

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 10:34:50

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

Dwelling Details			
Assessment Type	As designed	Total Floor Area	146 m ²
Site Reference	SAP VG 21-0282	Plot Reference	Plot 35
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	10.34 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	10.27 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	54.22 kWh _{PE} /m ²		
Dwelling primary energy	53.66 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	43.4 kWh/m ²		
Dwelling fabric energy efficiency	39.9 kWh/m ²		OK

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

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))			
Name	Net area [m ²]	U-Value [W/m ² K]	
Exposed wall: Walls (1)	127.67	0.19	
Exposed wall: Walls (2)	40.95	0.18	
Ground floor: Ground Floor, Ground Floor	72.89	0.13	
Exposed roof: Roof (1)	72.89	0.09 (!)	

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
Front , Windows	10.47	East	0.7	1.3
Rear , Windows	4.67	West	0.7	1.3
Front Door, Door	2.14	East	N/A	1.3
Side, Windows	5.2	South	0.7	1.3
Side, Windows	8.1	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

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E3: Sill	Calculated by person with suitable expertise	0.021 (!)	E3-01
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	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.088	MFF-150-E17-01

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

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	3.8 kWp	
Orientation	South	
Pitch	45°	
Overshading	None or very little	
Manufacturer		
MCS certificate		
10 Heat networks		
N/A		
11 Supporting documentary evidence		
N/A		
12 Declarations		
a. Assessor Declaration		
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.		
Signed:	Assessor ID:	
Name:	Date:	
b. Client Declaration		
N/A		

Summary for Input Data



Property Reference	SAP VG 21-0282		Issued on Date	15/11/2024
Assessment Reference	Plot 35	Prop Type Ref	SAP VG 21-0282	
Property				

SAP Rating	95 A	DER	10.27	TER	10.34
Environmental	90 B	% DER < TER			0.68
CO ₂ Emissions (t/year)	1.44	DFEE	39.93	TFEE	43.39
Compliance Check	See BREL	% DFEE < TFEE			7.98
% DPER < TPER	1.04	DPER	53.66	TPER	54.22

Assessor Details	Miss Victoria Gartside	Assessor ID	AL30-0001
Client			

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

Orientation	East	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	House, Detached	
Which Floor	0	
2.0 Number of Storeys	2	
3.0 Date Built	2023	
3.0 Property Age Band	L	
4.0 Sheltered Sides	0	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	226.76	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements	Ground floor:	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	1st Storey:	38.68 m	72.89 m ²	2.38 m
	2nd Storey:	38.68 m	72.89 m ²	2.77 m
		32.20 m	60.31 m ²	2.28 m

8.0 Living Area	15.44	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	145.64	127.67	0.00	None	17.97	Enter Gross Area
	Render wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.18	110.00	53.56	40.95	0.00	None	12.61	Enter Gross Area

9.2 Internal Walls	Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
	Studs	Plasterboard on timber frame	9.00	198.70
	Block	Dense block, plasterboard on dabs	75.00	61.73

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	72.89	72.89	None	0.00	Enter Gross Area	0.00

10.2 Internal Ceilings	Description	Storey	Construction	Area (m ²)
	Internal Ceiling 1	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	72.89

Summary for Input Data

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	72.89

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1		Plasterboard ceiling, carpeted chipboard floor	9.00	72.89

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	Render wall	East	10.47	0
Rear	Windows	External Wall	West	4.67	0
Front Door	Door	Render wall	East	2.14	0
Side	Windows	External Wall	South	5.20	0
Side	Windows	External Wall	North	8.10	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	21.19	0.02	0.02 MFF-150-E2-02	No
E3 Sill	Independently assessed	17.69	0.02	0.02 E3-01	No
E4 Jamb	Independently assessed	43.20	0.02	0.02 E4-01 RCD	No
E5 Ground floor (normal)	Independently assessed	38.68	0.09	0.09 Manufacturer Declaration	No
E10 Eaves (insulation at ceiling level)	Independently assessed	22.34	0.06	0.06 E10-01	No
E16 Corner (normal)	Independently assessed	25.75	0.05	0.05 E16-01 RCD	No
E6 Intermediate floor within a dwelling	Independently assessed	38.68	0.00	0.00 E6-01 RCD	No
E12 Gable (insulation at ceiling level)	Independently assessed	16.34	0.06	0.06 E12-01 RCD	No
E17 Corner (inverted – internal area greater than external area)	Independently assessed	5.15	-0.09	-0.09 MFF-150-E17-01	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

Number of open flues

Number of chimneys/flues attached to closed fire

Number of flues attached to solid fuel boiler

Number of flues attached to other heater

Number of blocked chimneys

Number of intermittent extract fans

Number of passive vents

Number of flueless gas fires

21.0 Fixed Cooling System

Summary for Input Data

22.0 Pressure Testing

Designed AP ₅₀	Yes	
Property Tested?	4.00	m ³ /(h.m ²) @ 50 Pa
Test Method	Blower Door	

22.0 Lighting

No Fixed Lighting	No				
	Name Lighting 1	Efficacy 85.00	Power 10.00	Capacity 850.00	Count 33

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

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No

Summary for Input Data

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
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32.0 Photovoltaic Unit

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

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
3.80	South	45°	None Or Little	No	No	1.00		

34.0 Small-scale Hydro

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

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

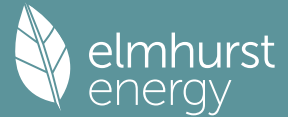
Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout



Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024		
Assessment Reference	Plot 35			Prop Type Ref	SAP VG 21-0282			
Property								
SAP Rating	95 A		DER	10.27		TER	10.34	
Environmental	90 B		% DER < TER				0.68	
CO ₂ Emissions (t/year)	1.44		DFEE	39.93		TFEE	43.39	
Compliance Check	See BREL		% DFEE < TFEE				7.98	
% DPER < TPER	1.04		DPER	53.66		TPER	54.22	
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	72.8900 (1b)	x 2.3800 (2b)	= 173.4782 (1b) - (3b)
First floor	72.8900 (1c)	x 2.7700 (2c)	= 201.9053 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	145.7800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 375.3835 (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	6 * 10 = 60.0000 (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) =	60.0000 / (5) = 0.1598 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3598 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3598 (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	0.4588	0.4498	0.4408	0.3958	0.3868	0.3418	0.3418	0.3328	0.3598	0.3868	0.4048	0.4228 (22b)
Effective ac	0.6052	0.6012	0.5972	0.5783	0.5748	0.5584	0.5584	0.5554	0.5647	0.5748	0.5819	0.5894 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (U _w = 1.30)			28.4400	1.2357	35.1445		(27)
Door			2.1400	1.3000	2.7820		(26a)
Ground Floor			72.8900	0.1300	9.4757	75.0000	5466.7500 (28a)
External Wall	145.6400	17.9700	127.6700	0.1900	24.2573	110.0000	14043.7000 (29a)
Render wall	53.5600	12.6100	40.9500	0.1800	7.3710	110.0000	4504.5000 (29a)
Plane Roof	72.8900		72.8900	0.0900	6.5601	9.0000	656.0100 (30)
Total net area of external elements A _{um} (A, m ²)			344.9800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	85.5906		(33)
Studs			198.7000			9.0000	1788.3000 (32c)
Block			61.7300			75.0000	4629.7500 (32c)
Internal Floor 1			72.8900			18.0000	1312.0200 (32d)
Internal Ceiling 1			72.8900			9.0000	656.0100 (32e)
Heat capacity C _m = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	33057.0400 (34)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							226.7598 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				21.1900	0.0240	0.5086	
E3 Sill				17.6900	0.0210	0.3715	

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	74.9756	74.4694	73.9732	71.6424	71.2063	69.1762	69.1762	68.8003	69.9582	71.2063	72.0885	73.0108 (38)
Heat transfer coeff	168.7189	168.2126	167.7164	165.3856	164.9495	162.9195	162.9195	162.5435	163.7014	164.9495	165.8317	166.7540 (39)
Average = Sum(39)m / 12 =												165.3835
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1574	1.1539	1.1505	1.1345	1.1315	1.1176	1.1176	1.1150	1.1229	1.1315	1.1375	1.1439 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

Assumed occupancy													2.9274 (42)
Hot water usage for mixer showers													
73.3023	72.2007	70.5955	67.5242	65.2576	62.7300	61.2932	62.8863	64.6326	67.3466	70.4839	73.0215	(42a)	
Hot water usage for baths													
31.6456	31.1756	30.5138	29.2935	28.3798	27.3666	26.8193	27.4765	28.1920	29.2762	30.5216	31.5386	(42b)	
Hot water usage for other uses													
44.6093	42.9871	41.3649	39.7428	38.1206	36.4985	36.4985	38.1206	39.7428	41.3649	42.9871	44.6093	(42c)	
Average daily hot water use (litres/day)												137.4766 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.5572	146.3635	142.4742	136.5605	131.7580	126.5950	124.6110	128.4834	132.5675	137.9877	143.9926	149.1694 (44)	
Energy content	236.8620	208.4196	218.9776	186.9444	177.3716	155.6633	150.7062	159.0893	163.4690	187.2480	205.1439	233.5632 (45)	
Energy content (annual)										Total = Sum(45)m =		2283.4581	
Distribution loss (46)m = 0.15 x (45)m													
35.5293	31.2629	32.8466	28.0417	26.6057	23.3495	22.6059	23.8634	24.5203	28.0872	30.7716	35.0345 (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	19.5803	17.6296	19.3996	18.5216	18.9794	18.2057	18.7101	18.7948	18.2845	19.0792	18.7055	19.5469 (61)	
Total heat required for water heating calculated for each month													
256.4423	226.0493	238.3772	205.4661	196.3510	173.8690	169.4163	177.8841	181.7535	206.3272	223.8493	253.1101 (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)		
FV 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													
256.4423	226.0493	238.3772	205.4661	196.3510	173.8690	169.4163	177.8841	181.7535	206.3272	223.8493	253.1101 (64)		
12Total per year (kWh/year)									Total per year (kWh/year) = Sum(64)m =		2508.8953 (64)		
Electric shower(s)											2509 (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 (64a)		
											0.0000 (64a)		
Heat gains from water heating, kWh/month													
83.6517	73.7069	77.6600	66.7894	63.7209	56.3095	54.7873	57.5959	58.9246	67.0298	72.8867	82.5465 (65)		

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	160.9020	178.1415	160.9020	166.2654	160.9020	166.2654	160.9020	160.9020	166.2654	160.9020	166.2654	160.9020 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	315.8935	319.1715	310.9110	293.3256	271.1271	250.2637	236.3256	233.0476	241.3081	258.8935	281.0920	301.9554 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950 (71)
Water heating gains (Table 5)	112.4351	109.6829	104.3817	92.7631	85.6464	78.2076	73.6389	77.4138	81.8397	90.0938	101.2315	110.9496 (72)
Total internal gains	659.1412	676.9065	646.1053	622.2647	587.5861	561.6473	537.7771	538.2741	556.3237	579.7999	618.4995	643.7176 (73)

[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				8.1000	10.6334		0.7300		0.7000		0.7700						30.5008	(74)		
East				10.4700	19.6403		0.7300		0.7000		0.7700						72.8196	(76)		
South				5.2000	46.7521		0.7300		0.7000		0.7700						86.0911	(78)		
West				4.6700	19.6403		0.7300		0.7000		0.7700						32.4802	(80)		
Solar gains	221.8916	405.2722	617.8831	856.8366	1032.1802	1053.6915	1004.0260	870.6961	701.2453	465.8842	270.9704	186.4110	(83)							
Total gains	881.0328	1082.1787	1263.9884	1479.1013	1619.7663	1615.3388	1541.8031	1408.9702	1257.5691	1045.6841	889.4699	830.1286	(84)							

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	54.4249	54.5887	54.7502	55.5218	55.6686	56.3623	56.3623	56.4926	56.0930	55.6686	55.3725	55.0662
alpha	4.6283	4.6392	4.6500	4.7015	4.7112	4.7575	4.7575	4.7662	4.7395	4.7112	4.6915	4.6711
util living area	0.9968	0.9914	0.9765	0.9233	0.8017	0.6145	0.4584	0.5182	0.7787	0.9597	0.9929	0.9976 (86)
MIT	19.7804	19.9606	20.2207	20.5548	20.7937	20.9049	20.9288	20.9245	20.8448	20.5090	20.0856	19.7577 (87)
Th 2	19.9543	19.9571	19.9598	19.9728	19.9752	19.9865	19.9865	19.9886	19.9821	19.9752	19.9703	19.9652 (88)
util rest of house	0.9959	0.9888	0.9692	0.8999	0.7478	0.5292	0.3561	0.4103	0.7011	0.9426	0.9903	0.9969 (89)
MIT 2	18.5232	18.7551	19.0859	19.5051	19.7731	19.8856	19.9010	19.9013	19.8360	19.4610	18.9259	18.5026 (90)
Living area fraction									fLA =	Living area /	(4) =	0.1059 (91)
MIT	18.6564	18.8828	19.2061	19.6163	19.8812	19.9936	20.0098	20.0097	19.9428	19.5720	19.0487	18.6355 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.5064	18.7328	19.0561	19.4663	19.7312	19.8436	19.8598	19.8597	19.7928	19.4220	18.8987	18.4855 (93)

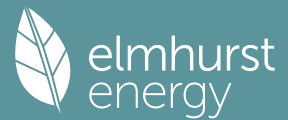
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9938	0.9845	0.9606	0.8857	0.7333	0.5165	0.3430	0.3961	0.6846	0.9301	0.9863	0.9953 (94)
Useful gains	875.5899	1065.3516	1214.1350	1310.0425	1187.7030	834.3353	528.8985	558.0856	860.8976	972.5829	877.3212	826.1874 (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	2396.8837	2326.8493	2105.8661	1747.5066	1324.7356	854.2769	531.0895	562.3492	931.9247	1455.1857	1956.6031	2382.1659 (97)
Space heating kWh	1131.8426	847.7264	663.4479	314.9742	101.9522	0.0000	0.0000	0.0000	0.0000	359.0565	777.0830	1157.6480 (98a)
Space heating requirement - total per year (kWh/year)												5353.7309
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	1131.8426	847.7264	663.4479	314.9742	101.9522	0.0000	0.0000	0.0000	0.0000	359.0565	777.0830	1157.6480 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5353.7309
Space heating per m2										(98c) / (4) =		36.7247 (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	1131.8426	847.7264	663.4479	314.9742	101.9522	0.0000	0.0000	0.0000	0.0000	359.0565	777.0830	1157.6480 (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)	1278.9182	957.8830	749.6587	355.9030	115.2002	0.0000	0.0000	0.0000	0.0000	405.7136	878.0598	1308.0769 (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	256.4423	226.0493	238.3772	205.4661	196.3510	173.8690	169.4163	177.8841	181.7535	206.3272	223.8493	253.1101 (64)	
Efficiency of water heater (217)m	88.2190	88.1799	88.0985	87.9017	87.5069	87.0000	87.0000	87.0000	87.0000	87.9466	88.1601	88.2271 (217)	
Fuel for water heating, kWh/month	290.6881	256.3500	270.5803	233.7453	224.3834	199.8494	194.7314	204.4645	208.9121	234.6050	253.9124	286.8848 (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	32.7489	26.2724	23.6554	17.3309	13.3869	10.9372	12.2120	15.8736	20.6183	27.0523	30.5555	33.6591 (232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-63.4880	-85.6805	-117.7110	-127.4304	-134.3502	-124.3278	-122.8370	-117.4604	-108.1393	-95.4577	-68.5481	-55.4785 (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	-42.8426	-85.7144	-159.8635	-226.5866	-289.4561	-287.2967	-285.4419	-247.8981	-190.6401	-119.5862	-56.3428	-34.3562 (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													6049.4134 (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													2859.1066 (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)													264.3025 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-3246.9343 (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	6011.8883 (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	6049.4134	0.2100	1270.3768 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2859.1066	0.2100	600.4124 (264)
Space and water heating			1870.7892 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	264.3025	0.1443	38.1470 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1220.9089	0.1354	-165.3028
PV Unit electricity exported	-2026.0254	0.1274	-258.1986
Total			-423.5014 (269)
Total CO2, kg/year			1497.3641 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.2700 (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	6049.4134	1.1300	6835.8372 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2859.1066	1.1300	3230.7905 (278)
Space and water heating			10066.6277 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	264.3025	1.5338	405.3960 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1220.9089	1.5004	-1831.8907
PV Unit electricity exported	-2026.0254	0.4679	-947.8963
Total			-2779.7870 (283)
Total Primary energy kWh/year			7822.3375 (286)
Dwelling Primary energy Rate (DPER)			53.6600 (287)

