216.2628	207.6126	184.4577	179.8294	188.7333	192.7476	217.0747	234.5081	264.6844 (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)	-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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)	-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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1													2638.8332 (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													2640.6422 (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	3839.6491 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2638.8332	3.6400	96.0535 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2640.6422	3.6400	96.1194 (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			155.4747 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.4297 (257)
SAP value		93.0348
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	2638.8332	0.2100	554.1550 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2640.6422	0.2100	554.5349 (264)
Space and water heating			1108.6898 (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			930.3353 (272)
CO2 emissions per m2			10.9100 (273)
EI value			90.4295
EI rating			90 (274)
EI band			B

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

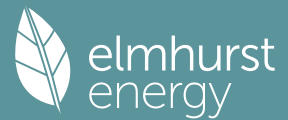
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	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 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 136.8196	Feb 133.8981	Mar 130.3403	Apr 124.9302	May 120.5369	Jun 115.8136	Jul 113.9984	Aug 117.5408	Sep 121.2769	Oct 126.2354	Nov 131.7289	Dec 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													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	19.3765	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	(64a)
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)

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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

North					0.7100	10.6334	0.7300	0.7000				0.7700			2.6735 (74)
East					8.0200	19.6403	0.7300	0.7000				0.7700			55.7797 (76)
West					5.5900	19.6403	0.7300	0.7000				0.7700			38.8788 (80)

Solar gains	97.3320	190.2813	313.6339	458.6997	563.8488	578.0797	549.9851	471.1972	365.1103	225.8042	121.3261			80.0713 (83)	
Total gains	678.9714	769.8479	874.7445	985.1694	1055.8248	1035.7940	989.1429	913.3635	824.9318	720.1885	653.8829			645.9749 (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	0.9898	0.9803	0.9527	0.8744	0.7276	0.5405	0.3963	0.4457	0.6978	0.9224	0.9811	0.9918	(86)	
MIT	20.0313	20.1780	20.4157	20.6892	20.8588	20.9238	20.9355	20.9338	20.8903	20.6481	20.2893	20.0068	(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	0.9869	0.9748	0.9398	0.8429	0.6710	0.4650	0.3112	0.3553	0.6197	0.8949	0.9749	0.9895	(89)	
MIT 2	18.8852	19.0727	19.3703	19.7050	19.8862	19.9533	19.9605	19.9619	19.9256	19.6688	19.2256	18.8626	(90)	
Living area fraction	19.0521	19.2337	19.5226	19.8483	20.0279	20.0947	20.1025	20.1035	20.0661	19.8115	19.3805	19.0293	(91)	
MIT	18.9021	19.0837	19.3726	19.6983	19.8779	19.9447	19.9525	19.9535	19.9161	19.6615	19.2305	18.8793	(93)	
Temperature adjustment														
adjusted MIT														

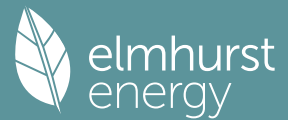
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	0.9824	0.9679	0.9292	0.8306	0.6614	0.4572	0.3032	0.3467	0.6092	0.8820	0.9680	0.9857	(94)	
Useful gains	667.0128	745.1617	812.8392	818.2991	698.3732	473.5354	299.9449	316.6987	502.5170	635.2127	632.9733	636.7209	(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	1356.5432	1313.6182	1188.5907	982.8714	742.3444	479.0419	300.4872	317.7469	523.8601	822.5512	1107.1803	1347.4460	(97)	
Space heating kWh	513.0106	382.0028	279.5591	118.4921	32.7145	0.0000	0.0000	0.0000	0.0000	139.3799	341.4291	528.7794	(98a)	
Space heating requirement - total per year (kWh/year)												2335.3674		
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	513.0106	382.0028	279.5591	118.4921	32.7145	0.0000	0.0000	0.0000	0.0000	139.3799	341.4291	528.7794	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												2335.3674		
Space heating per m ²												27.3911	(99)	

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													88.5000	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	513.0106	382.0028	279.5591	118.4921	32.7145	0.0000	0.0000	0.0000	0.0000	139.3799	341.4291	528.7794	(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)	579.6730	431.6416	315.8859	133.8893	36.9656	0.0000	0.0000	0.0000	0.0000	157.4914	385.7955	597.4909	(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												87.0000	(216)	

