

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 10:34:40

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

Dwelling Details			
Assessment Type	As designed	Total Floor Area	72 m ²
Site Reference	SAP VG 21-0282	Plot Reference	Plot 15
Address			

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

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate			
Fuel for main heating system	Mains gas		
Target carbon dioxide emission rate	12.75 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	12.57 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	66.77 kWh _{PE} /m ²		
Dwelling primary energy	66.35 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	38.7 kWh/m ²		
Dwelling fabric energy efficiency	35.3 kWh/m ²		OK

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.19	Walls (1) (0.19)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	0.13	Heatloss Floor 1 (0.13)	OK
Roofs	0.16	0.09	Roof (1) (0.09)	OK
Windows, doors, and roof windows	1.6	1.27	Front Windows (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)	71.23	0.19	
Party wall: Party Wall (1)	41.4	0 (!)	
Ground floor: Heatloss Floor 1, Heatloss Floor 1	35.97	0.13	
Exposed roof: Roof (1)	35.97	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 door, Front door	2.14	West	N/A	1.1 (!)
Front Windows, Windows	4.56	West	0.7	1.3
Side Windows, Windows	1.42	North	0.7	1.3
Rear Windows, Windows	6.01	East	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	0.022 (!)	RCD E3.01

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E4: Jamb	Calculated by person with suitable expertise	0.017 (!)	
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.092	Manufacturer Declaration
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.001 (!)	RCD E6.01
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.046	RCD E16.01
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.04	SMRF-P05-0.16
Party wall	P1: Ground floor	Calculated by person with suitable expertise	0.069	Manufacturer Declaration
Party wall	P2: Intermediate floor within a dwelling	SAP table default	0 (!)	
Party wall	P4: Roof (insulation at ceiling level)	Calculated by person with suitable expertise	0.101	MPW-P4-01
External wall	E10: Eaves (insulation at ceiling level)	Calculated by person with suitable expertise	0.06	RCD E10.01
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.056	RCD E12.01

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	88.7%
Emitter type	Radiators
Flow temperature	
System type	Combi boiler
Manufacturer	Vaillant
Model	ecoFIT sustain 835
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water

3 Hot water	
Cylinder/store - type: N/A	
Capacity	N/A
Declared heat loss	N/A
Primary pipework insulated	N/A
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 - type: N/A	
Efficiency	
Manufacturer	
Model	

6 Controls

Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services	
Function	
Ecodesign class	
Manufacturer	
Model	
Water heating - type: N/A	
Manufacturer	
Model	

7 Lighting		
Minimum permitted light source efficacy	75 lm/W	
Lowest light source efficacy	85 lm/W	OK
External lights control	N/A	
8 Mechanical ventilation		
System type: N/A		
Maximum permitted specific fan power	N/A	
Specific fan power	N/A	N/A
Minimum permitted heat recovery efficiency	N/A	
Heat recovery efficiency	N/A	N/A
Manufacturer/Model		
Commissioning		
9 Local generation		
Technology type: Photovoltaic system (1)		
Peak power	1.5 kWp	
Orientation	East	
Pitch	30°	
Overshading	None or very little	
Manufacturer	PV	
MCS certificate		
10 Heat networks		
N/A		
11 Supporting documentary evidence		
N/A		
12 Declarations		
a. Assessor Declaration		
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.		
Signed:	Assessor ID:	
Name:		
	Date:	
b. Client Declaration		
N/A		

Summary for Input Data

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

SAP Rating	91 B	DER	12.57	TER	12.75
Environmental	90 B	% DER < TER			1.41
CO ₂ Emissions (t/year)	0.87	DFEE	35.32	TFEE	38.67
Compliance Check	See BREL	% DFEE < TFEE			8.68
% DPER < TPER	0.63	DPER	66.35	TPER	66.77

Assessor Details	Miss Victoria Gartside	Assessor ID	AL30-0001
Client			

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

Orientation	West
Property Tenture	ND
Transaction Type	6
Terrain Type	Suburban
1.0 Property Type	House, Semi-Detached
Which Floor	0
2.0 Number of Storeys	2
3.0 Date Built	2023
3.0 Property Age Band	L
4.0 Sheltered Sides	1
5.0 Sunlight/Shade	Average or unknown
6.0 Thermal Mass Parameter	Precise calculation
Thermal Mass	235.33 kJ/m ² K
7.0 Electricity Tariff	Standard
Smart electricity meter fitted	Yes
Smart gas meter fitted	Yes

7.0 Measurements	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	16.97 m	35.97 m ²	2.40 m
1st Storey:	16.97 m	35.97 m ²	2.63 m
2nd Storey:	16.84 m	21.25 m ²	2.61 m

8.0 Living Area	12.91 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
	Brick wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.19	110.00	85.36	71.23	0.00	None	14.13	Enter Gross Area

9.1 Party Walls	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)	Shelter Res	Shelter
	Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs on both sides, dense blocks, cavity or cavity fill	0.00	70.00	41.40	0.00	None