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

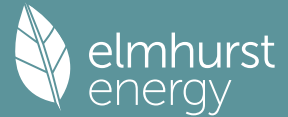
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	72.8900 (1b)	x 2.3800 (2b)	= 173.4782 (1b) - (3b)
First floor	72.8900 (1c)	x 2.7700 (2c)	= 201.9053 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	145.7800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	375.3835 (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) = 0.1066 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3566 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3566 (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	0.4546 0.4457 0.4368 0.3922 0.3833 0.3387 0.3387 0.3298 0.3566 0.3833 0.4011 0.4190 (22b)
Effective ac	0.6033 0.5993 0.5954 0.5769 0.5735 0.5574 0.5574 0.5544 0.5636 0.5735 0.5805 0.5878 (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)			28.4400	1.1450	32.5649			(27)
Ground Floor			72.8900	0.1300	9.4757			(28a)
External Wall	145.6400	17.9700	127.6700	0.1800	22.9806			(29a)
Render wall	53.5600	12.6100	40.9500	0.1800	7.3710			(29a)
Plane Roof	72.8900		72.8900	0.1100	8.0179			(30)
Total net area of external elements Aum(A, m2)			344.9800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		82.5501			(33)

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

226.7598 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	21.1900	0.0500	1.0595	
E3 Sill	17.6900	0.0500	0.8845	
E4 Jamb	43.2000	0.0500	2.1600	
E5 Ground floor (normal)	38.6800	0.1600	6.1888	
E10 Eaves (insulation at ceiling level)	22.3400	0.0600	1.3404	
E16 Corner (normal)	25.7500	0.0900	2.3175	
E6 Intermediate floor within a dwelling	38.6800	0.0000	0.0000	
E12 Gable (insulation at ceiling level)	16.3400	0.0600	0.9804	
E17 Corner (inverted - internal area greater than external area)	5.1500	-0.0900	-0.4635	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				14.4676 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	97.0177 (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	74.7391	74.2421	73.7548	71.4663	71.0382	69.0449	69.0449	68.6758	69.8127	71.0382	71.9043	72.8099	(38)
Average = Sum(39)m / 12 =	171.7568	171.2597	170.7725	168.4840	168.0558	166.0626	166.0626	165.6935	166.8304	168.0558	168.9220	169.8276	(39)
												168.4820	
HLP	1.1782	1.1748	1.1714	1.1557	1.1528	1.1391	1.1391	1.1366	1.1444	1.1528	1.1587	1.1650	(40)
HLP (average)												1.1557	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9274 (42)
Hot water usage for mixer showers	73.3023	72.2007	70.5955	67.5242	65.2576	62.7300	61.2932	62.8863	64.6326	67.3466	70.4839	73.0215	(42a)
Hot water usage for baths	31.6456	31.1756	30.5138	29.2935	28.3798	27.3666	26.8193	27.4765	28.1920	29.2762	30.5216	31.5386	(42b)
Hot water usage for other uses	44.6093	42.9871	41.3649	39.7428	38.1206	36.4985	36.4985	38.1206	39.7428	41.3649	42.9871	44.6093	(42c)
Average daily hot water use (litres/day)													137.4766 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.5572	146.3635	142.4742	136.5605	131.7580	126.5950	124.6110	128.4834	132.5675	137.9877	143.9926	149.1694	(44)
Energy content (annual)	236.8620	208.4196	218.9776	186.9444	177.3716	155.6633	150.7062	159.0893	163.4690	187.2480	205.1439	233.5632	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2283.4581	
	35.5293	31.2629	32.8466	28.0417	26.6057	23.3495	22.6059	23.8634	24.5203	28.0872	30.7716	35.0345	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	287.8209	254.4470	269.9365	236.2595	228.3305	204.9784	201.6651	210.0482	212.7840	238.2069	254.4589	284.5221	(62)
WWHRS	-33.5108	-29.6372	-31.0344	-25.6977	-23.9493	-20.4936	-19.2095	-20.4274	-21.2035	-24.9965	-28.3180	-32.8902	(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	254.3102	224.8098	238.9021	210.5618	204.3812	184.4848	182.4556	189.6209	191.5806	213.2104	226.1409	251.6319	(64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				2572.0901	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)
Heat gains from water heating, kWh/month	91.4963	80.8064	85.5498	74.4878	71.7158	64.0868	62.8495	65.6369	66.6822	74.9997	80.5391	90.3995	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	160.9020	178.1415	160.9020	166.2654	160.9020	166.2654	160.9020	160.9020	166.2654	160.9020	166.2654	160.9020	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	315.8935	319.1715	310.9110	293.3256	271.1271	250.2637	236.3256	233.0476	241.3081	258.8935	281.0920	301.9554	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	(71)
Water heating gains (Table 5)	122.9790	120.2476	114.9863	103.4553	96.3922	89.0095	84.4752	88.2217	92.6142	100.8060	111.8599	121.5047	(72)
Total internal gains	669.6851	687.4711	656.7099	632.9569	598.3319	572.4492	548.6134	549.0819	567.0982	590.5122	629.1279	654.2727	(73)

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6. Solar gains

[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b	g or Table 6b	Specific data or Table 6c	FF or Table 6c	Access factor Table 6d	Gains W	
North	8.1000				10.6334		0.6300		0.7000	0.7700	26.3226	(74)
East	10.4700				19.6403		0.6300		0.7000	0.7700	62.8443	(76)
South	5.2000				46.7521		0.6300		0.7000	0.7700	74.2978	(78)
West	4.6700				19.6403		0.6300		0.7000	0.7700	28.0308	(80)
Solar gains	191.4955	349.7555	533.2416	739.4617	890.7857	909.3502	866.4882	751.4227	605.1843	402.0644	233.8511	160.8752 (83)
Total gains	861.1806	1037.2266	1189.9515	1372.4186	1489.1176	1481.7993	1415.1016	1300.5046	1172.2825	992.5766	862.9790	815.1479 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	53.4623	53.6175	53.7704	54.5008	54.6396	55.2955	55.2955	55.4187	55.0410	54.6396	54.3595	54.0696
alpha	4.5642	4.5745	4.5847	4.6334	4.6426	4.6864	4.6864	4.6946	4.6694	4.6426	4.6240	4.6046
util living area	0.9971	0.9928	0.9816	0.9415	0.8421	0.6669	0.5048	0.5653	0.8160	0.9674	0.9938	0.9978 (86)
MIT	19.4138	19.6356	19.9662	20.4081	20.7549	20.9407	20.9870	20.9785	20.8455	20.3753	19.8192	19.3859 (87)
Th 2	19.9375	19.9402	19.9429	19.9556	19.9579	19.9690	19.9690	19.9711	19.9647	19.9579	19.9531	19.9481 (88)
util rest of house	0.9962	0.9906	0.9757	0.9221	0.7926	0.5782	0.3922	0.4488	0.7421	0.9530	0.9915	0.9971 (89)
MIT 2	18.0862	18.3711	18.7922	19.3481	19.7467	19.9335	19.9645	19.9628	19.8541	19.3200	18.6157	18.0577 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.2268	18.5050	18.9166	19.4604	19.8535	20.0402	20.0728	20.0704	19.9591	19.4317	18.7431	18.1984 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.2268	18.5050	18.9166	19.4604	19.8535	20.0402	20.0728	20.0704	19.9591	19.4317	18.7431	18.1984 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9939	0.9862	0.9677	0.9106	0.7869	0.5848	0.4039	0.4605	0.7416	0.9429	0.9874	0.9952 (94)
Useful gains	855.9595	1022.8722	1151.4794	1249.7645	1171.8232	866.5081	571.5836	598.9035	869.3699	935.9492	852.1365	811.2620 (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	2392.0193	2329.9912	2120.4086	1779.2603	1370.2450	903.4107	576.7046	608.1576	977.4780	1484.2264	1966.7840	2377.3104 (97)
Space heating kWh	1142.8285	878.3840	720.8833	381.2370	147.6258	0.0000	0.0000	0.0000	0.0000	407.9182	802.5462	1165.1400 (98a)
Space heating requirement - total per year (kWh/year)	5646.5630											
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	1142.8285	878.3840	720.8833	381.2370	147.6258	0.0000	0.0000	0.0000	0.0000	407.9182	802.5462	1165.1400 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	5646.5630											
Space heating per m2	(98c) / (4) = 38.7335 (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	1142.8285	878.3840	720.8833	381.2370	147.6258	0.0000	0.0000	0.0000	0.0000	407.9182	802.5462	1165.1400 (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)	1236.8273	950.6321	780.1768	412.5941	159.7682	0.0000	0.0000	0.0000	0.0000	441.4700	868.5565	1260.9740 (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	254.3102	224.8098	238.9021	210.5618	204.3812	184.4848	182.4556	189.6209	191.5806	213.2104	226.1409	251.6319 (64)
Efficiency of water heater (217)m	87.2001	87.0012	86.5916	85.6368	83.6955	80.3000	80.3000	80.3000	80.3000	85.7477	86.8551	87.2405 (217)
Fuel for water heating, kWh/month	291.6398	258.3984	275.8952	245.8779	244.1960	229.7444	227.2175	236.1406	238.5810	248.6486	260.3657	288.4346 (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	33.4323	26.8206	24.1490	17.6926	13.6663	11.1654	12.4668	16.2048	21.0485	27.6167	31.1930	34.3614 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-63.6894	-87.5807	-122.7939	-134.4983	-142.0017	-131.3475	-129.5711	-123.6844	-113.0156	-98.2823	-69.1651	-55.3128 (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	-43.0359	-89.6181	-176.5209	-262.9002	-345.5847	-346.6164	-342.6750	-291.1895	-214.7404	-127.5802	-57.2521	-34.1144 (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)												

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(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												6110.9990	(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												3045.1396	(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)												269.8174	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3602.7709	(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												5909.1852	(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	6110.9990	0.2100	1283.3098 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3045.1396	0.2100	639.4793 (264)
Space and water heating			1922.7891 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	269.8174	0.1443	38.9430 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1270.9429	0.1352	-171.7702
PV Unit electricity exported	-2331.8280	0.1261	-294.1295
Total			-465.8997 (269)
Total CO2, kg/year			1507.7616 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.3400 (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	6110.9990	1.1300	6905.4288 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3045.1396	1.1300	3441.0078 (278)
Space and water heating			10346.4366 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	269.8174	1.5338	413.8550 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1270.9429	1.4995	-1905.8165
PV Unit electricity exported	-2331.8280	0.4630	-1079.6814
Total			-2985.4979 (283)
Total Primary energy kWh/year			7904.8945 (286)
Target Primary Energy Rate (TPER)			54.2200 (287)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024		
Assessment Reference	Plot 35			Prop Type Ref	SAP VG 21-0282			
Property								
SAP Rating	95 A		DER	10.27		TER	10.34	
Environmental	90 B		% DER < TER				0.68	
CO ₂ Emissions (t/year)	1.44		DFEE	39.93		TFEE	43.39	
Compliance Check	See BREL		% DFEE < TFEE				7.98	
% DPER < TPER	1.04		DPER	53.66		TPER	54.22	
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	72.8900 (1b)	x 2.3800 (2b)	= 173.4782 (1b) - (3b)
First floor	72.8900 (1c)	x 2.7700 (2c)	= 201.9053 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	145.7800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 375.3835 (5)

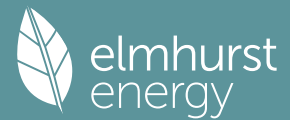
2. Ventilation rate

	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) = 0.1066 (8)											
Pressure test	Yes											
Pressure Test Method	Blower Door											
Measured/design AP50	4.0000 (17)											
Infiltration rate	0.3066 (18)											
Number of sides sheltered	0 (19)											
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)											
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3066 (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	0.3909	0.3832	0.3755	0.3372	0.3295	0.2912	0.2912	0.2836	0.3066	0.3295	0.3449	0.3602 (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	0.5764	0.5734	0.5705	0.5569	0.5543	0.5424	0.5424	0.5402	0.5470	0.5543	0.5595	0.5649 (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)			28.4400	1.2357	35.1445		(27)
Door			2.1400	1.3000	2.7820		(26a)
Ground Floor			72.8900	0.1300	9.4757	75.0000	5466.7500 (28a)
External Wall	145.6400	17.9700	127.6700	0.1900	24.2573	110.0000	14043.7000 (29a)
Render wall	53.5600	12.6100	40.9500	0.1800	7.3710	110.0000	4504.5000 (29a)
Plane Roof	72.8900		72.8900	0.0900	6.5601	9.0000	656.0100 (30)
Total net area of external elements Aum(A, m ²)			344.9800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	85.5906		(33)
Studs			198.7000			9.0000	1788.3000 (32c)
Block			61.7300			75.0000	4629.7500 (32c)
Internal Floor 1			72.8900			18.0000	1312.0200 (32d)
Internal Ceiling 1			72.8900			9.0000	656.0100 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	33057.0400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							226.7598 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

