

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 10:34:47

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 17
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	10.45 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	10.44 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	54.83 kWh _{PE} /m ²		
Dwelling primary energy	54.57 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	43.9 kWh/m ²		
Dwelling fabric energy efficiency	40.6 kWh/m ²		OK

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.19	Walls (1) (0.19)	OK
Party walls	0.2	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)	168.62	0.19	
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	North	0.7	1.3
Rear , Windows	4.67	South	0.7	1.3
Front Door, Door	2.14	North	N/A	1.3
Side, Windows	5.2	East	0.7	1.3
Side, Windows	8.1	West	0.7	1.3

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part 1 - Main Dwelling: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.024 (!)	MFF-150-E2-02
External wall	E3: Sill	Calculated by person with suitable expertise	0.021 (!)	E3-01

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

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 17	Prop Type Ref	SAP VG 21-0282	
Property				

SAP Rating	95 A	DER	10.44	TER	10.45
Environmental	90 B	% DER < TER			0.10
CO ₂ Emissions (t/year)	1.47	DFEE	40.56	TFEE	43.85
Compliance Check	See BREL	% DFEE < TFEE			7.51
% DPER < TPER	0.47	DPER	54.57	TPER	54.83

Assessor Details	Miss Victoria Gartside	Assessor ID	AL30-0001
Client			

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

Orientation	North	
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	199.20	168.62	0.00	None	30.58	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

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

Ground Floor Ground Floor - Solid Lowest occupied Suspended concrete floor, carpeted 0.13 None 0.00 75.00 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	External Wall	North	10.47	0
Rear	Windows	External Wall	South	4.67	0
Front Door	Door	External Wall	North	2.14	0
Side	Windows	External Wall	East	5.20	0
Side	Windows	External Wall	West	8.10	0

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	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 0.02 W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present No

19.1 Mechanical extract ventilation - Decentralised

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

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	6
Number of passive vents	0
Number of flueless gas fires	0

21.0 Fixed Cooling System

No

22.0 Pressure Testing

Yes

Summary for Input Data

Designed AP₅₀ m²/(h.m²) @ 50 Pa

Property Tested?

Test Method

22.0 Lighting

No Fixed Lighting

Name	Efficacy	Power	Capacity	Count
Lighting 1	85.00	10.00	850.00	33

24.0 Main Heating 1

Database

Percentage of Heat %

Database Ref. No.

Fuel Type

SAP Code

In Winter

In Summer

Model Name

Manufacturer

System Type

Controls SAP Code

Delayed Start Stat

Burner Control

HETAS approved System

Flue Type

Fan Assisted Flue

Is MHS Pumped

Heating Pump Age

Heat Emitter

Underfloor Heating

Flow Temperature

Flow Temperature Value

Boiler Interlock

Combi boiler type

25.0 Main Heating 2

26.0 Heat Networks

Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None								
Heat source 2	None								
Heat source 3	None								
Heat source 4	None								
Heat source 5	None								

27.0 Secondary Heating

28.0 Water Heating

Water Heating

SAP Code

Flue Gas Heat Recovery System

Waste Water Heat Recovery Instantaneous System 1

Waste Water Heat Recovery Instantaneous System 2

Waste Water Heat Recovery Storage System

Solar Panel

Water use <= 125 litres/person/day

Summary for Input Data

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

Electricity Generated	0.00									kWh/Year	
Apportioned	0.00										
Connected to dwelling's electricity meter	Yes										
Electricity Generation	Annual										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

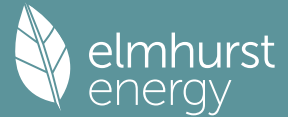
Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout



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Environmental	90 B	% DER < TER				0.10
CO ₂ Emissions (t/year)	1.47	DFEE	40.56	TFEE	43.85	
Compliance Check	See BREL	% DFEE < TFEE				7.51
% DPER < TPER	0.47	DPER	54.57	TPER	54.83	
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) =	Air changes per hour 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	199.2000	30.5800	168.6200	0.1900	32.0378	110.0000	18548.2000 (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) =	86.0001		(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	
E4 Jamb				43.2000	0.0160	0.6912	

Ventilation heat loss calculated monthly (39)m = 0.33 x (25)m x (5)												
(39)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	74.9756	74.4694	73.9732	71.6424	71.2063	69.1762	69.1762	68.8003	69.9582	71.2063	72.0885	73.0108 (39)
Heat transfer coeff												
	169.1284	168.6221	168.1259	165.7951	165.3590	163.3290	163.3290	162.9530	164.1109	165.3590	166.2412	167.1635 (39)
Average = Sum(39)m / 12 =												165.7930
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1.1602	1.1567	1.1533	1.1373	1.1343	1.1204	1.1204	1.1178	1.1257	1.1343	1.1404	1.1467 (40)
HLP (average)												1.1373
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

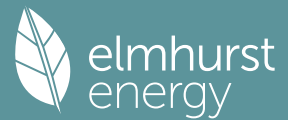
Assumed occupancy													2.9274 (42)
Hot water usage for mixer showers	73.3023	72.2007	70.5955	67.5242	65.2576	62.7300	61.2932	62.8863	64.6326	67.3466	70.4839	73.0215 (42a)	
Hot water usage for baths	31.6456	31.1756	30.5138	29.2935	28.3798	27.3666	26.8193	27.4765	28.1920	29.2762	30.5216	31.5386 (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 (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	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)	
12Total per year (kWh/year)												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)	

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	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						10.4700	10.6334	0.7300		0.7000	0.7700	39.4251 (74)	
East						5.2000	19.6403	0.7300		0.7000	0.7700	36.1664 (76)	
South						4.6700	46.7521	0.7300		0.7000	0.7700	77.3164 (78)	
West						8.1000	19.6403	0.7300		0.7000	0.7700	56.3361 (80)	
Solar gains	209.2439	382.9221	587.3298	822.5685	999.6377	1024.6383	974.6110	839.0432	669.0168	440.9803	255.6219	175.7447 (83)	
Total gains	868.3851	1059.8286	1233.4352	1444.8332	1587.2238	1586.2856	1512.3881	1377.3173	1225.3406	1020.7802	874.1214	819.4623 (84)	