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(217)m	88.0217	87.9651	87.8339	87.5712	87.2262	87.0000	87.0000	87.0000	87.0000	87.6281	87.9292	88.0357	(217)
Fuel for water heating, kWh/month	268.1898	236.5932	249.9486	216.2628	207.6126	184.4577	179.8294	188.7333	192.7476	217.0747	234.5081	264.6844	(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												2638.8332	(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												2640.6422	(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												3839.6491	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2638.8332	5.6000	147.7747 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2640.6422	5.6000	147.8760 (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			221.4286 (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	2638.8332	0.2100	554.1550 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2640.6422	0.2100	554.5349 (264)
Space and water heating			1108.6898 (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			930.3353 (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	2638.8332	1.1300	2981.8815 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2640.6422	1.1300	2983.9257 (278)
Space and water heating			5965.8072 (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			4867.7121 (286)

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SAP 10 EPC IMPROVEMENTS

Plot 28

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

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

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

Measures omitted - SAP change or cost saving too small:
N Solar water heating + 0.6 -£ 20 -134 kg (14.4%)

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

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

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

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

	Current	Potential	Saving
Electricity	£74	£74	£0
Mains gas	£395	£395	£0
Space heating	£269	£269	£0
Water heating	£148	£148	£0
Lighting	£51	£51	£0
Generated (PV)	-£247	-£247	£0
Total cost of fuels	£222	£222	£0
Total cost of uses	£221	£221	£0
Delivered energy	45 kWh/m²	45 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	57 kWh/m²	57 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

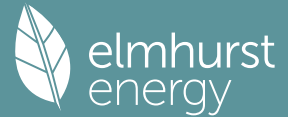
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	42.6300 (1b)	x 2.3900 (2b)	= 101.8857 (1b) - (3b)
First floor	42.6300 (1c)	x 2.6200 (2c)	= 111.6906 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	213.5763 (5)

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

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
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
Average = Sum(39)m / 12 =												

	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
HLP (average)												
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)

	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
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
Energy content (annual)												
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)

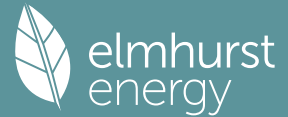
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	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)
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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(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		
North					0.7100	10.6334	0.7300	0.7000	0.7700		2.6735 (74)		
East					8.0200	19.6403	0.7300	0.7000	0.7700		55.7797 (76)		
West					5.5900	19.6403	0.7300	0.7000	0.7700		38.8788 (80)		
Solar gains	97.3320	190.2813	313.6339	458.6997	563.8488	578.0797	549.9851	471.1972	365.1103	225.8042	121.3261	80.0713 (83)	
Total gains	678.9714	769.8479	874.7445	985.1694	1055.8248	1035.7940	989.1429	913.3635	824.9318	720.1885	653.8829	645.9749 (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	0.9898	0.9803	0.9527	0.8744	0.7276	0.5405	0.3963	0.4457	0.6978	0.9224	0.9811	0.9918 (86)
MIT	20.0313	20.1780	20.4157	20.6892	20.8588	20.9238	20.9355	20.9338	20.8903	20.6481	20.2893	20.0068 (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	0.9869	0.9748	0.9398	0.8429	0.6710	0.4650	0.3112	0.3553	0.6197	0.8949	0.9749	0.9895 (89)
MIT 2	18.8852	19.0727	19.3703	19.7050	19.8862	19.9533	19.9605	19.9619	19.9256	19.6688	19.2256	18.8626 (90)
Living area fraction	19.0521	19.2337	19.5226	19.8483	20.0279	20.0947	20.1025	20.1035	20.0661	19.8115	19.3805	19.0293 (92)
MIT	18.9021	19.0837	19.3726	19.6983	19.8779	19.9447	19.9525	19.9535	19.9161	19.6615	19.2305	-0.1500
Temperature adjustment												18.8793 (93)
adjusted MIT												

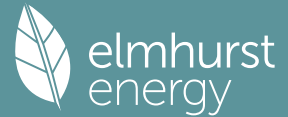
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9824	0.9679	0.9292	0.8306	0.6614	0.4572	0.3032	0.3467	0.6092	0.8820	0.9680	0.9857 (94)
Ext temp.	667.0128	745.1617	812.8392	818.2991	698.3732	473.5354	299.9449	316.6987	502.5170	635.2127	632.9733	636.7209 (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	1356.5432	1313.6182	1188.5907	982.8714	742.3444	479.0419	300.4872	317.7469	523.8601	822.5512	1107.1803	1347.4460 (97)
Space heating requirement - total per year (kWh/year)	513.0106	382.0028	279.5591	118.4921	32.7145	0.0000	0.0000	0.0000	0.0000	139.3799	341.4291	528.7794 (98a)
Solar heating kWh												2335.3674
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Space heating kWh	513.0106	382.0028	279.5591	118.4921	32.7145	0.0000	0.0000	0.0000	0.0000	139.3799	341.4291	528.7794 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2335.3674
Space heating per m2										(98c) / (4) =		27.3911 (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	513.0106	382.0028	279.5591	118.4921	32.7145	0.0000	0.0000	0.0000	0.0000	139.3799	341.4291	528.7794 (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)	579.6730	431.6416	315.8859	133.8893	36.9656	0.0000	0.0000	0.0000	0.0000	157.4914	385.7955	597.4909 (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	88.0217	87.9651	87.8339	87.5712	87.2262	87.0000	87.0000	87.0000	87.0000	87.6281	87.9292	87.0000 (216)
Fuel for water heating, kWh/month	268.1898	236.5932	249.9486	216.2628	207.6126	184.4577	179.8294	188.7333	192.7476	217.0747	234.5081	264.6844 (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												2638.8332	(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												2640.6422	(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												3839.6491	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2638.8332	3.6400	96.0535	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2640.6422	3.6400	96.1194	(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			155.4747	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.4297	(257)
SAP value		93.0348	
SAP rating (Section 12)		93	(258)
SAP band		A	