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E2 Other lintels (including other steel lintels)	21.1900	0.0240	0.5086
E3 Sill	17.6900	0.0210	0.3715
E4 Jamb	43.2000	0.0160	0.6912
E5 Ground floor (normal)	38.6800	0.0920	3.5586
E10 Eaves (insulation at ceiling level)	22.3400	0.0580	1.2957
E16 Corner (normal)	25.7500	0.0470	1.2103
E6 Intermediate floor within a dwelling	38.6800	0.0010	0.0387
E12 Gable (insulation at ceiling level)	16.3400	0.0570	0.9314
E17 Corner (inverted - internal area greater than external area)	5.1500	-0.0880	-0.4532
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.1526 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	93.7432 (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	71.4007	71.0333	70.6731	68.9815	68.6650	67.1916	67.1916	66.9187	67.7591	68.6650	69.3052	69.9746 (38)
Average = Sum(39)m / 12 =	165.1440	164.7765	164.4164	162.7247	162.4082	160.9348	160.9348	160.6619	161.5023	162.4082	163.0485	163.7179 (39)
												162.7232
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1328	1.1303	1.1278	1.1162	1.1141	1.1040	1.1040	1.1021	1.1078	1.1141	1.1185	1.1230 (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												2.9274 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	31.6456	31.1756	30.5138	29.2935	28.3798	27.3666	26.8193	27.4765	28.1920	29.2762	30.5216	31.5386 (42b)
Hot water usage for other uses	44.6093	42.9871	41.3649	39.7428	38.1206	36.4985	36.4985	38.1206	39.7428	41.3649	42.9871	44.6093 (42c)
Average daily hot water use (litres/day)												69.8943 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	76.2549	74.1627	71.8787	69.0363	66.5004	63.8650	63.3178	65.5971	67.9348	70.6412	73.5087	76.1479 (44)
Energy content (annual)	120.7691	105.6067	110.4750	94.5072	89.5223	78.5295	76.5773	81.2229	83.7705	95.8594	104.7267	119.2292 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	102.6537	89.7657	93.9037	80.3311	76.0940	66.7501	65.0907	69.0395	71.2049	81.4805	89.0177	101.3448 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	102.6537	89.7657	93.9037	80.3311	76.0940	66.7501	65.0907	69.0395	71.2049	81.4805	89.0177	101.3448 (64)
12Total per year (kWh/year)												986.6764 (64)
Electric shower(s)	58.7029	52.3048	57.1148	54.5040	55.5267	52.9671	54.7327	55.5267	54.5040	57.1148	56.0409	58.7029 (64a)
Heat gains from water heating, kWh/month	40.3392	35.5176	37.7546	33.7088	32.9052	29.9293	29.9559	31.1416	31.4272	34.6488	36.2646	40.0119 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												667.7425 (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	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	160.9020	178.1415	160.9020	166.2654	160.9020	166.2654	160.9020	160.9020	166.2654	160.9020	166.2654	160.9020 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	315.8935	319.1715	310.9110	293.3256	271.1271	250.2637	236.3256	233.0476	241.3081	258.8935	281.0920	301.9554 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950 (71)
Water heating gains (Table 5)	54.2193	52.8536	50.7455	46.8178	44.2274	41.5685	40.2632	41.8569	43.6489	46.5710	50.3675	53.7795 (72)
Total internal gains	597.9254	617.0772	589.4691	573.3194	543.1671	525.0082	504.4015	502.7172	518.1330	533.2771	564.6355	583.5475 (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	8.1000	10.6334	0.7300	0.7000	0.7700	30.5008 (74)						
East	10.4700	19.6403	0.7300	0.7000	0.7700	72.8196 (76)						
South	5.2000	46.7521	0.7300	0.7000	0.7700	86.0911 (78)						
West	4.6700	19.6403	0.7300	0.7000	0.7700	32.4802 (80)						
Solar gains	221.8916	405.2722	617.8831	856.8366	1032.1802	1053.6915	1004.0260	870.6961	701.2453	465.8842	270.9704	186.4110 (83)
Total gains	819.8170	1022.3494	1207.3523	1430.1560	1575.3473	1578.6996	1508.4275	1373.4133	1219.3783	999.1613	835.6059	769.9585 (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	55.6031	55.7271	55.8491	56.4297	56.5397	57.0573	57.0573	57.1542	56.8568	56.5397	56.3177	56.0874
alpha	4.7069	4.7151	4.7233	4.7620	4.7693	4.8038	4.8038	4.8103	4.7905	4.7693	4.7545	4.7392
util living area	0.9977	0.9931	0.9797	0.9291	0.8088	0.6206	0.4628	0.5251	0.7881	0.9649	0.9945	0.9983 (86)
MIT	19.4551	19.6953	20.0425	20.4884	20.8112	20.9598	20.9919	20.9857	20.8772	20.4205	19.8537	19.4187 (87)
Th 2	19.9741	19.9762	19.9782	19.9876	19.9894	19.9976	19.9976	19.9991	19.9944	19.9894	19.9858	19.9821 (88)
util rest of house	0.9969	0.9910	0.9733	0.9071	0.7561	0.5358	0.3607	0.4172	0.7120	0.9497	0.9924	0.9977 (89)
MIT 2	18.5636	18.8041	19.1484	19.5825	19.8653	19.9793	19.9955	19.9949	19.9274	19.5290	18.9702	18.5334 (90)
Living area fraction									fLA = Living area /	(4) =		0.1059 (91)
MIT	18.6581	18.8985	19.2431	19.6785	19.9655	20.0831	20.1010	20.0999	20.0280	19.6234	19.0638	18.6272 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6581	18.8985	19.2431	19.6785	19.9655	20.0831	20.1010	20.0999	20.0280	19.6234	19.0638	18.6272 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9956	0.9879	0.9672	0.8990	0.7547	0.5433	0.3715	0.4284	0.7149	0.9425	0.9898	0.9967 (94)
Useful gains	816.1907	1009.9549	1167.7994	1285.6769	1188.8622	857.7824	560.3098	588.3781	871.7082	941.6871	827.0571	767.3954 (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	2371.1466	2306.6227	2095.1799	1753.9255	1342.3819	882.4269	563.4335	594.4269	957.3875	1465.4733	1950.6725	2361.9878 (97)
Space heating kWh	1156.8872	871.3607	689.9711	337.1390	114.2187	0.0000	0.0000	0.0000	0.0000	389.6970	809.0031	1186.3767 (98a)
Space heating requirement - total per year (kWh/year)												5554.6536
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	1156.8872	871.3607	689.9711	337.1390	114.2187	0.0000	0.0000	0.0000	0.0000	389.6970	809.0031	1186.3767 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5554.6536
Space heating per m2										(98c) / (4) =		38.1030 (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	1512.7870	1190.9174	1221.0307	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8866	0.9374	0.9086	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1341.2107	1116.4212	1109.4374	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1774.8012	1695.7762	1541.1984	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	312.1852	431.0401	321.2302	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	78.0463	107.7600	80.3075	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												266.1139 (107)
Energy for space heating												38.1030 (99)
Energy for space cooling												1.8254 (108)
Total												39.9284 (109)
Fabric Energy Efficiency (DFEE)												39.9 (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	72.8900 (1b)	x 2.3800 (2b)	= 173.4782 (1b) - (3b)
First floor	72.8900 (1c)	x 2.7700 (2c)	= 201.9053 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	145.7800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 375.3835 (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)

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Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											Air changes per hour	
Pressure test												40.0000 / (5) =	0.1066 (8)
Pressure Test Method												Yes	
Measured/design AP50												Blower Door	
Infiltration rate												5.0000 (17)	
Number of sides sheltered												0.3566 (18)	
												0 (19)	
Shelter factor												(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) =	0.3566 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
	0.4546	0.4457	0.4368	0.3922	0.3833	0.3387	0.3387	0.3298	0.3566	0.3833	0.4011	0.4190	(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	0.6033	0.5993	0.5954	0.5769	0.5735	0.5574	0.5574	0.5544	0.5636	0.5735	0.5805	0.5878	(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)			28.4400	1.1450	32.5649			(27)
Ground Floor			72.8900	0.1300	9.4757			(28a)
External Wall	145.6400	17.9700	127.6700	0.1800	22.9806			(29a)
Render wall	53.5600	12.6100	40.9500	0.1800	7.3710			(29a)
Plane Roof	72.8900		72.8900	0.1100	8.0179			(30)
Total net area of external elements Aum(A, m2)			344.9800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)... (30) + (32) =	82.5501			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								226.7598 (35)
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		
E2 Other lintels (including other steel lintels)				21.1900	0.0500	1.0595		
E3 Sill				17.6900	0.0500	0.8845		
E4 Jamb				43.2000	0.0500	2.1600		
E5 Ground floor (normal)				38.6800	0.1600	6.1888		
E10 Eaves (insulation at ceiling level)				22.3400	0.0600	1.3404		
E16 Corner (normal)				25.7500	0.0900	2.3175		
E6 Intermediate floor within a dwelling				38.6800	0.0000	0.0000		
E12 Gable (insulation at ceiling level)				16.3400	0.0600	0.9804		
E17 Corner (inverted - internal area greater than external area)				5.1500	-0.0900	-0.4635		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.4676 (36)	
Point Thermal bridges							(36a) = 0.0000	
Total fabric heat loss							(33) + (36) + (36a) = 97.0177 (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	74.7391	74.2421	73.7548	71.4663	71.0382	69.0449	69.0449	68.6758	69.8127	71.0382	71.9043	72.8099	(38)
Average = Sum(39)m / 12 =	171.7568	171.2597	170.7725	168.4840	168.0558	166.0626	166.0626	165.6935	166.8304	168.0558	168.9220	169.8276	(39)
												168.4820	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1782	1.1748	1.1714	1.1557	1.1528	1.1391	1.1391	1.1366	1.1444	1.1528	1.1587	1.1650	(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												2.9274 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	31.6456	31.1756	30.5138	29.2935	28.3798	27.3666	26.8193	27.4765	28.1920	29.2762	30.5216	31.5386 (42b)
Hot water usage for other uses	44.6093	42.9871	41.3649	39.7428	38.1206	36.4985	36.4985	38.1206	39.7428	41.3649	42.9871	44.6093 (42c)
Average daily hot water use (litres/day)												69.8943 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	76.2549	74.1627	71.8787	69.0363	66.5004	63.8650	63.3178	65.5971	67.9348	70.6412	73.5087	76.1479 (44)
Distribution loss (46)m = 0.15 x (45)m	120.7691	105.6067	110.4750	94.5072	89.5223	78.5295	76.5773	81.2229	83.7705	95.8594	104.7267	119.2292 (45)
Water storage loss:	Total = Sum(45)m =											1160.7958
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 (46)
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 (56)
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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
WWHRS	102.6537	89.7657	93.9037	80.3311	76.0940	66.7501	65.0907	69.0395	71.2049	81.4805	89.0177	101.3448 (62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
Solar input	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)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
12Total per year (kWh/year)	102.6537	89.7657	93.9037	80.3311	76.0940	66.7501	65.0907	69.0395	71.2049	81.4805	89.0177	101.3448 (64)
Electric shower(s)	Total per year (kWh/year) = Sum(64)m =											986.6764 (64)
Heat gains from water heating, kWh/month	58.7029	52.3048	57.1148	54.5040	55.5267	52.9671	54.7327	55.5267	54.5040	57.1148	56.0409	58.7029 (64a)
	40.3392	35.5176	37.7546	33.7088	32.9052	29.9293	29.9559	31.1416	31.4272	34.6488	36.2646	40.0119 (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	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	160.9020	178.1415	160.9020	166.2654	160.9020	166.2654	160.9020	160.9020	166.2654	160.9020	166.2654	160.9020 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	315.8935	319.1715	310.9110	293.3256	271.1271	250.2637	236.3256	233.0476	241.3081	258.8935	281.0920	301.9554 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950 (71)
Water heating gains (Table 5)	54.2193	52.8536	50.7455	46.8178	44.2274	41.5685	40.2632	41.8569	43.6489	46.5710	50.3675	53.7795 (72)
Total internal gains	597.9254	617.0772	589.4691	573.3194	543.1671	525.0082	504.4015	502.7172	518.1330	533.2771	564.6355	583.5475 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				8.1000	10.6334		0.6300		0.7000		0.7700		26.3226 (74)
East				10.4700	19.6403		0.6300		0.7000		0.7700		62.8443 (76)
South				5.2000	46.7521		0.6300		0.7000		0.7700		74.2978 (78)
West				4.6700	19.6403		0.6300		0.7000		0.7700		28.0308 (80)
Solar gains	191.4955	349.7555	533.2416	739.4617	890.7857	909.3502	866.4882	751.4227	605.1843	402.0644	233.8511	160.8752	(83)
Total gains	789.4209	966.8327	1122.7107	1312.7811	1433.9528	1434.3583	1370.8897	1254.1398	1123.3173	935.3416	798.4867	744.4228	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	53.4623	53.6175	53.7704	54.5008	54.6396	55.2955	55.2955	55.4187	55.0410	54.6396	54.3595	54.0696
alpha	4.5642	4.5745	4.5847	4.6334	4.6426	4.6864	4.6864	4.6946	4.6694	4.6426	4.6240	4.6046
util living area	0.9980	0.9946	0.9853	0.9494	0.8563	0.6834	0.5196	0.5833	0.8335	0.9737	0.9955	0.9985 (86)
MIT	19.3579	19.5818	19.9172	20.3719	20.7342	20.9343	20.9854	20.9756	20.8293	20.3361	19.7695	19.3304 (87)
Th 2	19.9375	19.9402	19.9429	19.9556	19.9579	19.9690	19.9690	19.9711	19.9647	19.9579	19.9531	19.9481 (88)
util rest of house	0.9974	0.9929	0.9804	0.9322	0.8091	0.5944	0.4045	0.4644	0.7624	0.9616	0.9938	0.9980 (89)
MIT 2	18.4390	18.6640	18.9985	19.4491	19.7774	19.9380	19.9650	19.9636	19.8678	19.4240	18.8616	18.4196 (90)
Living area fraction	18.5363	18.7612	19.0958	19.5468	19.8787	20.0435	20.0731	20.0708	19.9697	19.5206	18.9578	18.5161 (92)
MIT	18.5363	18.7612	19.0958	19.5468	19.8787	20.0435	20.0731	20.0708	19.9697	19.5206	18.9578	18.5161 (93)
Temperature adjustment												0.0000
adjusted MIT	18.5363	18.7612	19.0958	19.5468	19.8787	20.0435	20.0731	20.0708	19.9697	19.5206	18.9578	18.5161 (93)