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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	54.2931	54.4561	54.6169	55.3847	55.5308	56.2210	56.2210	56.3507	55.9531	55.5308	55.2361	54.9313
alpha	4.6195	4.6304	4.6411	4.6923	4.7021	4.7481	4.7481	4.7567	4.7302	4.7021	4.6824	4.6621
util living area	0.9970	0.9921	0.9786	0.9291	0.8113	0.6248	0.4678	0.5301	0.7914	0.9631	0.9934	0.9977 (86)
MIT	19.7695	19.9444	20.2012	20.5379	20.7849	20.9024	20.9281	20.9232	20.8373	20.4944	20.0737	19.7479 (87)
Th 2	19.9520	19.9548	19.9576	19.9705	19.9729	19.9842	19.9842	19.9863	19.9799	19.9729	19.9680	19.9629 (88)
util rest of house	0.9961	0.9897	0.9719	0.9069	0.7583	0.5388	0.3635	0.4201	0.7150	0.9472	0.9910	0.9970 (89)
MIT 2	18.5075	18.7327	19.0599	19.4838	19.7625	19.8816	19.8983	19.8984	19.8277	19.4418	18.9091	18.4882 (90)
Living area fraction									fLA = Living area /	(4) =		0.1059 (91)
MIT	18.6412	18.8611	19.1808	19.5954	19.8708	19.9898	20.0074	20.0069	19.9346	19.5533	19.0324	18.6216 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.4912	18.7111	19.0308	19.4454	19.7208	19.8398	19.8574	19.8569	19.7846	19.4033	18.8824	18.4716 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9942	0.9856	0.9637	0.8929	0.7435	0.5258	0.3502	0.4055	0.6981	0.9351	0.9872	0.9955 (94)
Useful gains	863.3097	1044.5674	1188.6273	1290.0354	1180.0869	834.1373	529.5996	558.5563	855.3520	954.5497	862.9372	815.7625 (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	2400.1276	2328.8531	2106.7554	1748.3813	1326.3134	855.8033	532.0227	563.3201	932.9126	1455.6976	1958.7227	2385.6981 (97)
Space heating kWh	1143.3926	863.0399	683.0873	330.0090	108.7925	0.0000	0.0000	0.0000	0.0000	372.8540	788.9655	1168.0321 (98a)
Space heating requirement - total per year (kWh/year)												5458.1731
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	1143.3926	863.0399	683.0873	330.0090	108.7925	0.0000	0.0000	0.0000	0.0000	372.8540	788.9655	1168.0321 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5458.1731
Space heating per m2										(98c) / (4) =		37.4412 (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	1143.3926	863.0399	683.0873	330.0090	108.7925	0.0000	0.0000	0.0000	0.0000	372.8540	788.9655	1168.0321 (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)	1291.9690	975.1864	771.8501	372.8916	122.9294	0.0000	0.0000	0.0000	0.0000	421.3040	891.4865	1319.8103 (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	88.2214	88.1844	88.1070	87.9184	87.5289	87.0000	87.0000	87.0000	87.0000	87.9597	88.1640	88.2291 (217)	
Fuel for water heating, kWh/month	290.6805	256.3369	270.5542	233.7010	224.3270	199.8494	194.7314	204.4645	208.9121	234.5700	253.9009	286.8783 (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													6167.4272 (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													2858.9062 (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	6129.7016 (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	6167.4272	0.2100	1295.1597 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2858.9062	0.2100	600.3703 (264)
Space and water heating			1895.5300 (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			1522.1049 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.4400 (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	6167.4272	1.1300	6969.1927 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2858.9062	1.1300	3230.5640 (278)
Space and water heating			10199.7567 (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			7955.4665 (286)
Dwelling Primary energy Rate (DPER)			54.5700 (287)

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

1. Overall dwelling characteristics

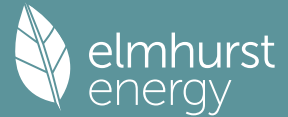
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	72.8900 (1b)	x 2.3800 (2b)	= 173.4782 (1b) - (3b)
First floor	72.8900 (1c)	x 2.7700 (2c)	= 201.9053 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	145.7800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 375.3835 (5)

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)

	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	0.4546	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	199.2000	30.5800	168.6200	0.1800	30.3516			(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)					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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	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)
Heat transfer coeff	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)
Average = Sum(39)m / 12 =												168.4820	

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

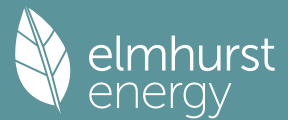
Assumed occupancy													2.9274 (42)
Hot water usage for mixer showers	73.3023	72.2007	70.5955	67.5242	65.2576	62.7300	61.2932	62.8863	64.6326	67.3466	70.4839	73.0215	(42a)
Hot water usage for baths	31.6456	31.1756	30.5138	29.2935	28.3798	27.3666	26.8193	27.4765	28.1920	29.2762	30.5216	31.5386	(42b)
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)
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	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)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												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	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	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)	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)

6. Solar gains

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[Jan]	Area m2				Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North	10.4700				10.6334	0.6300		0.7000		0.7700		34.0244 (74)	
East	5.2000				19.6403	0.6300		0.7000		0.7700		31.2121 (76)	
South	4.6700				46.7521	0.6300		0.7000		0.7700		66.7251 (78)	
West	8.1000				19.6403	0.6300		0.7000		0.7700		48.6188 (80)	
Solar gains	180.5804	330.4670	506.8737	709.8879	862.7010	884.2769	841.1026	724.1058	577.3707	380.5720	220.6052	151.6701	(83)
Total gains	850.2654	1017.9382	1163.5836	1342.8448	1461.0329	1456.7260	1389.7161	1273.1877	1144.4689	971.0842	849.7331	805.9428	(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	0.9973	0.9934	0.9831	0.9455	0.8493	0.6756	0.5132	0.5758	0.8260	0.9699	0.9942	0.9979	(86)
MIT	19.4053	19.6209	19.9471	20.3904	20.7446	20.9374	20.9861	20.9769	20.8365	20.3607	19.8090	19.3787	(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	0.9964	0.9913	0.9776	0.9272	0.8010	0.5867	0.3992	0.4578	0.7536	0.9563	0.9920	0.9972	(89)
MIT 2	18.0753	18.3524	18.7684	19.3273	19.7365	19.9313	19.9642	19.9621	19.8465	19.3025	18.6028	18.0485	(90)
Living area fraction	fLA = Living area / (4) =												0.1059 (91)
MIT	18.2162	18.4868	18.8932	19.4399	19.8433	20.0379	20.0724	20.0696	19.9514	19.4145	18.7305	18.1894	(92)
Temperature adjustment													0.0000
adjusted MIT	18.2162	18.4868	18.8932	19.4399	19.8433	20.0379	20.0724	20.0696	19.9514	19.4145	18.7305	18.1894	(93)
8. Space heating requirement													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9942	0.9871	0.9699	0.9158	0.7948	0.5931	0.4110	0.4697	0.7525	0.9466	0.9881	0.9954	(94)
Useful gains	845.3535	1004.7634	1128.6099	1229.7262	1161.3009	863.9479	571.1331	597.9846	861.2178	919.2047	839.6401	802.2659	(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	2390.1992	2326.8649	2116.4252	1775.8055	1368.5277	903.0293	576.6379	608.0222	976.1863	1481.3363	1964.6520	2375.7826	(97)
Space heating kWh	1149.3652	888.4522	734.9346	393.1771	154.1768	0.0000	0.0000	0.0000	0.0000	418.2259	810.0086	1170.6964	(98a)
Space heating requirement - total per year (kWh/year)													5719.0367
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	1149.3652	888.4522	734.9346	393.1771	154.1768	0.0000	0.0000	0.0000	0.0000	418.2259	810.0086	1170.6964	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)													5719.0367
Space heating per m2	(98c) / (4) =												39.2306 (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	1149.3652	888.4522	734.9346	393.1771	154.1768	0.0000	0.0000	0.0000	0.0000	418.2259	810.0086	1170.6964	(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)	1243.9017	961.5283	795.3838	425.5163	166.8580	0.0000	0.0000	0.0000	0.0000	452.6254	876.6326	1266.9875	(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	87.2079	87.0180	86.6241	85.6990	83.7852	80.3000	80.3000	80.3000	80.3000	85.7973	86.8695	80.3000	(216)
Fuel for water heating, kWh/month	291.6138	258.3485	275.7918	245.6994	243.9348	229.7444	227.2175	236.1406	238.5810	248.5047	260.3226	288.4135	(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) (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)													

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(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												6189.4336	(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												3044.3126	(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												5986.7928	(238)

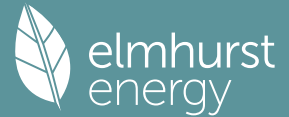
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	6189.4336	0.2100	1299.7811 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3044.3126	0.2100	639.3057 (264)
Space and water heating			1939.0867 (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			1524.0592 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.4500 (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	6189.4336	1.1300	6994.0600 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3044.3126	1.1300	3440.0733 (278)
Space and water heating			10434.1332 (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			7992.5911 (286)
Target Primary Energy Rate (TPER)			54.8300 (287)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 17			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	95 A	DER	10.44	TER	10.45		
Environmental	90 B	% DER < TER				0.10	
CO ₂ Emissions (t/year)	1.47	DFEE	40.56	TFEE	43.85		
Compliance Check	See BREL	% DFEE < TFEE				7.51	
% DPER < TPER	0.47	DPER	54.57	TPER	54.83		
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) =	Air changes per hour 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)