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

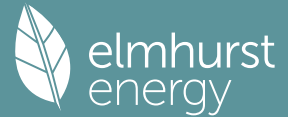
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2638.8332	0.2100	554.1550	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2640.6422	0.2100	554.5349	(264)
Space and water heating			1108.6898	(265)
Pumps, fans and 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			930.3353	(272)
CO2 emissions per m2			10.9100	(273)
EI value			90.4295	
EI rating			90	(274)
EI band			B	

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

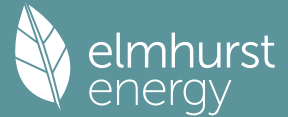
Hot water usage for baths 28.9616 28.5315 27.9258 26.8090 25.9727 25.0455 24.5446 25.1461 25.8009 26.7932 27.9330 28.8637 (42b)

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	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	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		
North				0.7100	10.6334		0.7300	0.7000	0.7700		2.6735 (74)		
East				8.0200	19.6403		0.7300	0.7000	0.7700		55.7797 (76)		
West				5.5900	19.6403		0.7300	0.7000	0.7700		38.8788 (80)		
Solar gains	97.3320	190.2813	313.6339	458.6997	563.8488	578.0797	549.9851	471.1972	365.1103	225.8042	121.3261	80.0713	(83)
Total gains	678.9714	769.8479	874.7445	985.1694	1055.8248	1035.7940	989.1429	913.3635	824.9318	720.1885	653.8829	645.9749	(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	0.9898	0.9803	0.9527	0.8744	0.7276	0.5405	0.3963	0.4457	0.6978	0.9224	0.9811	0.9918 (86)
MIT	20.0313	20.1780	20.4157	20.6892	20.8588	20.9238	20.9355	20.9338	20.8903	20.6481	20.2893	20.0068 (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	0.9869	0.9748	0.9398	0.8429	0.6710	0.4650	0.3112	0.3553	0.6197	0.8949	0.9749	0.9895 (89)
MIT 2	18.8852	19.0727	19.3703	19.7050	19.8862	19.9533	19.9605	19.9619	19.9256	19.6688	19.2256	18.8626 (90)
Living area fraction	19.0521	19.2337	19.5226	19.8483	20.0279	20.0947	20.1025	20.1035	20.0661	19.8115	19.3805	19.0293 (91)
MIT	19.0521	19.2337	19.5226	19.8483	20.0279	20.0947	20.1025	20.1035	20.0661	19.8115	19.3805	19.0293 (92)
Temperature adjustment	18.9021	19.0837	19.3726	19.6983	19.8779	19.9447	19.9525	19.9535	19.9161	19.6615	19.2305	-0.1500
adjusted MIT	18.9021	19.0837	19.3726	19.6983	19.8779	19.9447	19.9525	19.9535	19.9161	19.6615	19.2305	18.8793 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	667.0128	745.1617	812.8392	818.2991	698.3732	473.5354	299.9449	316.6987	502.5170	635.2127	632.9733	636.7209	(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	1356.5432	1313.6182	1188.5907	982.8714	742.3444	479.0419	300.4872	317.7469	523.8601	822.5512	1107.1803	1347.4460	(97)
Space heating kWh	513.0106	382.0028	279.5591	118.4921	32.7145	0.0000	0.0000	0.0000	0.0000	139.3799	341.4291	528.7794	(98a)
Space heating requirement - total per year (kWh/year)												2335.3674	
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	513.0106	382.0028	279.5591	118.4921	32.7145	0.0000	0.0000	0.0000	0.0000	139.3799	341.4291	528.7794	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2335.3674	
Space heating per m ²												27.3911	(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	513.0106	382.0028	279.5591	118.4921	32.7145	0.0000	0.0000	0.0000	0.0000	139.3799	341.4291	528.7794	(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)	579.6730	431.6416	315.8859	133.8893	36.9656	0.0000	0.0000	0.0000	0.0000	157.4914	385.7955	597.4909	(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	88.0217	87.9651	87.8339	87.5712	87.2262	87.0000	87.0000	87.0000	87.0000	87.6281	87.9292	88.0357	(216)
Fuel for water heating, kWh/month	268.1898	236.5932	249.9486	216.2628	207.6126	184.4577	179.8294	188.7333	192.7476	217.0747	234.5081	264.6844	(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												2638.8332	(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												2640.6422	(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												3839.6491	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2638.8332	5.6000	147.7747	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2640.6422	5.6000	147.8760	(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			221.4286	(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	2638.8332	0.2100	554.1550	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2640.6422	0.2100	554.5349	(264)
Space and water heating			1108.6898	(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			930.3353 (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	2638.8332	1.1300	2981.8815 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2640.6422	1.1300	2983.9257 (278)
Space and water heating			5965.8072 (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			4867.7121 (286)