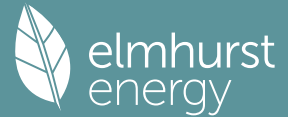
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9961	0.9902	0.9751	0.9237	0.8049	0.6014	0.4165	0.4765	0.7628	0.9548	0.9914	0.9970 (94)
Useful gains	786.3463	957.3578	1094.7340	1212.6707	1154.2122	862.5595	570.9317	597.5748	856.8874	893.0234	791.6166	742.2005 (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	2445.1883	2373.8725	2151.0165	1793.8155	1374.4799	903.9695	576.7516	608.2310	979.2381	1499.1514	2003.0403	2431.2710 (97)
Space heating kWh	1234.1784	951.8979	785.8741	418.4243	163.8792	0.0000	0.0000	0.0000	0.0000	450.9592	872.2251	1256.6684 (98a)
Space heating requirement - total per year (kWh/year)												6134.1067
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	1234.1784	951.8979	785.8741	418.4243	163.8792	0.0000	0.0000	0.0000	0.0000	450.9592	872.2251	1256.6684 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6134.1067
Space heating per m ²												(98c) / (4) = 42.0778 (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	1560.9887	1228.8635	1259.2707	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8357	0.9020	0.8655	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1304.4699	1108.4675	1089.8979	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1606.0906	1535.0177	1401.7879	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	217.1669	317.3533	232.0461	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	54.2917	79.3383	58.0115	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												191.6416 (107)
Energy for space heating												42.0778 (99)
Energy for space cooling												1.3146 (108)
Total												43.3924 (109)
Fabric Energy Efficiency (TFEE)												43.4 (109)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024		
Assessment Reference	Plot 35			Prop Type Ref	SAP VG 21-0282			
Property								
SAP Rating	95 A		DER	10.27		TER	10.34	
Environmental	90 B		% DER < TER				0.68	
CO ₂ Emissions (t/year)	1.44		DFEE	39.93		TFEE	43.39	
Compliance Check	See BREL		% DFEE < TFEE				7.98	
% DPER < TPER	1.04		DPER	53.66		TPER	54.22	
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	72.8900 (1b)	x 2.3800 (2b)	= 173.4782 (1b) - (3b)
First floor	72.8900 (1c)	x 2.7700 (2c)	= 201.9053 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	145.7800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 375.3835 (5)

2. Ventilation rate

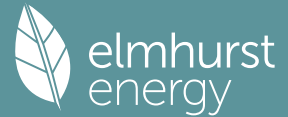
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	6 * 10 = 60.0000 (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) =	60.0000 / (5) = 0.1598 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3598 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3598 (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	0.4588	0.4498	0.4408	0.3958	0.3868	0.3418	0.3418	0.3328	0.3598	0.3868	0.4048	0.4228 (22b)
Effective ac	0.6052	0.6012	0.5972	0.5783	0.5748	0.5584	0.5584	0.5554	0.5647	0.5748	0.5819	0.5894 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (U _w = 1.30)			28.4400	1.2357	35.1445		(27)
Door			2.1400	1.3000	2.7820		(26a)
Ground Floor			72.8900	0.1300	9.4757	75.0000	5466.7500 (28a)
External Wall	145.6400	17.9700	127.6700	0.1900	24.2573	110.0000	14043.7000 (29a)
Render wall	53.5600	12.6100	40.9500	0.1800	7.3710	110.0000	4504.5000 (29a)
Plane Roof	72.8900		72.8900	0.0900	6.5601	9.0000	656.0100 (30)
Total net area of external elements A _{um} (A, m ²)			344.9800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	85.5906		(33)
Studs			198.7000			9.0000	1788.3000 (32c)
Block			61.7300			75.0000	4629.7500 (32c)
Internal Floor 1			72.8900			18.0000	1312.0200 (32d)
Internal Ceiling 1			72.8900			9.0000	656.0100 (32e)
Heat capacity C _m = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	33057.0400 (34)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							226.7598 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				21.1900	0.0240	0.5086	
E3 Sill				17.6900	0.0210	0.3715	

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E4 Jamb	43.2000	0.0160	0.6912	
E5 Ground floor (normal)	38.6800	0.0920	3.5586	
E10 Eaves (insulation at ceiling level)	22.3400	0.0580	1.2957	
E16 Corner (normal)	25.7500	0.0470	1.2103	
E6 Intermediate floor within a dwelling	38.6800	0.0010	0.0387	
E12 Gable (insulation at ceiling level)	16.3400	0.0570	0.9314	
E17 Corner (inverted - internal area greater than external area)	5.1500	-0.0880	-0.4532	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.1526	(36)
Point Thermal bridges			0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	93.7432	(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	74.9756	74.4694	73.9732	71.6424	71.2063	69.1762	69.1762	68.8003	69.9582	71.2063	72.0885	73.0108	(38)
Average = Sum(39)m / 12 =	168.7189	168.2126	167.7164	165.3856	164.9495	162.9195	162.9195	162.5435	163.7014	164.9495	165.8317	166.7540	(39)
												165.3835	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1574	1.1539	1.1505	1.1345	1.1315	1.1176	1.1176	1.1150	1.1229	1.1315	1.1375	1.1439	(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													2.9274	(42)
Hot water usage for mixer showers	73.3023	72.2007	70.5955	67.5242	65.2576	62.7300	61.2932	62.8863	64.6326	67.3466	70.4839	73.0215	(42a)	
Hot water usage for baths	31.6456	31.1756	30.5138	29.2935	28.3798	27.3666	26.8193	27.4765	28.1920	29.2762	30.5216	31.5386	(42b)	
Hot water usage for other uses	44.6093	42.9871	41.3649	39.7428	38.1206	36.4985	36.4985	38.1206	39.7428	41.3649	42.9871	44.6093	(42c)	
Average daily hot water use (litres/day)													137.4766	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Energy conte	149.5572	146.3635	142.4742	136.5605	131.7580	126.5950	124.6110	128.4834	132.5675	137.9877	143.9926	149.1694	(44)	
Energy content (annual)	236.8620	208.4196	218.9776	186.9444	177.3716	155.6633	150.7062	159.0893	163.4690	187.2480	205.1439	233.5632	(45)	
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2283.4581		
Water storage loss:	35.5293	31.2629	32.8466	28.0417	26.6057	23.3495	22.6059	23.8634	24.5203	28.0872	30.7716	35.0345	(46)	
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)	
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)	
Combi loss	19.5803	17.6296	19.3996	18.5216	18.9794	18.2057	18.7101	18.7948	18.2845	19.0792	18.7055	19.5469	(61)	
Total heat required for water heating calculated for each month	256.4423	226.0493	238.3772	205.4661	196.3510	173.8690	169.4163	177.8841	181.7535	206.3272	223.8493	253.1101	(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	256.4423	226.0493	238.3772	205.4661	196.3510	173.8690	169.4163	177.8841	181.7535	206.3272	223.8493	253.1101	(64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2508.8953	(64)	
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)	
												0.0000	(64a)	
Heat gains from water heating, kWh/month	83.6517	73.7069	77.6600	66.7894	63.7209	56.3095	54.7873	57.5959	58.9246	67.0298	72.8867	82.5465	(65)	

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

Metabolic gains (Table 5), Watts														
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	(66)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.9020	178.1415	160.9020	166.2654	160.9020	166.2654	160.9020	160.9020	166.2654	160.9020	166.2654	160.9020	(67)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	315.8935	319.1715	310.9110	293.3256	271.1271	250.2637	236.3256	233.0476	241.3081	258.8935	281.0920	301.9554	(68)	
Pumps, fans	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	(69)	
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)	
Water heating gains (Table 5)	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	(71)	
Total internal gains	112.4351	109.6829	104.3817	92.7631	85.6464	78.2076	73.6389	77.4138	81.8397	90.0938	101.2315	110.9496	(72)	
	659.1412	676.9065	646.1053	622.2647	587.5861	561.6473	537.7771	538.2741	556.3237	579.7999	618.4995	643.7176	(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				8.1000	10.6334		0.7300		0.7000	0.7700	30.5008 (74)	
East				10.4700	19.6403		0.7300		0.7000	0.7700	72.8196 (76)	
South				5.2000	46.7521		0.7300		0.7000	0.7700	86.0911 (78)	
West				4.6700	19.6403		0.7300		0.7000	0.7700	32.4802 (80)	
Solar gains	221.8916	405.2722	617.8831	856.8366	1032.1802	1053.6915	1004.0260	870.6961	701.2453	465.8842	270.9704	186.4110 (83)
Total gains	881.0328	1082.1787	1263.9884	1479.1013	1619.7663	1615.3388	1541.8031	1408.9702	1257.5691	1045.6841	889.4699	830.1286 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	54.4249	54.5887	54.7502	55.5218	55.6686	56.3623	56.3623	56.4926	56.0930	55.6686	55.3725	55.0662
alpha	4.6283	4.6392	4.6500	4.7015	4.7112	4.7575	4.7575	4.7662	4.7395	4.7112	4.6915	4.6711
util living area	0.9968	0.9914	0.9765	0.9233	0.8017	0.6145	0.4584	0.5182	0.7787	0.9597	0.9929	0.9976 (86)
MIT	19.7804	19.9606	20.2207	20.5548	20.7937	20.9049	20.9288	20.9245	20.8448	20.5090	20.0856	19.7577 (87)
Th 2	19.9543	19.9571	19.9598	19.9728	19.9752	19.9865	19.9865	19.9886	19.9821	19.9752	19.9703	19.9652 (88)
util rest of house	0.9959	0.9888	0.9692	0.8999	0.7478	0.5292	0.3561	0.4103	0.7011	0.9426	0.9903	0.9969 (89)
MIT 2	18.5232	18.7551	19.0859	19.5051	19.7731	19.8856	19.9010	19.9013	19.8360	19.4610	18.9259	18.5026 (90)
Living area fraction									fLA =	Living area /	(4) =	0.1059 (91)
MIT	18.6564	18.8828	19.2061	19.6163	19.8812	19.9936	20.0098	20.0097	19.9428	19.5720	19.0487	18.6355 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.5064	18.7328	19.0561	19.4663	19.7312	19.8436	19.8598	19.8597	19.7928	19.4220	18.8987	18.4855 (93)

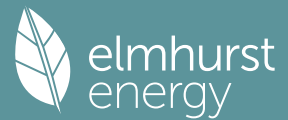
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9938	0.9845	0.9606	0.8857	0.7333	0.5165	0.3430	0.3961	0.6846	0.9301	0.9863	0.9953 (94)
Useful gains	875.5899	1065.3516	1214.1350	1310.0425	1187.7030	834.3353	528.8985	558.0856	860.8976	972.5829	877.3212	826.1874 (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	2396.8837	2326.8493	2105.8661	1747.5066	1324.7356	854.2769	531.0895	562.3492	931.9247	1455.1857	1956.6031	2382.1659 (97)
Space heating kWh	1131.8426	847.7264	663.4479	314.9742	101.9522	0.0000	0.0000	0.0000	0.0000	359.0565	777.0830	1157.6480 (98a)
Space heating requirement - total per year (kWh/year)												5353.7309
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	1131.8426	847.7264	663.4479	314.9742	101.9522	0.0000	0.0000	0.0000	0.0000	359.0565	777.0830	1157.6480 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5353.7309
Space heating per m2										(98c) / (4) =		36.7247 (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	1131.8426	847.7264	663.4479	314.9742	101.9522	0.0000	0.0000	0.0000	0.0000	359.0565	777.0830	1157.6480 (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)	1278.9182	957.8830	749.6587	355.9030	115.2002	0.0000	0.0000	0.0000	0.0000	405.7136	878.0598	1308.0769 (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	256.4423	226.0493	238.3772	205.4661	196.3510	173.8690	169.4163	177.8841	181.7535	206.3272	223.8493	253.1101 (64)	
Efficiency of water heater (217)m	88.2190	88.1799	88.0985	87.9017	87.5069	87.0000	87.0000	87.0000	87.0000	87.9466	88.1601	88.2271 (217)	
Fuel for water heating, kWh/month	290.6881	256.3500	270.5803	233.7453	224.3834	199.8494	194.7314	204.4645	208.9121	234.6050	253.9124	286.8848 (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	32.7489	26.2724	23.6554	17.3309	13.3869	10.9372	12.2120	15.8736	20.6183	27.0523	30.5555	33.6591 (232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-63.4880	-85.6805	-117.7110	-127.4304	-134.3502	-124.3278	-122.8370	-117.4604	-108.1393	-95.4577	-68.5481	-55.4785 (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	-42.8426	-85.7144	-159.8635	-226.5866	-289.4561	-287.2967	-285.4419	-247.8981	-190.6401	-119.5862	-56.3428	-34.3562 (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													6049.4134 (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													2859.1066 (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)													264.3025 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-3246.9343 (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	6011.8883 (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	6049.4134	0.2100	1270.3768 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2859.1066	0.2100	600.4124 (264)
Space and water heating			1870.7892 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	264.3025	0.1443	38.1470 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1220.9089	0.1354	-165.3028
PV Unit electricity exported	-2026.0254	0.1274	-258.1986
Total			-423.5014 (269)
Total CO2, kg/year			1497.3641 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.2700 (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	6049.4134	1.1300	6835.8372 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2859.1066	1.1300	3230.7905 (278)
Space and water heating			10066.6277 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	264.3025	1.5338	405.3960 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1220.9089	1.5004	-1831.8907
PV Unit electricity exported	-2026.0254	0.4679	-947.8963
Total			-2779.7870 (283)
Total Primary energy kWh/year			7822.3375 (286)
Dwelling Primary energy Rate (DPER)			53.6600 (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	72.8900 (1b)	x 2.3800 (2b)	= 173.4782 (1b) - (3b)
First floor	72.8900 (1c)	x 2.7700 (2c)	= 201.9053 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	145.7800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	375.3835 (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) = 0.1066 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3566 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3566 (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	0.4546 0.4457 0.4368 0.3922 0.3833 0.3387 0.3387 0.3298 0.3566 0.3833 0.4011 0.4190 (22b)
Effective ac	0.6033 0.5993 0.5954 0.5769 0.5735 0.5574 0.5574 0.5544 0.5636 0.5735 0.5805 0.5878 (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)			28.4400	1.1450	32.5649			(27)
Ground Floor			72.8900	0.1300	9.4757			(28a)
External Wall	145.6400	17.9700	127.6700	0.1800	22.9806			(29a)
Render wall	53.5600	12.6100	40.9500	0.1800	7.3710			(29a)
Plane Roof	72.8900		72.8900	0.1100	8.0179			(30)
Total net area of external elements Aum(A, m2)			344.9800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		82.5501			(33)