	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	0.3909	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	199.2000	30.5800	168.6200	0.1900	32.0378	110.0000	18548.2000 (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) =	86.0001		(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	
E2 Other lintels (including other steel lintels)				21.1900	0.0240	0.5086	

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 71.4007	Feb 71.0333	Mar 70.6731	Apr 68.9815	May 68.6650	Jun 67.1916	Jul 67.1916	Aug 66.9187	Sep 67.7591	Oct 68.6650	Nov 69.3052	Dec 69.9746 (38)
Heat transfer coeff	165.5535	165.1860	164.8259	163.1342	162.8177	161.3443	161.3443	161.0714	161.9118	162.8177	163.4580	164.1274 (39)
Average = Sum(39)m / 12 =												163.1327
HLP	Jan 1.1356	Feb 1.1331	Mar 1.1306	Apr 1.1190	May 1.1169	Jun 1.1068	Jul 1.1068	Aug 1.1049	Sep 1.1107	Oct 1.1169	Nov 1.1213	Dec 1.1259 (40)
HLP (average)												1.1190
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

Assumed occupancy												2.9274 (42)
Hot water usage for mixer showers	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)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	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	124.5072	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										Total = Sum(45)m =		1160.7958
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss												
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	102.6537	89.7657	93.9037	80.3311	76.0940	66.7501	65.0907	69.0395	71.2049	81.4805	89.0177	101.3448 (61)
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 (62a)
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)									Total per year (kWh/year) = Sum(64)m =			986.6764 (64a)
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)
												667.7425 (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)

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)

[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					10.4700	10.6334	0.7300		0.7000		0.7700			39.4251 (74)							
East					5.2000	19.6403	0.7300		0.7000		0.7700			36.1664 (76)							
South					4.6700	46.7521	0.7300		0.7000		0.7700			77.3164 (78)							
West					8.1000	19.6403	0.7300		0.7000		0.7700			56.3361 (80)							
Solar gains	209.2439	382.9221	587.3298	822.5685	999.6377	1024.6383	974.6110	839.0432	669.0168	440.9803	255.6219	175.7447	(83)								
Total gains	807.1693	999.9993	1176.7990	1395.8879	1542.8048	1549.6464	1479.0125	1341.7604	1187.1498	974.2574	820.2574	759.2922	(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	55.4655	55.5889	55.7104	56.2881	56.3975	56.9125	56.9125	57.0089	56.7130	56.3975	56.1766	55.9475	
alpha	4.6977	4.7059	4.7140	4.7525	4.7598	4.7942	4.7942	4.8006	4.7809	4.7598	4.7451	4.7298	
util living area	0.9978	0.9937	0.9817	0.9347	0.8186	0.6313	0.4725	0.5374	0.8010	0.9681	0.9949	0.9984 (86)	
MIT	19.4406	19.6735	20.0163	20.4656	20.7992	20.9565	20.9911	20.9841	20.8670	20.4008	19.8379	19.4057 (87)	
Th 2	19.9718	19.9739	19.9759	19.9853	19.9871	19.9953	19.9953	19.9968	19.9921	19.9871	19.9835	19.9798 (88)	
util rest of house	0.9971	0.9918	0.9758	0.9140	0.7668	0.5457	0.3684	0.4274	0.7263	0.9540	0.9930	0.9979 (89)	
MIT 2	18.5474	18.7808	19.1212	19.5600	19.8543	19.9754	19.9929	19.9921	19.9187	19.5086	18.9528	18.5187 (90)	
Living area fraction	fLA = Living area / (4) =												0.1059 (91)
MIT	18.6420	18.8754	19.2160	19.6559	19.9544	20.0793	20.0987	20.0972	20.0191	19.6031	19.0465	18.6126 (92)	
Temperature adjustment													0.0000
adjusted MIT	18.6420	18.8754	19.2160	19.6559	19.9544	20.0793	20.0987	20.0972	20.0191	19.6031	19.0465	18.6126 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9958	0.9888	0.9700	0.9058	0.7649	0.5532	0.3793	0.4388	0.7285	0.9470	0.9905	0.9969 (94)
Useful gains	803.8104	988.8488	1141.5314	1264.3709	1180.1490	857.2600	561.0295	588.7443	864.8869	922.6047	812.4437	756.9006 (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	2374.3710	2308.5397	2095.9217	1754.6585	1343.9544	884.0510	564.4893	595.5120	958.3781	1465.8689	1952.7513	2365.5058 (97)
Space heating kWh	1168.4971	886.8322	710.0664	353.0071	121.8712	0.0000	0.0000	0.0000	0.0000	404.1886	821.0215	1196.8023 (98a)
Space heating requirement - total per year (kWh/year)	5662.2864											
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	1168.4971	886.8322	710.0664	353.0071	121.8712	0.0000	0.0000	0.0000	0.0000	404.1886	821.0215	1196.8023 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	5662.2864											
Space heating per m2	(98c) / (4) = 38.8413 (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	1516.6363	1193.9477	1224.1429	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8791	0.9323	0.9007	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1333.3147	1113.1098	1102.5744	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1740.8429	1661.3950	1504.2015	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	293.4203	407.9242	298.8106	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	73.3551	101.9811	74.7026	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												250.0388 (107)
Energy for space heating												38.8413 (99)
Energy for space cooling												1.7152 (108)
Total												40.5565 (109)
Fabric Energy Efficiency (DFEE)												40.6 (109)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	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) = 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)

	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	0.4546	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	199.2000	30.5800	168.6200	0.1800	30.3516			(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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	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)
Heat transfer coeff	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)
Average = Sum(39)m / 12 =												168.4820	

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	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 conte (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)
Energy content (annual)										Total = Sum(45)m =		1160.7958	
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	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)
										Total per year (kWh/year) = Sum(64)m =		986.6764	(64)
12Total per year (kWh/year)												987	(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)	
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		667.7425	(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)

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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 W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W	

North					10.4700	10.6334	0.6300	0.7000			0.7700	34.0244 (74)	
East					5.2000	19.6403	0.6300	0.7000			0.7700	31.2121 (76)	
South					4.6700	46.7521	0.6300	0.7000			0.7700	66.7251 (78)	
West					8.1000	19.6403	0.6300	0.7000			0.7700	48.6188 (80)	

Solar gains	180.5804	330.4670	506.8737	709.8879	862.7010	884.2769	841.1026	724.1058	577.3707	380.5720	220.6052	151.6701	(83)
Total gains	778.5058	947.5442	1096.3428	1283.2073	1405.8682	1409.2850	1345.5041	1226.8230	1095.5037	913.8492	785.2407	735.2176	(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	0.9981	0.9950	0.9866	0.9532	0.8634	0.6923	0.5284	0.5943	0.8434	0.9759	0.9958	0.9986	(86)	
MIT	19.3494	19.5669	19.8978	20.3535	20.7231	20.9307	20.9843	20.9737	20.8195	20.3210	19.7592	19.3232	(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	0.9975	0.9935	0.9821	0.9369	0.8174	0.6033	0.4118	0.4740	0.7741	0.9647	0.9942	0.9981	(89)	
MIT 2	18.4305	18.6493	18.9795	19.4320	19.7687	19.9361	19.9647	19.9630	19.8611	19.4097	18.8515	18.4124	(90)	
Living area fraction									fLA = Living area / (4) =			0.1059	(91)	
MIT	18.5278	18.7465	19.0768	19.5296	19.8697	20.0414	20.0727	20.0700	19.9626	19.5063	18.9476	18.5089	(92)	
Temperature adjustment												0.0000		
adjusted MIT	18.5278	18.7465	19.0768	19.5296	19.8697	20.0414	20.0727	20.0700	19.9626	19.5063	18.9476	18.5089	(93)	