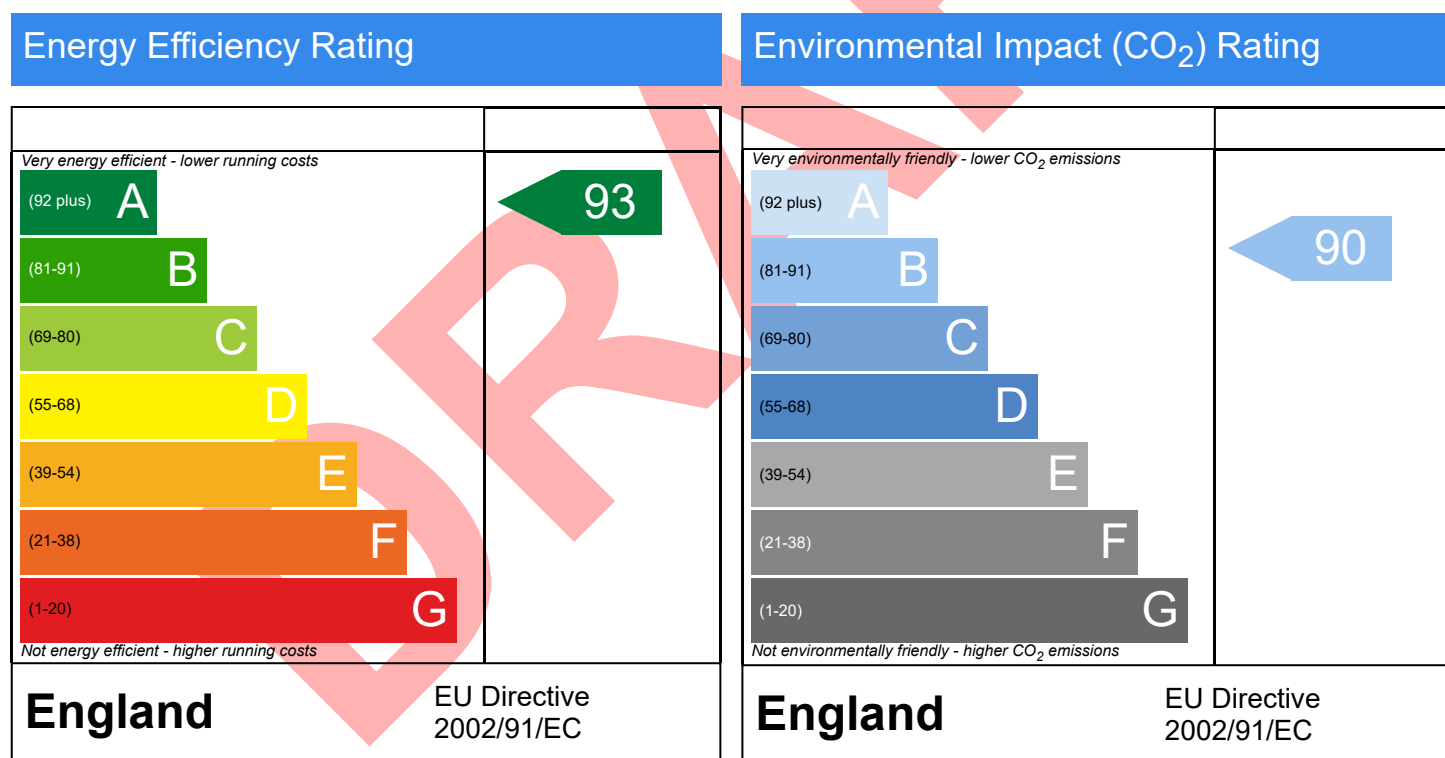
Predicted Energy Assessment



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.