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

226.7598 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	21.1900	0.0500	1.0595	
E3 Sill	17.6900	0.0500	0.8845	
E4 Jamb	43.2000	0.0500	2.1600	
E5 Ground floor (normal)	38.6800	0.1600	6.1888	
E10 Eaves (insulation at ceiling level)	22.3400	0.0600	1.3404	
E16 Corner (normal)	25.7500	0.0900	2.3175	
E6 Intermediate floor within a dwelling	38.6800	0.0000	0.0000	
E12 Gable (insulation at ceiling level)	16.3400	0.0600	0.9804	
E17 Corner (inverted - internal area greater than external area)	5.1500	-0.0900	-0.4635	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				14.4676 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	97.0177 (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	74.7391	74.2421	73.7548	71.4663	71.0382	69.0449	69.0449	68.6758	69.8127	71.0382	71.9043	72.8099	(38)
Average = Sum(39)m / 12 =	171.7568	171.2597	170.7725	168.4840	168.0558	166.0626	166.0626	165.6935	166.8304	168.0558	168.9220	169.8276	(39)
												168.4820	
HLP	1.1782	1.1748	1.1714	1.1557	1.1528	1.1391	1.1391	1.1366	1.1444	1.1528	1.1587	1.1650	(40)
HLP (average)												1.1557	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9274 (42)
Hot water usage for mixer showers	73.3023	72.2007	70.5955	67.5242	65.2576	62.7300	61.2932	62.8863	64.6326	67.3466	70.4839	73.0215	(42a)
Hot water usage for baths	31.6456	31.1756	30.5138	29.2935	28.3798	27.3666	26.8193	27.4765	28.1920	29.2762	30.5216	31.5386	(42b)
Hot water usage for other uses	44.6093	42.9871	41.3649	39.7428	38.1206	36.4985	36.4985	38.1206	39.7428	41.3649	42.9871	44.6093	(42c)
Average daily hot water use (litres/day)													137.4766 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.5572	146.3635	142.4742	136.5605	131.7580	126.5950	124.6110	128.4834	132.5675	137.9877	143.9926	149.1694	(44)
Energy content (annual)	236.8620	208.4196	218.9776	186.9444	177.3716	155.6633	150.7062	159.0893	163.4690	187.2480	205.1439	233.5632	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2283.4581	
	35.5293	31.2629	32.8466	28.0417	26.6057	23.3495	22.6059	23.8634	24.5203	28.0872	30.7716	35.0345	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	287.8209	254.4470	269.9365	236.2595	228.3305	204.9784	201.6651	210.0482	212.7840	238.2069	254.4589	284.5221	(62)
WWHRS	-33.5108	-29.6372	-31.0344	-25.6977	-23.9493	-20.4936	-19.2095	-20.4274	-21.2035	-24.9965	-28.3180	-32.8902	(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	254.3102	224.8098	238.9021	210.5618	204.3812	184.4848	182.4556	189.6209	191.5806	213.2104	226.1409	251.6319	(64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				2572.0901	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)
Heat gains from water heating, kWh/month	91.4963	80.8064	85.5498	74.4878	71.7158	64.0868	62.8495	65.6369	66.6822	74.9997	80.5391	90.3995	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	146.3688	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	160.9020	178.1415	160.9020	166.2654	160.9020	166.2654	160.9020	160.9020	166.2654	160.9020	166.2654	160.9020	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	315.8935	319.1715	310.9110	293.3256	271.1271	250.2637	236.3256	233.0476	241.3081	258.8935	281.0920	301.9554	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	37.6369	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	(71)
Water heating gains (Table 5)	122.9790	120.2476	114.9863	103.4553	96.3922	89.0095	84.4752	88.2217	92.6142	100.8060	111.8599	121.5047	(72)
Total internal gains	669.6851	687.4711	656.7099	632.9569	598.3319	572.4492	548.6134	549.0819	567.0982	590.5122	629.1279	654.2727	(73)

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6. Solar gains

[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b	g or Table 6b	Specific data or Table 6c	FF or Table 6c	Access factor Table 6d	Gains W	
North	8.1000				10.6334		0.6300		0.7000	0.7700	26.3226	(74)
East	10.4700				19.6403		0.6300		0.7000	0.7700	62.8443	(76)
South	5.2000				46.7521		0.6300		0.7000	0.7700	74.2978	(78)
West	4.6700				19.6403		0.6300		0.7000	0.7700	28.0308	(80)
Solar gains	191.4955	349.7555	533.2416	739.4617	890.7857	909.3502	866.4882	751.4227	605.1843	402.0644	233.8511	160.8752 (83)
Total gains	861.1806	1037.2266	1189.9515	1372.4186	1489.1176	1481.7993	1415.1016	1300.5046	1172.2825	992.5766	862.9790	815.1479 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	53.4623	53.6175	53.7704	54.5008	54.6396	55.2955	55.2955	55.4187	55.0410	54.6396	54.3595	54.0696
alpha	4.5642	4.5745	4.5847	4.6334	4.6426	4.6864	4.6864	4.6946	4.6694	4.6426	4.6240	4.6046
util living area	0.9971	0.9928	0.9816	0.9415	0.8421	0.6669	0.5048	0.5653	0.8160	0.9674	0.9938	0.9978 (86)
MIT	19.4138	19.6356	19.9662	20.4081	20.7549	20.9407	20.9870	20.9785	20.8455	20.3753	19.8192	19.3859 (87)
Th 2	19.9375	19.9402	19.9429	19.9556	19.9579	19.9690	19.9690	19.9711	19.9647	19.9579	19.9531	19.9481 (88)
util rest of house	0.9962	0.9906	0.9757	0.9221	0.7926	0.5782	0.3922	0.4488	0.7421	0.9530	0.9915	0.9971 (89)
MIT 2	18.0862	18.3711	18.7922	19.3481	19.7467	19.9335	19.9645	19.9628	19.8541	19.3200	18.6157	18.0577 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.2268	18.5050	18.9166	19.4604	19.8535	20.0402	20.0728	20.0704	19.9591	19.4317	18.7431	18.1984 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.2268	18.5050	18.9166	19.4604	19.8535	20.0402	20.0728	20.0704	19.9591	19.4317	18.7431	18.1984 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9939	0.9862	0.9677	0.9106	0.7869	0.5848	0.4039	0.4605	0.7416	0.9429	0.9874	0.9952 (94)
Useful gains	855.9595	1022.8722	1151.4794	1249.7645	1171.8232	866.5081	571.5836	598.9035	869.3699	935.9492	852.1365	811.2620 (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	2392.0193	2329.9912	2120.4086	1779.2603	1370.2450	903.4107	576.7046	608.1576	977.4780	1484.2264	1966.7840	2377.3104 (97)
Space heating kWh	1142.8285	878.3840	720.8833	381.2370	147.6258	0.0000	0.0000	0.0000	0.0000	407.9182	802.5462	1165.1400 (98a)
Space heating requirement - total per year (kWh/year)	5646.5630											
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	1142.8285	878.3840	720.8833	381.2370	147.6258	0.0000	0.0000	0.0000	0.0000	407.9182	802.5462	1165.1400 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	5646.5630											
Space heating per m2	(98c) / (4) = 38.7335 (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	1142.8285	878.3840	720.8833	381.2370	147.6258	0.0000	0.0000	0.0000	0.0000	407.9182	802.5462	1165.1400 (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)	1236.8273	950.6321	780.1768	412.5941	159.7682	0.0000	0.0000	0.0000	0.0000	441.4700	868.5565	1260.9740 (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	254.3102	224.8098	238.9021	210.5618	204.3812	184.4848	182.4556	189.6209	191.5806	213.2104	226.1409	251.6319 (64)
Efficiency of water heater (217)m	87.2001	87.0012	86.5916	85.6368	83.6955	80.3000	80.3000	80.3000	80.3000	85.7477	86.8551	87.2405 (217)
Fuel for water heating, kWh/month	291.6398	258.3984	275.8952	245.8779	244.1960	229.7444	227.2175	236.1406	238.5810	248.6486	260.3657	288.4346 (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	33.4323	26.8206	24.1490	17.6926	13.6663	11.1654	12.4668	16.2048	21.0485	27.6167	31.1930	34.3614 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-63.6894	-87.5807	-122.7939	-134.4983	-142.0017	-131.3475	-129.5711	-123.6844	-113.0156	-98.2823	-69.1651	-55.3128 (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	-43.0359	-89.6181	-176.5209	-262.9002	-345.5847	-346.6164	-342.6750	-291.1895	-214.7404	-127.5802	-57.2521	-34.1144 (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)												

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(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												6110.9990	(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												3045.1396	(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)												269.8174	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3602.7709	(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												5909.1852	(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	6110.9990	0.2100	1283.3098 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3045.1396	0.2100	639.4793 (264)
Space and water heating			1922.7891 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	269.8174	0.1443	38.9430 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1270.9429	0.1352	-171.7702
PV Unit electricity exported	-2331.8280	0.1261	-294.1295
Total			-465.8997 (269)
Total CO2, kg/year			1507.7616 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.3400 (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	6110.9990	1.1300	6905.4288 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3045.1396	1.1300	3441.0078 (278)
Space and water heating			10346.4366 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	269.8174	1.5338	413.8550 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1270.9429	1.4995	-1905.8165
PV Unit electricity exported	-2331.8280	0.4630	-1079.6814
Total			-2985.4979 (283)
Total Primary energy kWh/year			7904.8945 (286)
Target Primary Energy Rate (TPER)			54.2200 (287)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024
Assessment Reference	Plot 35		Prop Type Ref	SAP VG 21-0282		
Property						
SAP Rating	95 A		DER	10.27	TER	10.34
Environmental	90 B		% DER < TER			0.68
CO ₂ Emissions (t/year)	1.44		DFEE	39.93	TFEE	43.39
Compliance Check	See BREL		% DFEE < TFEE			7.98
% DPER < TPER	1.04		DPER	53.66	TPER	54.22
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	72.8900 (1b)	x 2.3800 (2b)	= 173.4782 (1b) - (3b)
First floor	72.8900 (1c)	x 2.7700 (2c)	= 201.9053 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	145.7800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 375.3835 (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	6 * 10 = 60.0000 (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) =	60.0000 / (5) = 0.1598 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3598 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3598 (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	0.4588	0.4498	0.4408	0.3958	0.3868	0.3418	0.3418	0.3328	0.3598	0.3868	0.4048	0.4228 (22b)
Effective ac	0.6052	0.6012	0.5972	0.5783	0.5748	0.5584	0.5584	0.5554	0.5647	0.5748	0.5819	0.5894 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (U _w = 1.30)			28.4400	1.2357	35.1445		(27)
Door			2.1400	1.3000	2.7820		(26a)
Ground Floor			72.8900	0.1300	9.4757	75.0000	5466.7500 (28a)
External Wall	145.6400	17.9700	127.6700	0.1900	24.2573	110.0000	14043.7000 (29a)
Render wall	53.5600	12.6100	40.9500	0.1800	7.3710	110.0000	4504.5000 (29a)
Plane Roof	72.8900		72.8900	0.0900	6.5601	9.0000	656.0100 (30)
Total net area of external elements A _{um} (A, m ²)			344.9800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	85.5906		(33)
Studs			198.7000			9.0000	1788.3000 (32c)
Block			61.7300			75.0000	4629.7500 (32c)
Internal Floor 1			72.8900			18.0000	1312.0200 (32d)
Internal Ceiling 1			72.8900			9.0000	656.0100 (32e)
Heat capacity C _m = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	33057.0400 (34)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							226.7598 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				21.1900	0.0240	0.5086	
E3 Sill				17.6900	0.0210	0.3715	

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E4 Jamb								43.2000	0.0160	0.6912		
E5 Ground floor (normal)								38.6800	0.0920	3.5586		
E10 Eaves (insulation at ceiling level)								22.3400	0.0580	1.2957		
E16 Corner (normal)								25.7500	0.0470	1.2103		
E6 Intermediate floor within a dwelling								38.6800	0.0010	0.0387		
E12 Gable (insulation at ceiling level)								16.3400	0.0570	0.9314		
E17 Corner (inverted - internal area greater than external area)								5.1500	-0.0880	-0.4532		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											8.1526	(36)
Point Thermal bridges											0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	93.7432 (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	74.9756	74.4694	73.9732	71.6424	71.2063	69.1762	69.1762	68.8003	69.9582	71.2063	72.0885	73.0108 (38)
Average = Sum(39)m / 12 =	168.7189	168.2126	167.7164	165.3856	164.9495	162.9195	162.9195	162.5435	163.7014	164.9495	165.8317	166.7540 (39)
												165.3835
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1574	1.1539	1.1505	1.1345	1.1315	1.1176	1.1176	1.1150	1.1229	1.1315	1.1375	1.1439 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31
												1.1345
												31

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.9274 (42)
Hot water usage for mixer showers												
	73.3023	72.2007	70.5955	67.5242	65.2576	62.7300	61.2932	62.8863	64.6326	67.3466	70.4839	73.0215 (42a)
Hot water usage for baths												
	31.6456	31.1756	30.5138	29.2935	28.3798	27.3666	26.8193	27.4765	28.1920	29.2762	30.5216	31.5386 (42b)
Hot water usage for other uses												
	44.6093	42.9871	41.3649	39.7428	38.1206	36.4985	36.4985	38.1206	39.7428	41.3649	42.9871	44.6093 (42c)
Average daily hot water use (litres/day)												137.4766 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	149.5572	146.3635	142.4742	136.5605	131.7580	126.5950	124.6110	128.4834	132.5675	137.9877	143.9926	149.1694 (44)
Energy conte	236.8620	208.4196	218.9776	186.9444	177.3716	155.6633	150.7062	159.0893	163.4690	187.2480	205.1439	233.5632 (45)
Energy content (annual)										Total = Sum(45)m =		2283.4581
Distribution loss (46)m = 0.15 x (45)m												
	35.5293	31.2629	32.8466	28.0417	26.6057	23.3495	22.6059	23.8634	24.5203	28.0872	30.7716	35.0345 (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	19.5803	17.6296	19.3996	18.5216	18.9794	18.2057	18.7101	18.7948	18.2845	19.0792	18.7055	19.5469 (61)
Total heat required for water heating calculated for each month												
	256.4423	226.0493	238.3772	205.4661	196.3510	173.8690	169.4163	177.8841	181.7535	206.3272	223.8493	253.1101 (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												
	256.4423	226.0493	238.3772	205.4661	196.3510	173.8690	169.4163	177.8841	181.7535	206.3272	223.8493	253.1101 (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												
	83.6517	73.7069	77.6600	66.7894	63.7209	56.3095	54.7873	57.5959	58.9246	67.0298	72.8867	82.5465 (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
	175.6426	175.6426	175.6426	175.6426	175.6426	175.6426	175.6426	175.6426	175.6426	175.6426	175.6426	175.6426 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	37.4148	33.2315	27.0256	20.4601	15.2942	12.9120	13.9519	18.1352	24.3410	30.9065	36.0724	38.4546 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	471.4828	476.3753	464.0463	437.7994	404.6673	373.5279	352.7248	347.8323	360.1613	386.4082	419.5403	450.6797 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	55.4916	55.4916	55.4916	55.4916	55.4916	55.4916	55.4916	55.4916	55.4916	55.4916	55.4916	55.4916 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950 (71)
Water heating gains (Table 5)												
	112.4351	109.6829	104.3817	92.7631	85.6464	78.2076	73.6389	77.4138	81.8397	90.0938	101.2315	110.9496 (72)
Total internal gains												
	738.3718	736.3289	712.4928	668.0618	622.6471	578.6866	554.3547	557.4204	580.3811	624.4476	673.8834	717.1231 (73)

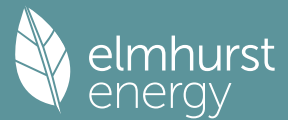
6. Solar gains												

[Jan]												
	Area											
	m2											
	Solar flux											
	Table 6a											
	W/m2											
	Specific data											
	or Table 6b											
	g											
	Specific data											
	or Table 6c											
	FF											
	Access											
	factor											
	Table 6d											
	Gains											
	W											
North	8.1000											30.5008 (74)
East	10.4700											72.8196 (76)
South	5.2000											86.0911 (78)
West	4.6700											32.4802 (80)

Solar gains	221.8916	405.2722	617.8831	856.8366	1032.1802	1053.6915	1004.0260	870.6961	701.2453	465.8842	270.9704	186.4110 (83)
Total gains	960.2634	1141.6011	1330.3759	1524.8984	1654.8273	1632.3781	1558.3807	1428.1166	1281.6264	1090.3318	944.8537	903.5341 (84)