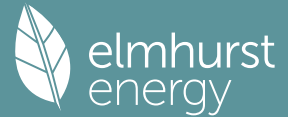
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9963	0.9909	0.9770	0.9286	0.8129	0.6100	0.4239	0.4862	0.7739	0.9580	0.9919	0.9972	(94)
Useful gains	775.6350	938.9301	1071.1604	1191.5675	1142.8305	859.7170	570.4199	596.5167	847.8592	875.4589	778.9002	733.1296	(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	2443.7277	2371.3503	2147.7666	1790.9204	1372.9738	903.6179	576.6872	608.0992	978.0680	1496.7480	2001.3200	2430.0462	(97)
Space heating kWh	1241.0610	962.5864	800.9951	431.5341	171.2266	0.0000	0.0000	0.0000	0.0000	462.2391	880.1423	1262.5060	(98a)
Space heating requirement - total per year (kWh/year)												6212.2904	
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	1241.0610	962.5864	800.9951	431.5341	171.2266	0.0000	0.0000	0.0000	0.0000	462.2391	880.1423	1262.5060	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6212.2904	
Space heating per m ²												42.6141	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Utilisation	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)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8283	0.8964	0.8572	0.0000	0.0000	0.0000	0.0000	(101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1292.9102	1101.4931	1079.4554	0.0000	0.0000	0.0000	0.0000	(102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1576.7841	1505.3463	1369.8591	0.0000	0.0000	0.0000	0.0000	(103)
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	51.0973	75.1167	54.0151	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												180.2291	(107)
Energy for space heating												42.6141	(99)
Energy for space cooling												1.2363	(108)
Total												43.8505	(109)
Fabric Energy Efficiency (TFEE)												43.9	(109)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024
Assessment Reference	Plot 17		Prop Type Ref	SAP VG 21-0282		
Property						
SAP Rating	95 A	DER	10.44	TER	10.45	
Environmental	90 B	% DER < TER				0.10
CO ₂ Emissions (t/year)	1.47	DFEE	40.56	TFEE	43.85	
Compliance Check	See BREL	% DFEE < TFEE				7.51
% DPER < TPER	0.47	DPER	54.57	TPER	54.83	
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) =	Air changes per hour 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	199.2000	30.5800	168.6200	0.1900	32.0378	110.0000	18548.2000 (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) =	86.0001		(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	
E4 Jamb				43.2000	0.0160	0.6912	

Ventilation heat loss calculated monthly (39)m = 0.33 x (25)m x (5)												
(39)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	74.9756	74.4694	73.9732	71.6424	71.2063	69.1762	69.1762	68.8003	69.9582	71.2063	72.0885	73.0108 (39)
Heat transfer coeff												
	169.1284	168.6221	168.1259	165.7951	165.3590	163.3290	163.3290	162.9530	164.1109	165.3590	166.2412	167.1635 (39)
Average = Sum(39)m / 12 =												165.7930
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1.1602	1.1567	1.1533	1.1373	1.1343	1.1204	1.1204	1.1178	1.1257	1.1343	1.1404	1.1467 (40)
HLP (average)												1.1373
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

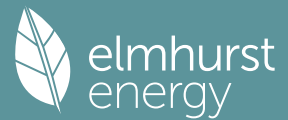
Assumed occupancy													2.9274 (42)
Hot water usage for mixer showers	73.3023	72.2007	70.5955	67.5242	65.2576	62.7300	61.2932	62.8863	64.6326	67.3466	70.4839	73.0215 (42a)	
Hot water usage for baths	31.6456	31.1756	30.5138	29.2935	28.3798	27.3666	26.8193	27.4765	28.1920	29.2762	30.5216	31.5386 (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)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	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)	
Distribution loss (46)m = 0.15 x (45)m	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)	
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)												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)	
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	Solar flux		g		FF		Access		Gains
						m2	Table 6a	Specific data	or Table 6b	Specific data	or Table 6c		factor	W	
							W/m2						Table 6d		
North						10.4700	10.6334	0.7300		0.7000			0.7700	39.4251 (74)	
East						5.2000	19.6403	0.7300		0.7000			0.7700	36.1664 (76)	
South						4.6700	46.7521	0.7300		0.7000			0.7700	77.3164 (78)	
West						8.1000	19.6403	0.7300		0.7000			0.7700	56.3361 (80)	
Solar gains	209.2439	382.9221	587.3298	822.5685	999.6377	1024.6383	974.6110	839.0432	669.0168	440.9803	255.6219	175.7447	(83)		
Total gains	868.3851	1059.8286	1233.4352	1444.8332	1587.2238	1586.2856	1512.3881	1377.3173	1225.3406	1020.7802	874.1214	819.4623	(84)		

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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	54.2931	54.4561	54.6169	55.3847	55.5308	56.2210	56.2210	56.3507	55.9531	55.5308	55.2361	54.9313
alpha	4.6195	4.6304	4.6411	4.6923	4.7021	4.7481	4.7481	4.7567	4.7302	4.7021	4.6824	4.6621
util living area	0.9970	0.9921	0.9786	0.9291	0.8113	0.6248	0.4678	0.5301	0.7914	0.9631	0.9934	0.9977 (86)
MIT	19.7695	19.9444	20.2012	20.5379	20.7849	20.9024	20.9281	20.9232	20.8373	20.4944	20.0737	19.7479 (87)
Th 2	19.9520	19.9548	19.9576	19.9705	19.9729	19.9842	19.9842	19.9863	19.9799	19.9729	19.9680	19.9629 (88)
util rest of house	0.9961	0.9897	0.9719	0.9069	0.7583	0.5388	0.3635	0.4201	0.7150	0.9472	0.9910	0.9970 (89)
MIT 2	18.5075	18.7327	19.0599	19.4838	19.7625	19.8816	19.8983	19.8984	19.8277	19.4418	18.9091	18.4882 (90)
Living area fraction									fLA = Living area /	(4) =		0.1059 (91)
MIT	18.6412	18.8611	19.1808	19.5954	19.8708	19.9898	20.0074	20.0069	19.9346	19.5533	19.0324	18.6216 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.4912	18.7111	19.0308	19.4454	19.7208	19.8398	19.8574	19.8569	19.7846	19.4033	18.8824	18.4716 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9942	0.9856	0.9637	0.8929	0.7435	0.5258	0.3502	0.4055	0.6981	0.9351	0.9872	0.9955 (94)
Useful gains	863.3097	1044.5674	1188.6273	1290.0354	1180.0869	834.1373	529.5996	558.5563	855.3520	954.5497	862.9372	815.7625 (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	2400.1276	2328.8531	2106.7554	1748.3813	1326.3134	855.8033	532.0227	563.3201	932.9126	1455.6976	1958.7227	2385.6981 (97)
Space heating kWh	1143.3926	863.0399	683.0873	330.0090	108.7925	0.0000	0.0000	0.0000	0.0000	372.8540	788.9655	1168.0321 (98a)
Space heating requirement - total per year (kWh/year)												5458.1731
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	1143.3926	863.0399	683.0873	330.0090	108.7925	0.0000	0.0000	0.0000	0.0000	372.8540	788.9655	1168.0321 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5458.1731
Space heating per m2										(98c) / (4) =		37.4412 (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	1143.3926	863.0399	683.0873	330.0090	108.7925	0.0000	0.0000	0.0000	0.0000	372.8540	788.9655	1168.0321 (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)	1291.9690	975.1864	771.8501	372.8916	122.9294	0.0000	0.0000	0.0000	0.0000	421.3040	891.4865	1319.8103 (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	88.2214	88.1844	88.1070	87.9184	87.5289	87.0000	87.0000	87.0000	87.0000	87.9597	88.1640	88.2291 (217)	
Fuel for water heating, kWh/month	290.6805	256.3369	270.5542	233.7010	224.3270	199.8494	194.7314	204.4645	208.9121	234.5700	253.9009	286.8783 (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													6167.4272 (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													2858.9062 (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	6129.7016 (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	6167.4272	0.2100	1295.1597 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2858.9062	0.2100	600.3703 (264)
Space and water heating			1895.5300 (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			1522.1049 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.4400 (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	6167.4272	1.1300	6969.1927 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2858.9062	1.1300	3230.5640 (278)
Space and water heating			10199.7567 (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			7955.4665 (286)
Dwelling Primary energy Rate (DPER)			54.5700 (287)