7. Mean internal temperature (heating season)												

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Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	54.4249	54.5887	54.7502	55.5218	55.6686	56.3623	56.3623	56.4926	56.0930	55.6686	55.3725	55.0662
alpha	4.6283	4.6392	4.6500	4.7015	4.7112	4.7575	4.7575	4.7662	4.7395	4.7112	4.6915	4.6711
util living area	0.9955	0.9894	0.9717	0.9158	0.7923	0.6092	0.4537	0.5119	0.7699	0.9534	0.9910	0.9966 (86)
MIT	19.8266	19.9943	20.2554	20.5732	20.8011	20.9060	20.9291	20.9250	20.8492	20.5305	20.1173	19.8008 (87)
Th 2	19.9543	19.9571	19.9598	19.9728	19.9752	19.9865	19.9865	19.9886	19.9821	19.9752	19.9703	19.9652 (88)
util rest of house	0.9941	0.9862	0.9630	0.8908	0.7374	0.5242	0.3524	0.4050	0.6916	0.9342	0.9877	0.9955 (89)
MIT 2	18.5821	18.7977	19.1288	19.5260	19.7800	19.8863	19.9011	19.9015	19.8395	19.4863	18.9660	18.5576 (90)
Living area fraction	fLA = Living area / (4) = 0.1059 (91)											
MIT	18.7139	18.9244	19.2481	19.6369	19.8881	19.9943	20.0099	20.0099	19.9465	19.5969	19.0879	18.6893 (92)
Temperature adjustment	-0.1500											
adjusted MIT	18.5639	18.7744	19.0981	19.4869	19.7381	19.8443	19.8599	19.8599	19.7965	19.4469	18.9379	18.5393 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9914	0.9812	0.9535	0.8764	0.7231	0.5117	0.3395	0.3910	0.6753	0.9210	0.9829	0.9934 (94)
Useful gains	952.0036	1120.0824	1268.5147	1336.3962	1196.6649	835.2174	529.0130	558.3557	865.4305	1004.2020	928.7408	897.5459 (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	2406.5922	2333.8531	2112.9133	1750.9225	1325.8855	854.3933	531.1071	562.3892	932.5186	1459.2850	1963.1043	2391.1319 (97)
Space heating kWh	1082.2139	815.6539	628.2325	298.4590	96.1401	0.0000	0.0000	0.0000	0.0000	338.5818	744.7417	1111.2280 (98a)
Space heating requirement - total per year (kWh/year)												5115.2509
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	1082.2139	815.6539	628.2325	298.4590	96.1401	0.0000	0.0000	0.0000	0.0000	338.5818	744.7417	1111.2280 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5115.2509
Space heating per m2										(98c) / (4) =		35.0888 (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	1082.2139	815.6539	628.2325	298.4590	96.1401	0.0000	0.0000	0.0000	0.0000	338.5818	744.7417	1111.2280 (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)	1222.8405	921.6429	709.8673	337.2418	108.6329	0.0000	0.0000	0.0000	0.0000	382.5783	841.5161	1255.6249 (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	256.4423	226.0493	238.3772	205.4661	196.3510	173.8690	169.4163	177.8841	181.7535	206.3272	223.8493	253.1101 (64)
Efficiency of water heater (217)m	88.2087	88.1701	88.0823	87.8822	87.4874	87.0000	87.0000	87.0000	87.0000	87.9260	88.1488	88.2178 (216)
Fuel for water heating, kWh/month	290.7223	256.3785	270.6302	233.7971	224.4334	199.8494	194.7314	204.4645	208.9121	234.6601	253.9449	286.9149 (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	32.7489	26.2724	23.6554	17.3309	13.3869	10.9372	12.2120	15.8736	20.6183	27.0523	30.5555	33.6591 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-63.4880	-85.6805	-117.7110	-127.4304	-134.3502	-124.3278	-122.8370	-117.4604	-108.1393	-95.4577	-68.5481	-55.4785 (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)	-42.8426	-85.7144	-159.8635	-226.5866	-289.4561	-287.2967	-285.4419	-247.8981	-190.6401	-119.5862	-56.3428	-34.3562 (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												5779.9445 (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												2859.4389 (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)												264.3025 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-3246.9343 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)

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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	5742.7516 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	5779.9445	3.6400	210.3900 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2859.4389	3.6400	104.0836 (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	264.3025	16.4900	43.5835 (250)
Additional standing charges			92.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1220.9089	16.4900	-201.3279
PV Unit electricity exported	-2026.0254	5.5900	-113.2548
Total			-314.5827 (252)
Total energy cost			149.6557 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	0.2824 (257)
SAP value	95.4223
SAP rating (Section 12)	95 (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	5779.9445	0.2100	1213.7883 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2859.4389	0.2100	600.4822 (264)
Space and water heating			1814.2705 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	264.3025	0.1443	38.1470 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1220.9089	0.1354	-165.3028
PV Unit electricity exported	-2026.0254	0.1274	-258.1986
Total			-423.5014 (269)
Total CO2, kg/year			1440.8454 (272)
CO2 emissions per m2			9.8800 (273)
EI value			89.8798
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	72.8900 (1b)	x 2.3800 (2b)	= 173.4782 (1b) - (3b)
First floor	72.8900 (1c)	x 2.7700 (2c)	= 201.9053 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	145.7800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 375.3835 (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	6 * 10 = 60.0000 (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) =	60.0000 / (5) = 0.1598 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3598 (18)
Number of sides sheltered	0 (19)

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Shelter factor
Infiltration rate adjusted to include shelter factor

$$(20) = 1 - [0.075 \times (19)] = 1.0000 \quad (20)$$
$$(21) = (18) \times (20) = 0.3598 \quad (21)$$

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infiltr rate													
Effective ac	0.4588	0.4498	0.4408	0.3958	0.3868	0.3418	0.3418	0.3328	0.3598	0.3868	0.4048	0.4228	(22b)
	0.6052	0.6012	0.5972	0.5783	0.5748	0.5584	0.5584	0.5554	0.5647	0.5748	0.5819	0.5894	(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)			28.4400	1.2357	35.1445			(27)
Door			2.1400	1.3000	2.7820			(26a)
Ground Floor			72.8900	0.1300	9.4757	75.0000	5466.7500	(28a)
External Wall	145.6400	17.9700	127.6700	0.1900	24.2573	110.0000	14043.7000	(29a)
Render wall	53.5600	12.6100	40.9500	0.1800	7.3710	110.0000	4504.5000	(29a)
Plane Roof	72.8900		72.8900	0.0900	6.5601	9.0000	656.0100	(30)
Total net area of external elements Aum(A, m2)			344.9800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	85.5906			(33)
Studs			198.7000			9.0000	1788.3000	(32c)
Block			61.7300			75.0000	4629.7500	(32c)
Internal Floor 1			72.8900			18.0000	1312.0200	(32d)
Internal Ceiling 1			72.8900			9.0000	656.0100	(32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
List of Thermal Bridges

$$(28) \dots (30) + (32) + (32a) \dots (32e) = 33057.0400 \quad (34)$$
$$226.7598 \quad (35)$$

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	21.1900	0.0240	0.5086	
E3 Sill	17.6900	0.0210	0.3715	
E4 Jamb	43.2000	0.0160	0.6912	
E5 Ground floor (normal)	38.6800	0.0920	3.5586	
E10 Eaves (insulation at ceiling level)	22.3400	0.0580	1.2957	
E16 Corner (normal)	25.7500	0.0470	1.2103	
E6 Intermediate floor within a dwelling	38.6800	0.0010	0.0387	
E12 Gable (insulation at ceiling level)	16.3400	0.0570	0.9314	
E17 Corner (inverted - internal area greater than external area)	5.1500	-0.0880	-0.4532	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				8.1526 (36)
Point Thermal bridges				0.0000 (36a)
Total fabric heat loss				(33) + (36) + (36a) = 93.7432 (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	74.9756	74.4694	73.9732	71.6424	71.2063	69.1762	69.1762	68.8003	69.9582	71.2063	72.0885	73.0108	(38)
Average = Sum(39)m / 12 =	168.7189	168.2126	167.7164	165.3856	164.9495	162.9195	162.9195	162.5435	163.7014	164.9495	165.8317	166.7540	(39)
												165.3835	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1574	1.1539	1.1505	1.1345	1.1315	1.1176	1.1176	1.1150	1.1229	1.1315	1.1375	1.1439	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

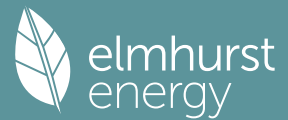
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9274 (42)
Hot water usage for mixer showers													
	73.3023	72.2007	70.5955	67.5242	65.2576	62.7300	61.2932	62.8863	64.6326	67.3466	70.4839	73.0215	(42a)
Hot water usage for baths													
	31.6456	31.1756	30.5138	29.2935	28.3798	27.3666	26.8193	27.4765	28.1920	29.2762	30.5216	31.5386	(42b)
Hot water usage for other uses													
	44.6093	42.9871	41.3649	39.7428	38.1206	36.4985	36.4985	38.1206	39.7428	41.3649	42.9871	44.6093	(42c)
Average daily hot water use (litres/day)													137.4766 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	149.5572	146.3635	142.4742	136.5605	131.7580	126.5950	124.6110	128.4834	132.5675	137.9877	143.9926	149.1694	(44)
Energy content (annual)	236.8620	208.4196	218.9776	186.9444	177.3716	155.6633	150.7062	159.0893	163.4690	187.2480	205.1439	233.5632	(45)
Distribution loss (46)m = 0.15 x (45)m													2283.4581
	35.5293	31.2629	32.8466	28.0417	26.6057	23.3495	22.6059	23.8634	24.5203	28.0872	30.7716	35.0345	(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	19.5803	17.6296	19.3996	18.5216	18.9794	18.2057	18.7101	18.7948	18.2845	19.0792	18.7055	19.5469	(61)
Total heat required for water heating calculated for each month	256.4423	226.0493	238.3772	205.4661	196.3510	173.8690	169.4163	177.8841	181.7535	206.3272	223.8493	253.1101	(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	256.4423	226.0493	238.3772	205.4661	196.3510	173.8690	169.4163	177.8841	181.7535	206.3272	223.8493	253.1101	(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	83.6517	73.7069	77.6600	66.7894	63.7209	56.3095	54.7873	57.5959	58.9246	67.0298	72.8867	82.5465	(65)

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

Metabolic gains (Table 5), Watts

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	175.6426	175.6426	175.6426	175.6426	175.6426	175.6426	175.6426	175.6426	175.6426	175.6426	175.6426	175.6426	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	37.4148	33.2315	27.0256	20.4601	15.2942	12.9120	13.9519	18.1352	24.3410	30.9065	36.0724	38.4546	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	471.4828	476.3753	464.0463	437.7994	404.6673	373.5279	352.7248	347.8323	360.1613	386.4082	419.5403	450.6797	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.4916	55.4916	55.4916	55.4916	55.4916	55.4916	55.4916	55.4916	55.4916	55.4916	55.4916	55.4916	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	(71)
Water heating gains (Table 5)	112.4351	109.6829	104.3817	92.7631	85.6464	78.2076	73.6389	77.4138	81.8397	90.0938	101.2315	110.9496	(72)
Total internal gains	738.3718	736.3289	712.4928	668.0618	622.6471	578.6866	554.3547	557.4204	580.3811	624.4476	673.8834	717.1231	(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					8.1000	10.6334		0.7300	0.7000	0.7700		30.5008 (74)	
East					10.4700	19.6403		0.7300	0.7000	0.7700		72.8196 (76)	
South					5.2000	46.7521		0.7300	0.7000	0.7700		86.0911 (78)	
West					4.6700	19.6403		0.7300	0.7000	0.7700		32.4802 (80)	

Solar gains	221.8916	405.2722	617.8831	856.8366	1032.1802	1053.6915	1004.0260	870.6961	701.2453	465.8842	270.9704	186.4110	(83)
Total gains	960.2634	1141.6011	1330.3759	1524.8984	1654.8273	1632.3781	1558.3807	1428.1166	1281.6264	1090.3318	944.8537	903.5341	(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	54.4249	54.5887	54.7502	55.5218	55.6686	56.3623	56.3623	56.4926	56.0930	55.6686	55.3725	55.0662	
alpha	4.6283	4.6392	4.6500	4.7015	4.7112	4.7575	4.7575	4.7662	4.7395	4.7112	4.6915	4.6711	
util living area	0.9955	0.9894	0.9717	0.9158	0.7923	0.6092	0.4537	0.5119	0.7699	0.9534	0.9910	0.9966	(86)
MIT	19.8266	19.9943	20.2554	20.5732	20.8011	20.9060	20.9291	20.9250	20.8492	20.5305	20.1173	19.8008	(87)
Th 2	19.9543	19.9571	19.9598	19.9728	19.9752	19.9865	19.9865	19.9886	19.9821	19.9752	19.9703	19.9652	(88)
util rest of house	0.9941	0.9862	0.9630	0.8908	0.7374	0.5242	0.3524	0.4050	0.6916	0.9342	0.9877	0.9955	(89)
MIT 2	18.5821	18.7977	19.1288	19.5260	19.7800	19.8863	19.9011	19.9015	19.8395	19.4863	18.9660	18.5576	(90)
Living area fraction									fLA = Living area /	(4) =		0.1059	(91)
MIT	18.7139	18.9244	19.2481	19.6369	19.8881	19.9943	20.0099	20.0099	19.9465	19.5969	19.0879	18.6893	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.5639	18.7744	19.0981	19.4869	19.7381	19.8443	19.8599	19.8599	19.7965	19.4469	18.9379	18.5393	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9914	0.9812	0.9535	0.8764	0.7231	0.5117	0.3395	0.3910	0.6753	0.9210	0.9829	0.9934	(94)
Useful gains	952.0036	1120.0824	1268.5147	1336.3962	1196.6649	835.2174	529.0130	558.3557	865.4305	1004.2020	928.7408	897.5459	(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	2406.5922	2333.8531	2112.9133	1750.9225	1325.8855	854.3933	531.1071	562.3892	932.5186	1459.2850	1963.1043	2391.1319	(97)
Space heating kWh	1082.2139	815.6539	628.2325	298.4590	96.1401	0.0000	0.0000	0.0000	0.0000	338.5818	744.7417	1111.2280	(98a)
Space heating requirement - total per year (kWh/year)												5115.2509	
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	1082.2139	815.6539	628.2325	298.4590	96.1401	0.0000	0.0000	0.0000	0.0000	338.5818	744.7417	1111.2280	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5115.2509	
Space heating per m ²										(98c) / (4) =		35.0888	(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	1082.2139	815.6539	628.2325	298.4590	96.1401	0.0000	0.0000	0.0000	0.0000	338.5818	744.7417	1111.2280	(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)	1222.8405	921.6429	709.8673	337.2418	108.6329	0.0000	0.0000	0.0000	0.0000	382.5783	841.5161	1255.6249	(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	256.4423	226.0493	238.3772	205.4661	196.3510	173.8690	169.4163	177.8841	181.7535	206.3272	223.8493	253.1101	(64)
Efficiency of water heater												87.0000	(216)
(217)m	88.2087	88.1701	88.0823	87.8822	87.4874	87.0000	87.0000	87.0000	87.0000	87.9260	88.1488	88.2178	(217)
Fuel for water heating, kWh/month													

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	290.7223	256.3785	270.6302	233.7971	224.4334	199.8494	194.7314	204.4645	208.9121	234.6601	253.9449	286.9149	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	32.7489	26.2724	23.6554	17.3309	13.3869	10.9372	12.2120	15.8736	20.6183	27.0523	30.5555	33.6591	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-63.4880	-85.6805	-117.7110	-127.4304	-134.3502	-124.3278	-122.8370	-117.4604	-108.1393	-95.4577	-68.5481	-55.4785	(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	-42.8426	-85.7144	-159.8635	-226.5866	-289.4561	-287.2967	-285.4419	-247.8981	-190.6401	-119.5862	-56.3428	-34.3562	(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												5779.9445	(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												2859.4389	(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)												264.3025	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3246.9343	(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												5742.7516	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	5779.9445	5.6000	323.6769 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2859.4389	5.6000	160.1286 (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	264.3025	26.0600	68.8772 (250)
Additional standing charges			99.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1220.9089	26.0600	-318.1689
PV Unit electricity exported	-2026.0254	5.8100	-117.7121
Total			-435.8809 (252)
Total energy cost			238.2134 (255)

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

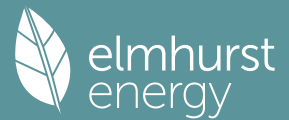
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	5779.9445	0.2100	1213.7883 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2859.4389	0.2100	600.4822 (264)
Space and water heating			1814.2705 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	264.3025	0.1443	38.1470 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1220.9089	0.1354	-165.3028
PV Unit electricity exported	-2026.0254	0.1274	-258.1986
Total			-423.5014 (269)
Total CO2, kg/year			1440.8454 (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	5779.9445	1.1300	6531.3373 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2859.4389	1.1300	3231.1659 (278)
Space and water heating			9762.5032 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	264.3025	1.5338	405.3960 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1220.9089	1.5004	-1831.8907
PV Unit electricity exported	-2026.0254	0.4679	-947.8963
Total			-2779.7870 (283)
Total Primary energy kWh/year			7518.2130 (286)

SAP 10 EPC IMPROVEMENTS

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Plot 35

Current energy efficiency rating: A 95
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 + 0.4 -£ 21 -137 kg (9.5%)

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

Potential energy efficiency rating: A 95
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	£91	£91	£0
Mains gas	£583	£583	£0
Space heating	£445	£445	£0
Water heating	£160	£160	£0
Lighting	£69	£69	£0
Generated (PV)	-£436	-£436	£0
Total cost of fuels	£238	£238	£0
Total cost of uses	£238	£238	£0
Delivered energy	39 kWh/m²	39 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.4 tonnes	1.4 tonnes	0.0 tonnes
CO2 emissions per m²	10 kg/m²	10 kg/m²	0 kg/m²
Primary energy	52 kWh/m²	52 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	72.8900 (1b)	x 2.3800 (2b)	= 173.4782 (1b) - (3b)
First floor	72.8900 (1c)	x 2.7700 (2c)	= 201.9053 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	145.7800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 375.3835 (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	6 * 10 =	60.0000 (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) =	60.0000 / (5) =	0.1598 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000 (17)	
Infiltration rate	0.3598 (18)	
Number of sides sheltered	0 (19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3598 (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	0.4588	0.4498	0.4408	0.3958	0.3868	0.3418	0.3418	0.3328	0.3598	0.3868	0.4048	0.4228 (22b)
Effective ac	0.6052	0.6012	0.5972	0.5783	0.5748	0.5584	0.5584	0.5554	0.5647	0.5748	0.5819	0.5894 (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)			28.4400	1.2357	35.1445			(27)
Door			2.1400	1.3000	2.7820			(26a)
Ground Floor			72.8900	0.1300	9.4757			(28a)
External Wall	145.6400	17.9700	127.6700	0.1900	24.2573	75.0000	5466.7500	(29a)
Render wall	53.5600	12.6100	40.9500	0.1800	7.3710	110.0000	4504.5000	(29a)
Plane Roof	72.8900		72.8900	0.0900	6.5601	9.0000	656.0100	(30)
Total net area of external elements Aum(A, m2)			344.9800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		85.5906			(33)
Studs			198.7000			9.0000	1788.3000	(32c)
Block			61.7300			75.0000	4629.7500	(32c)
Internal Floor 1			72.8900			18.0000	1312.0200	(32d)
Internal Ceiling 1			72.8900			9.0000	656.0100	(32e)

Heat capacity Cm = Sum(A x k)

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

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	21.1900	0.0240	0.5086	
E3 Sill	17.6900	0.0210	0.3715	
E4 Jamb	43.2000	0.0160	0.6912	
E5 Ground floor (normal)	38.6800	0.0920	3.5586	
E10 Eaves (insulation at ceiling level)	22.3400	0.0580	1.2957	
E16 Corner (normal)	25.7500	0.0470	1.2103	
E6 Intermediate floor within a dwelling	38.6800	0.0010	0.0387	
E12 Gable (insulation at ceiling level)	16.3400	0.0570	0.9314	
E17 Corner (inverted - internal area greater than external area)	5.1500	-0.0880	-0.4532	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				8.1526 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	93.7432 (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	74.9756	74.4694	73.9732	71.6424	71.2063	69.1762	69.1762	68.8003	69.9582	71.2063	72.0885	73.0108	(38)
Heat transfer coeff	168.7189	168.2126	167.7164	165.3856	164.9495	162.9195	162.9195	162.5435	163.7014	164.9495	165.8317	166.7540	(39)
Average = Sum(39)m / 12 =												165.3835	
HLP	1.1574	1.1539	1.1505	1.1345	1.1315	1.1176	1.1176	1.1150	1.1229	1.1315	1.1375	1.1439	(40)
HLP (average)												1.1345	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9274 (42)
Hot water usage for mixer showers	73.3023	72.2007	70.5955	67.5242	65.2576	62.7300	61.2932	62.8863	64.6326	67.3466	70.4839	73.0215	(42a)
Hot water usage for baths	31.6456	31.1756	30.5138	29.2935	28.3798	27.3666	26.8193	27.4765	28.1920	29.2762	30.5216	31.5386	(42b)
Hot water usage for other uses	44.6093	42.9871	41.3649	39.7428	38.1206	36.4985	36.4985	38.1206	39.7428	41.3649	42.9871	44.6093	(42c)
Average daily hot water use (litres/day)												137.4766	(43)
Daily hot water use	149.5572	146.3635	142.4742	136.5605	131.7580	126.5950	124.6110	128.4834	132.5675	137.9877	143.9926	149.1694	(44)
Energy conte	236.8620	208.4196	218.9776	186.9444	177.3716	155.6633	150.7062	159.0893	163.4690	187.2480	205.1439	233.5632	(45)
Energy content (annual)										Total = Sum(45)m =		2283.4581	
Distribution loss (46)m = 0.15 x (45)m	35.5293	31.2629	32.8466	28.0417	26.6057	23.3495	22.6059	23.8634	24.5203	28.0872	30.7716	35.0345	(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	19.5803	17.6296	19.3996	18.5216	18.9794	18.2057	18.7101	18.7948	18.2845	19.0792	18.7055	19.5469	(61)
Total heat required for water heating calculated for each month	256.4423	226.0493	238.3772	205.4661	196.3510	173.8690	169.4163	177.8841	181.7535	206.3272	223.8493	253.1101	(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)
FV 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	256.4423	226.0493	238.3772	205.4661	196.3510	173.8690	169.4163	177.8841	181.7535	206.3272	223.8493	253.1101	(64)
								Total per year (kWh/year) = Sum(64)m =				2508.8953	(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	83.6517	73.7069	77.6600	66.7894	63.7209	56.3095	54.7873	57.5959	58.9246	67.0298	72.8867	82.5465	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	175.6426	175.6426	175.6426	175.6426	175.6426	175.6426	175.6426	175.6426	175.6426	175.6426	175.6426	175.6426	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	37.4148	33.2315	27.0256	20.4601	15.2942	12.9120	13.9519	18.1352	24.3410	30.9065	36.0724	38.4546	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	471.4828	476.3753	464.0463	437.7994	404.6673	373.5279	352.7248	347.8323	360.1613	386.4082	419.5403	450.6797	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.4916	55.4916	55.4916	55.4916	55.4916	55.4916	55.4916	55.4916	55.4916	55.4916	55.4916	55.4916	(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)	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	(71)
Water heating gains (Table 5)	112.4351	109.6829	104.3817	92.7631	85.6464	78.2076	73.6389	77.4138	81.8397	90.0938	101.2315	110.9496	(72)

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Total internal gains
738.3718 736.3289 712.4928 668.0618 622.6471 578.6866 554.3547 557.4204 580.3811 624.4476 673.8834 717.1231 (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				8.1000	10.6334	0.7300	0.7000		0.7700		30.5008 (74)	
East				10.4700	19.6403	0.7300	0.7000		0.7700		72.8196 (76)	
South				5.2000	46.7521	0.7300	0.7000		0.7700		86.0911 (78)	
West				4.6700	19.6403	0.7300	0.7000		0.7700		32.4802 (80)	

Solar gains	221.8916	405.2722	617.8831	856.8366	1032.1802	1053.6915	1004.0260	870.6961	701.2453	465.8842	270.9704	186.4110 (83)
Total gains	960.2634	1141.6011	1330.3759	1524.8984	1654.8273	1632.3781	1558.3807	1428.1166	1281.6264	1090.3318	944.8537	903.5341 (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	54.4249	54.5887	54.7502	55.5218	55.6686	56.3623	56.3623	56.4926	56.0930	55.6686	55.3725	55.0662
alpha	4.6283	4.6392	4.6500	4.7015	4.7112	4.7575	4.7575	4.7662	4.7395	4.7112	4.6915	4.6711
util living area	0.9955	0.9894	0.9717	0.9158	0.7923	0.6092	0.4537	0.5119	0.7699	0.9534	0.9910	0.9966 (86)
MIT	19.8266	19.9943	20.2554	20.5732	20.8011	20.9060	20.9291	20.9250	20.8492	20.5305	20.1173	19.8008 (87)
Th 2	19.9543	19.9571	19.9598	19.9728	19.9752	19.9865	19.9865	19.9886	19.9821	19.9752	19.9703	19.9652 (88)
util rest of house	0.9941	0.9862	0.9630	0.8908	0.7374	0.5242	0.3524	0.4050	0.6916	0.9342	0.9877	0.9955 (89)
MIT 2	18.5821	18.7977	19.1288	19.5260	19.7800	19.8863	19.9011	19.9015	19.8395	19.4863	18.9660	18.5576 (90)
Living area fraction	18.7139	18.9244	19.2481	19.6369	19.8881	19.9943	20.0099	20.0099	19.9465	19.5969	19.0879	18.6893 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.5639	18.7744	19.0981	19.4869	19.7381	19.8443	19.8599	19.8599	19.7965	19.4469	18.9379	18.5393 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9914	0.9812	0.9535	0.8764	0.7231	0.5117	0.3395	0.3910	0.6753	0.9210	0.9829	0.9934 (94)
Useful gains	952.0036	1120.0824	1268.5147	1336.3962	1196.6649	835.2174	529.0130	558.3557	865.4305	1004.2020	928.7408	897.5459 (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	2406.5922	2333.8531	2112.9133	1750.9225	1325.8855	854.3933	531.1071	562.3892	932.5186	1459.2850	1963.1043	2391.1319 (97)
Space heating kWh	1082.2139	815.6539	628.2325	298.4590	96.1401	0.0000	0.0000	0.0000	0.0000	338.5818	744.7417	1111.2280 (98a)
Space heating requirement - total per year (kWh/year)												5115.2509
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	1082.2139	815.6539	628.2325	298.4590	96.1401	0.0000	0.0000	0.0000	0.0000	338.5818	744.7417	1111.2280 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5115.2509
Space heating per m2										(98c) / (4) =		35.0888 (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	1082.2139	815.6539	628.2325	298.4590	96.1401	0.0000	0.0000	0.0000	0.0000	338.5818	744.7417	1111.2280 (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)	1222.8405	921.6429	709.8673	337.2418	108.6329	0.0000	0.0000	0.0000	0.0000	382.5783	841.5161	1255.6249 (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	256.4423	226.0493	238.3772	205.4661	196.3510	173.8690	169.4163	177.8841	181.7535	206.3272	223.8493	253.1101 (64)
Efficiency of water heater	88.2087	88.1701	88.0823	87.8822	87.4874	87.0000	87.0000	87.0000	87.0000	87.9260	88.1488	88.2178 (217)
Fuel for water heating, kWh/month	290.7223	256.3785	270.6302	233.7971	224.4334	199.8494	194.7314	204.4645	208.9121	234.6601	253.9449	286.9149 (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	32.7489	26.2724	23.6554	17.3309	13.3869	10.9372	12.2120	15.8736	20.6183	27.0523	30.5555	33.6591 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-63.4880	-85.6805	-117.7110	-127.4304	-134.3502	-124.3278	-122.8370	-117.4604	-108.1393	-95.4577	-68.5481	-55.4785 (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)

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Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-42.8426	-85.7144	-159.8635	-226.5866	-289.4561	-287.2967	-285.4419	-247.8981	-190.6401	-119.5862	-56.3428	-34.3562	(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												5779.9445	(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												2859.4389	(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)												264.3025	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3246.9343	(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												5742.7516	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	5779.9445	3.6400	210.3900	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2859.4389	3.6400	104.0836	(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	264.3025	16.4900	43.5835	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1220.9089	16.4900	-201.3279	
PV Unit electricity exported	-2026.0254	5.5900	-113.2548	
Total			-314.5827	(252)
Total energy cost			149.6557	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		0.2824	(257)
SAP value	$[(255) \times (256)] / [(4) + 45.0] =$	95.4223	
SAP rating (Section 12)		95	(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	5779.9445	0.2100	1213.7883	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2859.4389	0.2100	600.4822	(264)
Space and water heating			1814.2705	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	264.3025	0.1443	38.1470	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1220.9089	0.1354	-165.3028	
PV Unit electricity exported	-2026.0254	0.1274	-258.1986	
Total			-423.5014	(269)
Total CO2, kg/year			1440.8454	(272)
CO2 emissions per m2			9.8800	(273)
EI value			89.8798	
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	72.8900 (1b)	x 2.3800 (2b)	= 173.4782	(1b) - (3b)
First floor	72.8900 (1c)	x 2.7700 (2c)	= 201.9053	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	145.7800			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	375.3835	(5)