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

1. Overall dwelling characteristics

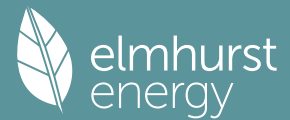
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	72.8900 (1b)	x 2.3800 (2b)	= 173.4782 (1b) - (3b)
First floor	72.8900 (1c)	x 2.7700 (2c)	= 201.9053 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	145.7800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 375.3835 (5)

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)

	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	0.4546	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	199.2000	30.5800	168.6200	0.1800	30.3516			(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)					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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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													
Hot water usage for baths													
Hot water usage for other uses													
Average daily hot water use (litres/day)													
Daily hot water use													
Energy conte													
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
Water storage loss:													
Total storage loss													
If cylinder contains dedicated solar storage													
Primary loss													
Combi loss													
Total heat required for water heating calculated for each month													
WWHRS													
PV diverter													
Solar input													
FGHRS													
Output from w/h													
12Total per year (kWh/year)													
Electric shower(s)													
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													
Heat gains from water heating, kWh/month													

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	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)	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)

6. Solar gains

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[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	10.4700	10.6334	0.6300	0.7000	0.7700	34.0244 (74)
East	5.2000	19.6403	0.6300	0.7000	0.7700	31.2121 (76)
South	4.6700	46.7521	0.6300	0.7000	0.7700	66.7251 (78)
West	8.1000	19.6403	0.6300	0.7000	0.7700	48.6188 (80)

Solar gains	180.5804	330.4670	506.8737	709.8879	862.7010	884.2769	841.1026	724.1058	577.3707	380.5720	220.6052	151.6701 (83)
Total gains	850.2654	1017.9382	1163.5836	1342.8448	1461.0329	1456.7260	1389.7161	1273.1877	1144.4689	971.0842	849.7331	805.9428 (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	0.9973	0.9934	0.9831	0.9455	0.8493	0.6756	0.5132	0.5758	0.8260	0.9699	0.9942	0.9979 (86)
MIT	19.4053	19.6209	19.9471	20.3904	20.7446	20.9374	20.9861	20.9769	20.8365	20.3607	19.8090	19.3787 (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	0.9964	0.9913	0.9776	0.9272	0.8010	0.5867	0.3992	0.4578	0.7536	0.9563	0.9920	0.9972 (89)
MIT 2	18.0753	18.3524	18.7684	19.3273	19.7365	19.9313	19.9642	19.9621	19.8465	19.3025	18.6028	18.0485 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.2162	18.4868	18.8932	19.4399	19.8433	20.0379	20.0724	20.0696	19.9514	19.4145	18.7305	18.1894 (92)
Temperature adjustment												
adjusted MIT	18.2162	18.4868	18.8932	19.4399	19.8433	20.0379	20.0724	20.0696	19.9514	19.4145	18.7305	18.1894 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9942	0.9871	0.9699	0.9158	0.7948	0.5931	0.4110	0.4697	0.7525	0.9466	0.9881	0.9954 (94)
Useful gains	845.3535	1004.7634	1128.6099	1229.7262	1161.3009	863.9479	571.1331	597.9846	861.2178	919.2047	839.6401	802.2659 (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	2390.1992	2326.8649	2116.4252	1775.8055	1368.5277	903.0293	576.6379	608.0222	976.1863	1481.3363	1964.6520	2375.7826 (97)
Space heating kWh	1149.3652	888.4522	734.9346	393.1771	154.1768	0.0000	0.0000	0.0000	0.0000	418.2259	810.0086	1170.6964 (98a)
Space heating requirement - total per year (kWh/year)	5719.0367											
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	1149.3652	888.4522	734.9346	393.1771	154.1768	0.0000	0.0000	0.0000	0.0000	418.2259	810.0086	1170.6964 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	5719.0367											
Space heating per m2	(98c) / (4) = 39.2306 (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	1149.3652	888.4522	734.9346	393.1771	154.1768	0.0000	0.0000	0.0000	0.0000	418.2259	810.0086	1170.6964 (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)	1243.9017	961.5283	795.3838	425.5163	166.8580	0.0000	0.0000	0.0000	0.0000	452.6254	876.6326	1266.9875 (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	87.2079	87.0180	86.6241	85.6990	83.7852	80.3000	80.3000	80.3000	80.3000	85.7973	86.8695	80.3000 (216)
Fuel for water heating, kWh/month	291.6138	258.3485	275.7918	245.6994	243.9348	229.7444	227.2175	236.1406	238.5810	248.5047	260.3226	288.4135 (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)												
(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)												

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(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												6189.4336	(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												3044.3126	(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												5986.7928	(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	6189.4336	0.2100	1299.7811 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3044.3126	0.2100	639.3057 (264)
Space and water heating			1939.0867 (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			1524.0592 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.4500 (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	6189.4336	1.1300	6994.0600 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3044.3126	1.1300	3440.0733 (278)
Space and water heating			10434.1332 (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			7992.5911 (286)
Target Primary Energy Rate (TPER)			54.8300 (287)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024
Assessment Reference	Plot 17		Prop Type Ref	SAP VG 21-0282		
Property						
SAP Rating	95 A	DER	10.44	TER	10.45	
Environmental	90 B	% DER < TER				0.10
CO ₂ Emissions (t/year)	1.47	DFEE	40.56	TFEE	43.85	
Compliance Check	See BREL	% DFEE < TFEE				7.51
% DPER < TPER	0.47	DPER	54.57	TPER	54.83	
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)
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)

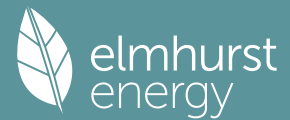
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4588	0.4498	0.4408	0.3958	0.3868	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 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	199.2000	30.5800	168.6200	0.1900	32.0378	110.0000	18548.2000 (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) =	86.0001		(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	
E4 Jamb				43.2000	0.0160	0.6912	

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	54.2931	54.4561	54.6169	55.3847	55.5308	56.2210	56.2210	56.3507	55.9531	55.5308	55.2361	54.9313	
alpha	4.6195	4.6304	4.6411	4.6923	4.7021	4.7481	4.7481	4.7567	4.7302	4.7021	4.6824	4.6621	
util living area	0.9957	0.9902	0.9740	0.9218	0.8019	0.6194	0.4630	0.5235	0.7826	0.9572	0.9915	0.9967 (86)	
MIT	19.8157	19.9782	20.2363	20.5569	20.7927	20.9036	20.9284	20.9238	20.8421	20.5162	20.1055	19.7910 (87)	
Th 2	19.9520	19.9548	19.9576	19.9705	19.9729	19.9842	19.9842	19.9863	19.9799	19.9729	19.9680	19.9629 (88)	
util rest of house	0.9944	0.9873	0.9660	0.8981	0.7479	0.5337	0.3597	0.4146	0.7053	0.9392	0.9885	0.9957 (89)	
MIT 2	18.5664	18.7755	19.1034	19.5055	19.7699	19.8824	19.8984	19.8986	19.8316	19.4676	18.9493	18.5433 (90)	
Living area fraction									fLA = Living area / (4) =				0.1059 (91)
MIT	18.6987	18.9029	19.2234	19.6168	19.8782	19.9905	20.0075	20.0072	19.9386	19.5787	19.0717	18.6754 (92)	
Temperature adjustment												-0.1500	
adjusted MIT	18.5487	18.7529	19.0734	19.4668	19.7282	19.8405	19.8575	19.8572	19.7886	19.4287	18.9217	18.5254 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9918	0.9825	0.9569	0.8837	0.7333	0.5209	0.3465	0.4002	0.6886	0.9263	0.9839	0.9937 (94)
Useful gains	939.8644	1099.6151	1243.8291	1317.3342	1189.6243	835.1021	529.7279	558.8622	860.3052	986.9431	914.5866	887.2150 (95)
Ext temp.	4.3004	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	2409.8679	2335.9036	2113.9137	1751.9280	1327.5415	855.9308	532.0424	563.3654	933.5633	1459.9013	1965.2600	2394.6899 (97)
Space heating kWh	1093.6826	830.7859	647.3430	312.9075	102.6104	0.0000	0.0000	0.0000	0.0000	351.8809	756.4849	1121.5613 (98a)
Space heating requirement - total per year (kWh/year)												5217.2565
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	1093.6826	830.7859	647.3430	312.9075	102.6104	0.0000	0.0000	0.0000	0.0000	351.8809	756.4849	1121.5613 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5217.2565
Space heating per m2										(98c) / (4) =		35.7886 (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	1093.6826	830.7859	647.3430	312.9075	102.6104	0.0000	0.0000	0.0000	0.0000	351.8809	756.4849	1121.5613 (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)	1235.7996	938.7411	731.4610	353.5678	115.9440	0.0000	0.0000	0.0000	0.0000	397.6055	854.7852	1267.3009 (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	88.2111	88.1748	88.0912	87.8993	87.5091	87.0000	87.0000	87.0000	87.0000	87.9396	88.1530	88.2199 (217)	
Fuel for water heating, kWh/month	290.7142	256.3648	270.6026	233.7517	224.3779	199.8494	194.7314	204.4645	208.9121	234.6238	253.9329	286.9080 (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													5895.2051 (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													2859.2332 (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)

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Appendix Q - special features

Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	5857.8065 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	5895.2051	3.6400	214.5855 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2859.2332	3.6400	104.0761 (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			153.8437 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.2903 (257)
SAP value		95.2942
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	5895.2051	0.2100	1237.9931 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2859.2332	0.2100	600.4390 (264)
Space and water heating			1838.4320 (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			1465.0069 (272)
CO2 emissions per m2			10.0500 (273)
EI value			89.7101
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

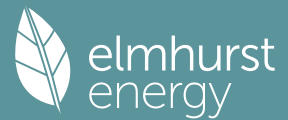
1. Overall dwelling characteristics

	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)

Full SAP Calculation Printout



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													
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	199.2000	30.5800	168.6200	0.1900	32.0378	110.0000	18548.2000	(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) =	86.0001			(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 (28)...(30) + (32) + (32a)...(32e) = 33057.0400 (34)
List of Thermal Bridges 226.7598 (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) = 94.1527 (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 =	169.1284	168.6221	168.1259	165.7951	165.3590	163.3290	163.3290	162.9530	164.1109	165.3590	166.2412	167.1635	(39)
												165.7930	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1602	1.1567	1.1533	1.1373	1.1343	1.1204	1.1204	1.1178	1.1257	1.1343	1.1404	1.1467	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

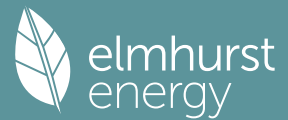
4. Water heating energy requirements (kWh/year)

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													
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	19.5803	17.6296	19.3996	18.5216	18.9794	18.2057	18.7101	18.7948	18.2845	19.0792	18.7055	19.5469	(59)
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)
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	(66)
	175.6426	175.6426	175.6426	175.6426	175.6426	175.6426	175.6426	175.6426	175.6426	175.6426	175.6426	175.6426	

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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					10.4700	10.6334		0.7300	0.7000	0.7700		39.4251 (74)
East					5.2000	19.6403		0.7300	0.7000	0.7700		36.1664 (76)
South					4.6700	46.7521		0.7300	0.7000	0.7700		77.3164 (78)
West					8.1000	19.6403		0.7300	0.7000	0.7700		56.3361 (80)
Solar gains	209.2439	382.9221	587.3298	822.5685	999.6377	1024.6383	974.6110	839.0432	669.0168	440.9803	255.6219	175.7447 (83)
Total gains	947.6157	1119.2510	1299.8226	1490.6303	1622.2848	1603.3249	1528.9657	1396.4637	1249.3979	1065.4279	929.5053	892.8678 (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	54.2931	54.4561	54.6169	55.3847	55.5308	56.2210	56.2210	56.3507	55.9531	55.5308	55.2361	54.9313
alpha	4.6195	4.6304	4.6411	4.6923	4.7021	4.7481	4.7481	4.7567	4.7302	4.7021	4.6824	4.6621
util living area	0.9957	0.9902	0.9740	0.9218	0.8019	0.6194	0.4630	0.5235	0.7826	0.9572	0.9915	0.9967 (86)
MIT	19.8157	19.9782	20.2363	20.5569	20.7927	20.9036	20.9284	20.9238	20.8421	20.5162	20.1055	19.7910 (87)
Th 2	19.9520	19.9548	19.9576	19.9705	19.9729	19.9842	19.9842	19.9863	19.9799	19.9729	19.9680	19.9629 (88)
util rest of house	0.9944	0.9873	0.9660	0.8981	0.7479	0.5337	0.3597	0.4146	0.7053	0.9392	0.9885	0.9957 (89)
MIT 2	18.5664	18.7755	19.1034	19.5055	19.7699	19.8824	19.8984	19.8986	19.8316	19.4676	18.9493	18.5433 (90)
Living area fraction	18.6987	18.9029	19.2234	19.6168	19.8782	19.9905	20.0075	20.0072	19.9386	19.5787	19.0717	18.6754 (92)
MIT	18.6987	18.9029	19.2234	19.6168	19.8782	19.9905	20.0075	20.0072	19.9386	19.5787	19.0717	18.6754 (92)
Temperature adjustment	18.5487	18.7529	19.0734	19.4668	19.7282	19.8405	19.8575	19.8572	19.7886	19.4287	18.9217	-0.1500
adjusted MIT	18.5487	18.7529	19.0734	19.4668	19.7282	19.8405	19.8575	19.8572	19.7886	19.4287	18.9217	18.5254 (93)

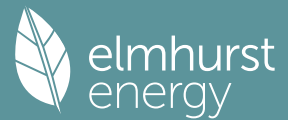
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9918	0.9825	0.9569	0.8837	0.7333	0.5209	0.3465	0.4002	0.6886	0.9263	0.9839	0.9937 (94)
Useful gains	939.8644	1099.6151	1243.8291	1317.3342	1189.6243	835.1021	529.7279	558.8622	860.3052	986.9431	914.5866	887.2150 (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	2409.8679	2335.9036	2113.9137	1751.9280	1327.5415	855.9308	532.0424	563.3654	933.5633	1459.9013	1965.2600	2394.6899 (97)
Space heating kWh	1093.6826	830.7859	647.3430	312.9075	102.6104	0.0000	0.0000	0.0000	0.0000	351.8809	756.4849	1121.5613 (98a)
Space heating requirement - total per year (kWh/year)												5217.2565
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	1093.6826	830.7859	647.3430	312.9075	102.6104	0.0000	0.0000	0.0000	0.0000	351.8809	756.4849	1121.5613 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5217.2565
Space heating per m2										(98c) / (4) =		35.7886 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)											
Fraction of space heat from main system(s)	1.0000 (202)											
Efficiency of main space heating system 1 (in %)	88.5000 (206)											
Efficiency of main space heating system 2 (in %)	0.0000 (207)											
Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1093.6826	830.7859	647.3430	312.9075	102.6104	0.0000	0.0000	0.0000	0.0000	351.8809	756.4849	1121.5613 (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)	1235.7996	938.7411	731.4610	353.5678	115.9440	0.0000	0.0000	0.0000	0.0000	397.6055	854.7852	1267.3009 (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	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)
Water heating requirement	88.2111	88.1748	88.0912	87.8993	87.5091	87.0000	87.0000	87.0000	87.0000	87.9396	88.1530	87.0000 (216)
Efficiency of water heater (217)m	290.7142	256.3648	270.6026	233.7517	224.3779	199.8494	194.7314	204.4645	208.9121	234.6238	253.9329	286.9080 (217)
Fuel for water heating, kWh/month												
Space cooling fuel requirement												