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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												6 * 10 =	60.0000 (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) =											60.0000 / (5) =	0.1598 (8)
Pressure test												Yes	
Pressure Test Method												Blower Door	
Measured/design AP50												4.0000	(17)
Infiltration rate												0.3598	(18)
Number of sides sheltered												0	(19)
Shelter factor												(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) =	0.3598 (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	0.4588	0.4498	0.4408	0.3958	0.3868	0.3418	0.3418	0.3328	0.3598	0.3868	0.4048	0.4228 (22b)	
Effective ac	0.6052	0.6012	0.5972	0.5783	0.5748	0.5584	0.5584	0.5554	0.5647	0.5748	0.5819	0.5894 (25)	

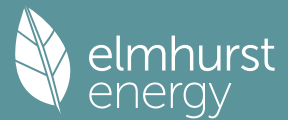
3. Heat losses and heat loss parameter

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)			28.4400	1.2357	35.1445			(27)					
Door			2.1400	1.3000	2.7820			(26a)					
Ground Floor			72.8900	0.1300	9.4757	75.0000	5466.7500	(28a)					
External Wall	145.6400	17.9700	127.6700	0.1900	24.2573	110.0000	14043.7000	(29a)					
Render wall	53.5600	12.6100	40.9500	0.1800	7.3710	110.0000	4504.5000	(29a)					
Plane Roof	72.8900		72.8900	0.0900	6.5601	9.0000	656.0100	(30)					
Total net area of external elements Aum(A, m2)			344.9800					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	85.5906			(33)					
Studs			198.7000			9.0000	1788.3000	(32c)					
Block			61.7300			75.0000	4629.7500	(32c)					
Internal Floor 1			72.8900			18.0000	1312.0200	(32d)					
Internal Ceiling 1			72.8900			9.0000	656.0100	(32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	33057.0400	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							226.7598	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
E2 Other lintels (including other steel lintels)				21.1900	0.0240	0.5086							
E3 Sill				17.6900	0.0210	0.3715							
E4 Jamb				43.2000	0.0160	0.6912							
E5 Ground floor (normal)				38.6800	0.0920	3.5586							
E10 Eaves (insulation at ceiling level)				22.3400	0.0580	1.2957							
E16 Corner (normal)				25.7500	0.0470	1.2103							
E6 Intermediate floor within a dwelling				38.6800	0.0010	0.0387							
E12 Gable (insulation at ceiling level)				16.3400	0.0570	0.9314							
E17 Corner (inverted - internal area greater than external area)				5.1500	-0.0880	-0.4532							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.1526	(36)					
Point Thermal bridges							0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	93.7432	(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	74.9756	74.4694	73.9732	71.6424	71.2063	69.1762	69.1762	68.8003	69.9582	71.2063	72.0885	73.0108	(38)
Average = Sum(39)m / 12 =	168.7189	168.2126	167.7164	165.3856	164.9495	162.9195	162.9195	162.5435	163.7014	164.9495	165.8317	166.7540	(39)
												165.3835	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1574	1.1539	1.1505	1.1345	1.1315	1.1176	1.1176	1.1150	1.1229	1.1315	1.1375	1.1439	(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													2.9274 (42)
Hot water usage for mixer showers													73.0215 (42a)
Hot water usage for baths													31.5386 (42b)
Hot water usage for other uses													44.6093 (42c)
Average daily hot water use (litres/day)													137.4766 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	149.5572	146.3635	142.4742	136.5605	131.7580	126.5950	124.6110	128.4834	132.5675	137.9877	143.9926	149.1694 (44)	
Energy content (annual)	236.8620	208.4196	218.9776	186.9444	177.3716	155.6633	150.7062	159.0893	163.4690	187.2480	205.1439	233.5632 (45)	
Distribution loss (46)m = 0.15 x (45)m													Total = Sum(45)m = 2283.4581
Water storage loss:	35.5293	31.2629	32.8466	28.0417	26.6057	23.3495	22.6059	23.8634	24.5203	28.0872	30.7716	35.0345 (46)	
Total storage loss													

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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 (56)
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	19.5803	17.6296	19.3996	18.5216	18.9794	18.2057	18.7101	18.7948	18.2845	19.0792	18.7055	19.5469 (61)
WWHRS	256.4423	226.0493	238.3772	205.4661	196.3510	173.8690	169.4163	177.8841	181.7535	206.3272	223.8493	253.1101 (62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
Solar input	-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)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Electric shower(s)	256.4423	226.0493	238.3772	205.4661	196.3510	173.8690	169.4163	177.8841	181.7535	206.3272	223.8493	253.1101 (64)
Heat gains from water heating, kWh/month	Total per year (kWh/year) = Sum(64)m = 2508.8953 (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 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)											
	83.6517	73.7069	77.6600	66.7894	63.7209	56.3095	54.7873	57.5959	58.9246	67.0298	72.8867	82.5465 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	175.6426	175.6426	175.6426	175.6426	175.6426	175.6426	175.6426	175.6426	175.6426	175.6426	175.6426	175.6426 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	37.4148	33.2315	27.0256	20.4601	15.2942	12.9120	13.9519	18.1352	24.3410	30.9065	36.0724	38.4546 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	471.4828	476.3753	464.0463	437.7994	404.6673	373.5279	352.7248	347.8323	360.1613	386.4082	419.5403	450.6797 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.4916	55.4916	55.4916	55.4916	55.4916	55.4916	55.4916	55.4916	55.4916	55.4916	55.4916	55.4916 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950	-117.0950 (71)
Water heating gains (Table 5)	112.4351	109.6829	104.3817	92.7631	85.6464	78.2076	73.6389	77.4138	81.8397	90.0938	101.2315	110.9496 (72)
Total internal gains	738.3718	736.3289	712.4928	668.0618	622.6471	578.6866	554.3547	557.4204	580.3811	624.4476	673.8834	717.1231 (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						8.1000	10.6334	0.7300	0.7000	0.7700	30.5008 (74)	
East						10.4700	19.6403	0.7300	0.7000	0.7700	72.8196 (76)	
South						5.2000	46.7521	0.7300	0.7000	0.7700	86.0911 (78)	
West						4.6700	19.6403	0.7300	0.7000	0.7700	32.4802 (80)	
Solar gains	221.8916	405.2722	617.8831	856.8366	1032.1802	1053.6915	1004.0260	870.6961	701.2453	465.8842	270.9704	186.4110 (83)
Total gains	960.2634	1141.6011	1330.3759	1524.8984	1654.8273	1632.3781	1558.3807	1428.1166	1281.6264	1090.3318	944.8537	903.5341 (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	54.4249	54.5887	54.7502	55.5218	55.6686	56.3623	56.3623	56.4926	56.0930	55.6686	55.3725	55.0662
alpha	4.6283	4.6392	4.6500	4.7015	4.7112	4.7575	4.7575	4.7662	4.7395	4.7112	4.6915	4.6711
util living area	0.9955	0.9894	0.9717	0.9158	0.7923	0.6092	0.4537	0.5119	0.7699	0.9534	0.9910	0.9966 (86)
MIT	19.8266	19.9943	20.2554	20.5732	20.8011	20.9060	20.9291	20.9250	20.8492	20.5305	20.1173	19.8008 (87)
Th 2	19.9543	19.9571	19.9598	19.9728	19.9752	19.9865	19.9865	19.9886	19.9821	19.9752	19.9703	19.9652 (88)
util rest of house	0.9941	0.9862	0.9630	0.8908	0.7374	0.5242	0.3524	0.4050	0.6916	0.9342	0.9877	0.9955 (89)
MIT 2	18.5821	18.7977	19.1288	19.5260	19.7800	19.8863	19.9011	19.9015	19.8395	19.4863	18.9660	18.5576 (90)
Living area fraction	18.7139	18.9244	19.2481	19.6369	19.8881	19.9943	20.0099	20.0099	19.9465	19.5969	19.0879	18.6893 (92)
MIT	18.5639	18.7744	19.0981	19.4869	19.7381	19.8443	19.8599	19.8599	19.7965	19.4469	18.9379	-0.1500
adjusted MIT												18.5393 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9914	0.9812	0.9535	0.8764	0.7231	0.5117	0.3395	0.3910	0.6753	0.9210	0.9829	0.9934 (94)
Ext temp.	952.0036	1120.0824	1268.5147	1336.3962	1196.6649	835.2174	529.0130	558.3557	865.4305	1004.2020	928.7408	897.5459 (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	2406.5922	2333.8531	2112.9133	1750.9225	1325.8855	854.3933	531.1071	562.3892	932.5186	1459.2850	1963.1043	2391.1319 (97)
Space heating requirement - total per year (kWh/year)	1082.2139	815.6539	628.2325	298.4590	96.1401	0.0000	0.0000	0.0000	0.0000	338.5818	744.7417	1111.2280 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Space heating kWh	1082.2139	815.6539	628.2325	298.4590	96.1401	0.0000	0.0000	0.0000	0.0000	338.5818	744.7417	1111.2280 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5115.2509
Space heating per m2												35.0888 (99)

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

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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	1082.2139	815.6539	628.2325	298.4590	96.1401	0.0000	0.0000	0.0000	0.0000	338.5818	744.7417	1111.2280	(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)	1222.8405	921.6429	709.8673	337.2418	108.6329	0.0000	0.0000	0.0000	0.0000	382.5783	841.5161	1255.6249	(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	256.4423	226.0493	238.3772	205.4661	196.3510	173.8690	169.4163	177.8841	181.7535	206.3272	223.8493	253.1101	(64)	
Efficiency of water heater	88.2087	88.1701	88.0823	87.8822	87.4874	87.0000	87.0000	87.0000	87.0000	87.9260	88.1488	88.2178	(217)	
Fuel for water heating, kWh/month	290.7223	256.3785	270.6302	233.7971	224.4334	199.8494	194.7314	204.4645	208.9121	234.6601	253.9449	286.9149	(219)	
Space cooling fuel requirement														
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)	
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	(231)	
Lighting	32.7489	26.2724	23.6554	17.3309	13.3869	10.9372	12.2120	15.8736	20.6183	27.0523	30.5555	33.6591	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)														
(233a)m	-63.4880	-85.6805	-117.7110	-127.4304	-134.3502	-124.3278	-122.8370	-117.4604	-108.1393	-95.4577	-68.5481	-55.4785	(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	-42.8426	-85.7144	-159.8635	-226.5866	-289.4561	-287.2967	-285.4419	-247.8981	-190.6401	-119.5862	-56.3428	-34.3562	(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													5779.9445	(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													2859.4389	(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)													264.3025	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-3246.9343	(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													5742.7516	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	5779.9445	5.6000	323.6769	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2859.4389	5.6000	160.1286	(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	264.3025	26.0600	68.8772	(250)
Additional standing charges			99.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1220.9089	26.0600	-318.1689	
PV Unit electricity exported	-2026.0254	5.8100	-117.7121	
Total			-435.8809	(252)
Total energy cost			238.2134	(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	5779.9445	0.2100	1213.7883	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2859.4389	0.2100	600.4822	(264)
Space and water heating			1814.2705	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	264.3025	0.1443	38.1470	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1220.9089	0.1354	-165.3028	
PV Unit electricity exported	-2026.0254	0.1274	-258.1986	
Total			-423.5014	(269)
Total CO2, kg/year			1440.8454	(272)

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----- 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	5779.9445	1.1300	6531.3373 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2859.4389	1.1300	3231.1659 (278)
Space and water heating			9762.5032 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	264.3025	1.5338	405.3960 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1220.9089	1.5004	-1831.8907
PV Unit electricity exported	-2026.0254	0.4679	-947.8963
Total			-2779.7870 (283)
Total Primary energy kWh/year			7518.2130 (286)

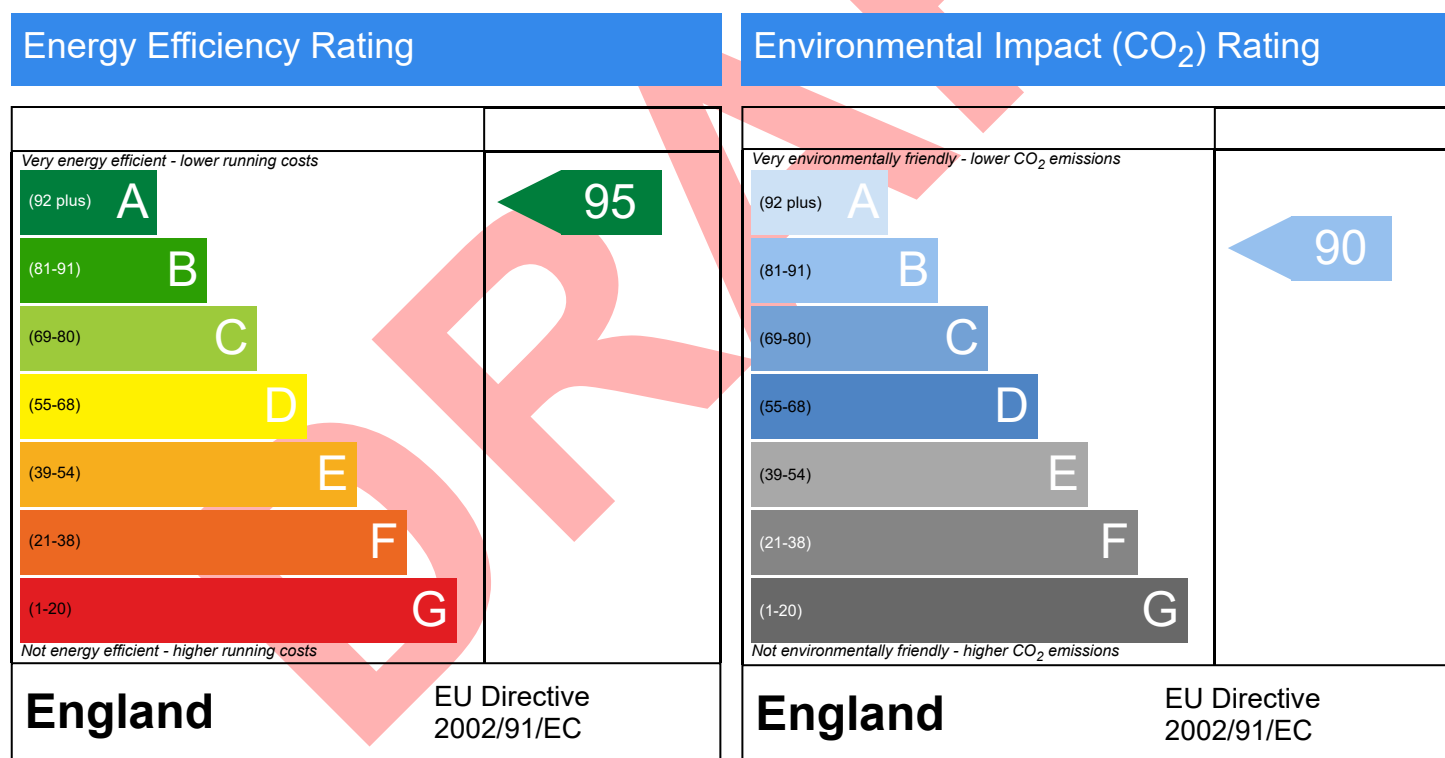
Predicted Energy Assessment



Dwelling type: House, Detached
Date of assessment: 15/11/2024
Produced by: Victoria Gartside
Total floor area: 145.78 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.