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(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												5895.2051	(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												2859.2332	(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												5857.8065	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	5895.2051	5.6000	330.1315 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2859.2332	5.6000	160.1171 (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			244.6564 (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	5895.2051	0.2100	1237.9931 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2859.2332	0.2100	600.4390 (264)
Space and water heating			1838.4320 (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			1465.0069 (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	5895.2051	1.1300	6661.5817 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2859.2332	1.1300	3230.9336 (278)
Space and water heating			9892.5153 (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			7648.2251 (286)

SAP 10 EPC IMPROVEMENTS

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Plot 17

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 (9.3%)

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	£589	£589	£0
Space heating	£452	£452	£0
Water heating	£160	£160	£0
Lighting	£69	£69	£0
Generated (PV)	-£436	-£436	£0
Total cost of fuels	£244	£244	£0
Total cost of uses	£245	£245	£0
Delivered energy	40 kWh/m²	40 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.5 tonnes	1.5 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 infiltr 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	75.0000	5466.7500	(28a)					
External Wall	199.2000	30.5800	168.6200	0.1900	32.0378	110.0000	18548.2000	(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) =		86.0001			(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							(36a) =	0.0000					
Total fabric heat loss					(33) + (36) + (36a) =			94.1527 (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 =	169.1284	168.6221	168.1259	165.7951	165.3590	163.3290	163.3290	162.9530	164.1109	165.3590	166.2412	167.1635	(39)
												165.7930	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1602	1.1567	1.1533	1.1373	1.1343	1.1204	1.1204	1.1178	1.1257	1.1343	1.1404	1.1467	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
												31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9274 (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	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													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	19.5803	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	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	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)
Appliances gains (calculated in Appendix L, equation L13 or L13a), 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)
Cooking gains (calculated in Appendix L, equation L15 or L15a), 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)
Pumps, fans	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)
Losses e.g. evaporation (negative values) (Table 5)	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)
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)
	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)

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6. Solar gains

[Jan]	Area m2		Solar flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		FF Access factor Table 6d		Gains W	
North	10.4700		10.6334		0.7300		0.7000		0.7700		39.4251 (74)	
East	5.2000		19.6403		0.7300		0.7000		0.7700		36.1664 (76)	
South	4.6700		46.7521		0.7300		0.7000		0.7700		77.3164 (78)	
West	8.1000		19.6403		0.7300		0.7000		0.7700		56.3361 (80)	
Solar gains	209.2439	382.9221	587.3298	822.5685	999.6377	1024.6383	974.6110	839.0432	669.0168	440.9803	255.6219	175.7447 (83)
Total gains	947.6157	1119.2510	1299.8226	1490.6303	1622.2848	1603.3249	1528.9657	1396.4637	1249.3979	1065.4279	929.5053	892.8678 (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	54.2931	54.4561	54.6169	55.3847	55.5308	56.2210	56.2210	56.3507	55.9531	55.5308	55.2361	54.9313
alpha	4.6195	4.6304	4.6411	4.6923	4.7021	4.7481	4.7481	4.7567	4.7302	4.7021	4.6824	4.6621
util living area	0.9957	0.9902	0.9740	0.9218	0.8019	0.6194	0.4630	0.5235	0.7826	0.9572	0.9915	0.9967 (86)
MIT	19.8157	19.9782	20.2363	20.5569	20.7927	20.9036	20.9284	20.9238	20.8421	20.5162	20.1055	19.7910 (87)
Th 2	19.9520	19.9548	19.9576	19.9705	19.9729	19.9842	19.9842	19.9863	19.9799	19.9729	19.9680	19.9629 (88)
util rest of house	0.9944	0.9873	0.9660	0.8981	0.7479	0.5337	0.3597	0.4146	0.7053	0.9392	0.9885	0.9957 (89)
MIT 2	18.5664	18.7755	19.1034	19.5055	19.7699	19.8824	19.8984	19.8986	19.8316	19.4676	18.9493	18.5433 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.6987	18.9029	19.2234	19.6168	19.8782	19.9905	20.0075	20.0072	19.9386	19.5787	19.0717	18.6754 (92)
Temperature adjustment	-0.1500											
adjusted MIT	18.5487	18.7529	19.0734	19.4668	19.7282	19.8405	19.8575	19.8572	19.7886	19.4287	18.9217	18.5254 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9918	0.9825	0.9569	0.8837	0.7333	0.5209	0.3465	0.4002	0.6886	0.9263	0.9839	0.9937 (94)
Useful gains	939.8644	1099.6151	1243.8291	1317.3342	1189.6243	835.1021	529.7279	558.8622	860.3052	986.9431	914.5866	887.2150 (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	2409.8679	2335.9036	2113.9137	1751.9280	1327.5415	855.9308	532.0424	563.3654	933.5633	1459.9013	1965.2600	2394.6899 (97)
Space heating kWh	1093.6826	830.7859	647.3430	312.9075	102.6104	0.0000	0.0000	0.0000	0.0000	351.8809	756.4849	1121.5613 (98a)
Space heating requirement - total per year (kWh/year)												5217.2565
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	1093.6826	830.7859	647.3430	312.9075	102.6104	0.0000	0.0000	0.0000	0.0000	351.8809	756.4849	1121.5613 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5217.2565
Space heating per m2												(98c) / (4) = 35.7886 (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	1093.6826	830.7859	647.3430	312.9075	102.6104	0.0000	0.0000	0.0000	0.0000	351.8809	756.4849	1121.5613 (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)	1235.7996	938.7411	731.4610	353.5678	115.9440	0.0000	0.0000	0.0000	0.0000	397.6055	854.7852	1267.3009 (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	88.2111	88.1748	88.0912	87.8993	87.5091	87.0000	87.0000	87.0000	87.0000	87.9396	88.1530	87.0000 (216)
Fuel for water heating, kWh/month	290.7142	256.3648	270.6026	233.7517	224.3779	199.8494	194.7314	204.4645	208.9121	234.6238	253.9329	286.9080 (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)												

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(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												5895.2051	(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												2859.2332	(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												5857.8065	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	5895.2051	3.6400	214.5855	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2859.2332	3.6400	104.0761	(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			153.8437	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		0.2903	(257)
SAP value	$[(255) \times (256)] / [(4) + 45.0] =$	95.2942	
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	5895.2051	0.2100	1237.9931	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2859.2332	0.2100	600.4390	(264)
Space and water heating			1838.4320	(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			1465.0069	(272)
CO2 emissions per m2			10.0500	(273)
EI value			89.7101	
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)

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)
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)

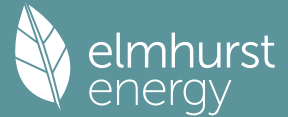
3. Heat losses and heat loss parameter

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	199.2000	30.5800	168.6200	0.1900	32.0378	110.0000	18548.2000	(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) =	86.0001			(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	(36a) =					
Total fabric heat loss						(33) + (36) + (36a) =	94.1527	(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	169.1284	168.6221	168.1259	165.7951	165.3590	163.3290	163.3290	162.9530	164.1109	165.3590	166.2412	167.1635	(39)
Average = Sum(39)m / 12 =												165.7930	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1602	1.1567	1.1533	1.1373	1.1343	1.1204	1.1204	1.1178	1.1257	1.1343	1.1404	1.1467	(40)
HLP (average)												1.1373	
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													
	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)

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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)
	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	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					10.4700	10.6334	0.7300	0.7000					0.7700	39.4251 (74)	
East					5.2000	19.6403	0.7300	0.7000					0.7700	36.1664 (76)	
South					4.6700	46.7521	0.7300	0.7000					0.7700	77.3164 (78)	
West					8.1000	19.6403	0.7300	0.7000					0.7700	56.3361 (80)	

Solar gains	209.2439	382.9221	587.3298	822.5685	999.6377	1024.6383	974.6110	839.0432	669.0168	440.9803	255.6219	175.7447 (83)			
Total gains	947.6157	1119.2510	1299.8226	1490.6303	1622.2848	1603.3249	1528.9657	1396.4637	1249.3979	1065.4279	929.5053	892.8678 (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	54.2931	54.4561	54.6169	55.3847	55.5308	56.2210	56.2210	56.3507	55.9531	55.5308	55.2361	54.9313	
alpha	4.6195	4.6304	4.6411	4.6923	4.7021	4.7481	4.7481	4.7567	4.7302	4.7021	4.6824	4.6621	
util living area	0.9957	0.9902	0.9740	0.9218	0.8019	0.6194	0.4630	0.5235	0.7826	0.9572	0.9915	0.9967	(86)
MIT	19.8157	19.9782	20.2363	20.5569	20.7927	20.9036	20.9284	20.9238	20.8421	20.5162	20.1055	19.7910	(87)
Th 2	19.9520	19.9548	19.9576	19.9705	19.9729	19.9842	19.9842	19.9863	19.9799	19.9729	19.9680	19.9629	(88)
util rest of house	0.9944	0.9873	0.9660	0.8981	0.7479	0.5337	0.3597	0.4146	0.7053	0.9392	0.9885	0.9957	(89)
MIT 2	18.5664	18.7755	19.1034	19.5055	19.7699	19.8824	19.8984	19.8986	19.8316	19.4676	18.9493	18.5433	(90)
Living area fraction	fLA = Living area / (4) =												0.1059 (91)
MIT	18.6987	18.9029	19.2234	19.6168	19.8782	19.9905	20.0075	20.0072	19.9386	19.5787	19.0717	18.6754	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.5487	18.7529	19.0734	19.4668	19.7282	19.8405	19.8575	19.8572	19.7886	19.4287	18.9217	18.5254	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9918	0.9825	0.9569	0.8837	0.7333	0.5209	0.3465	0.4002	0.6886	0.9263	0.9839	0.9937	(94)
Ext temp.	939.8644	1099.6151	1243.8291	1317.3342	1189.6243	835.1021	529.7279	558.8622	860.3052	986.9431	914.5866	887.2150	(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	2409.8679	2335.9036	2113.9137	1751.9280	1327.5415	855.9308	532.0424	563.3654	933.5633	1459.9013	1965.2600	2394.6899	(97)
Space heating requirement - total per year (kWh/year)	1093.6826	830.7859	647.3430	312.9075	102.6104	0.0000	0.0000	0.0000	0.0000	351.8809	756.4849	1121.5613	(98a)
Solar heating kWh												5217.2565	
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Space heating kWh	1093.6826	830.7859	647.3430	312.9075	102.6104	0.0000	0.0000	0.0000	0.0000	351.8809	756.4849	1121.5613	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5217.2565	
Space heating per m2	(98c) / (4) =											35.7886	(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)

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Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1093.6826	830.7859	647.3430	312.9075	102.6104	0.0000	0.0000	0.0000	0.0000	351.8809	756.4849	1121.5613 (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)	1235.7996	938.7411	731.4610	353.5678	115.9440	0.0000	0.0000	0.0000	0.0000	397.6055	854.7852	1267.3009 (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 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	88.2111	88.1748	88.0912	87.8993	87.5091	87.0000	87.0000	87.0000	87.0000	87.9396	88.1530	87.0000 (216)
Fuel for water heating, kWh/month	290.7142	256.3648	270.6026	233.7517	224.3779	199.8494	194.7314	204.4645	208.9121	234.6238	253.9329	286.9080 (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												5895.2051 (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												2859.2332 (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												5857.8065 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	5895.2051	5.6000	330.1315 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2859.2332	5.6000	160.1171 (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			244.6564 (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	5895.2051	0.2100	1237.9931 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2859.2332	0.2100	600.4390 (264)
Space and water heating			1838.4320 (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			1465.0069 (272)

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

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	5895.2051	1.1300	6661.5817 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	2859.2332	1.1300	3230.9336 (278)
Space and water heating			9892.5153 (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			7648.2251 (286)

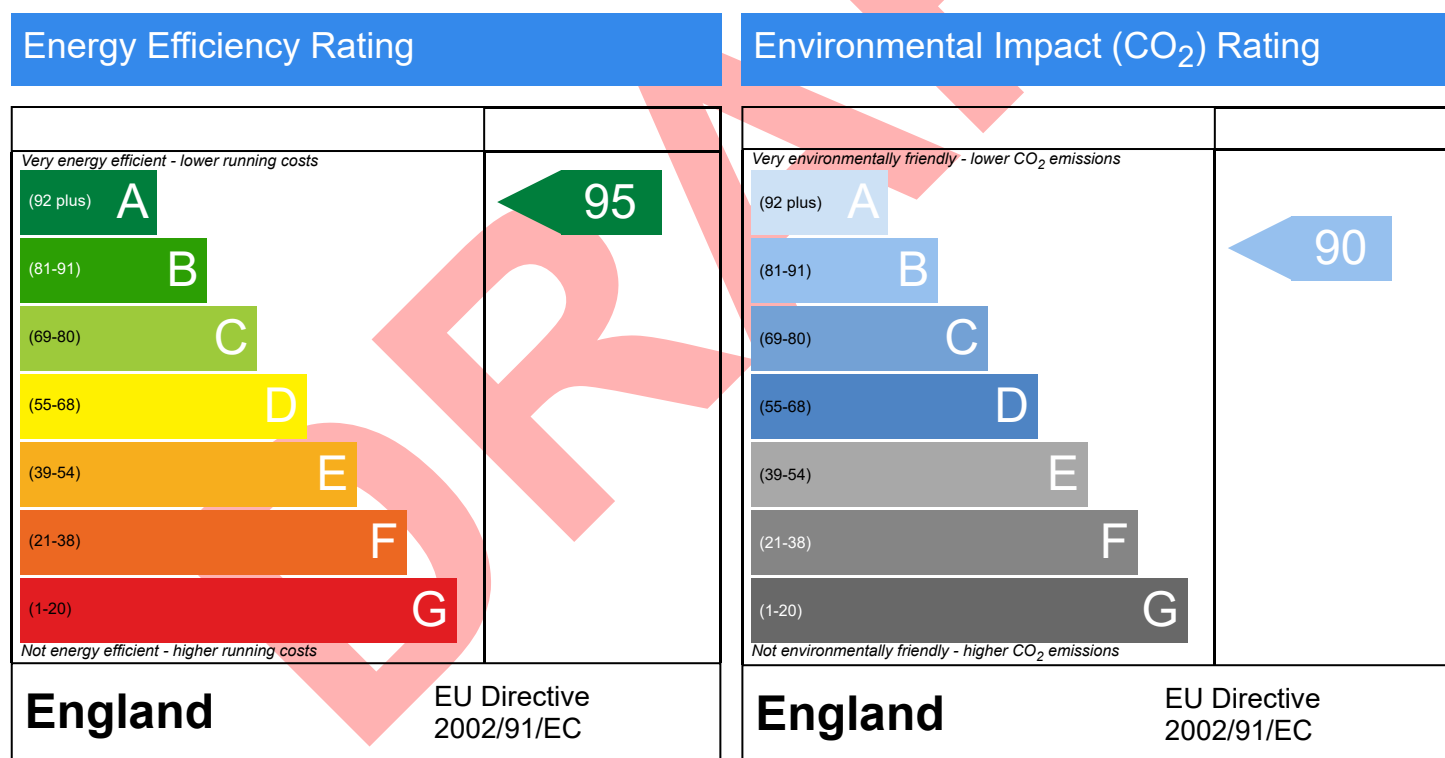
Predicted Energy Assessment



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.