9.2 Internal Walls	Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
	Internal Wall 2	Plasterboard on timber frame	9.00	104.94

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	35.97	35.97	None	0.00	Enter Gross Area	0.00

10.2 Internal Ceilings	Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
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Summary for Input Data

Description	Storey	Construction	Area (m²)
Internal Ceiling 1	+1	Plasterboard ceiling, carpeted chipboard floor	35.97

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Heatloss Floor 1	Ground Floor - Solid	Lowest occupied	Slab on ground, screed over insulation	0.13	None	0.00	110.00	35.97

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor		Plasterboard ceiling, carpeted chipboard floor	9.00	35.97

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front door	Manufacturer	Solid Door				0.00			1.10
Windows	Manufacturer	Window	Double Low-E Soft 0.05			0.73		0.70	1.30

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Front door	Front door	Brick wall	West	2.14	0
Front Windows	Windows	Brick wall	West	4.56	0
Side Windows	Windows	Brick wall	North	1.42	0
Rear Windows	Windows	Brick wall	East	6.01	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	9.61	0.02	0.02 MFF-150-E2-02	No
E3 Sill	Independently assessed	7.01	0.02	0.02 RCD E3.01	No
E4 Jamb	Independently assessed	25.50	0.02	0.02	No
E5 Ground floor (normal)	Independently assessed	16.97	0.09	0.09 Manufacturer Declaration	No
E6 Intermediate floor within a dwelling	Independently assessed	16.97	0.00	0.00 RCD E6.01	No
E16 Corner (normal)	Independently assessed	10.06	0.05	0.05 RCD E16.01	No
E18 Party wall between dwellings	Independently assessed	10.06	0.04	0.04 SMRF-P05-0.16	No
P1 Party wall - Ground floor	Independently assessed	8.23	0.07	0.07 Manufacturer Declaration	No
P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	16.46	0.00	0.00	No
P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	8.23	0.10	0.10 MPW-P4-01	No
E10 Eaves (insulation at ceiling level)	Independently assessed	8.74	0.06	0.06 RCD E10.01	No
E12 Gable (insulation at ceiling level)	Independently assessed	8.23	0.06	0.06 RCD E12.01	No

Y-value

0.04 W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present No

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.13	In Room Fan Kitchen	0
0.11	In Room Fan Other Wet Room	1
0.00	In Duct Fan Kitchen	0
0.00	In Duct Fan Other Wet Room	0
0.10	Through Wall Fan Kitchen	1
0.10	Through Wall Fan Other Wet Room	1

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	3
Number of passive vents	0
Number of flueless gas fires	0

Summary for Input Data

21.0 Fixed Cooling System		No									
22.0 Pressure Testing		Yes									
Designed AP ₅₀		4.00						m³/(h.m²) @ 50 Pa			
Property Tested?		Yes									
Test Method		Blower Door									
22.0 Lighting		No									
No Fixed Lighting		No									
		Name Lighting	Efficacy 85.00	Power 10.00		Capacity 850.00	Count 15				
24.0 Main Heating 1		Database									
Description		Gas Boiler									
Percentage of Heat		100.00						%			
Database Ref. No.		17960									
Fuel Type		Mains gas									
SAP Code		0									
In Winter		88.70									
In Summer		76.40									
Model Name		ecoFIT sustain 835									
Manufacturer		Vaillant									
System Type		Combi boiler									
Controls SAP Code		2110									
Delayed Start Stat		Yes									
Burner Control		Modulating									
HETAS approved System		No									
Flue Type		Balanced									
Fan Assisted Flue		Yes									
Is MHS Pumped		Pump in heated space									
Heating Pump Age		2013 or later									
Heat Emitter		Radiators									
Underfloor Heating		Yes - Pipes in thin screed									
Flow Temperature		Unknown									
Boiler Interlock		Yes									
Combi boiler type		Standard Combi									
25.0 Main Heating 2		None									
26.0 Heat Networks		None									
		Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1		None									
Heat source 2		None									
Heat source 3		None									
Heat source 4		None									
Heat source 5		None									
27.0 Secondary Heating		None									
28.0 Water Heating		Main Heating 1									
Water Heating		Main Heating 1									
SAP Code		901									
Flue Gas Heat Recovery System		No									
Waste Water Heat Recovery Instantaneous System 1		No									
Waste Water Heat Recovery Instantaneous System 2		No									

Summary for Input Data

Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
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
Shower	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder

Cylinder Stat	None
Cylinder In Heated Space	No
Independent Time Control	No
In Airing Cupboard	No

31.0 Thermal Store

	None
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32.0 Photovoltaic Unit

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

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
1.50	East	30°	None Or Little	No	No	1.00		PV

34.0 Small-scale Hydro

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

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

Lower cost measures

None

Further measures to achieve even higher standards

None

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024
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Property						
SAP Rating	91 B	DER	12.57	TER	12.75	
Environmental	90 B	% DER < TER				1.41
CO ₂ Emissions (t/year)	0.87	DFEE	35.32	TFEE	38.67	
Compliance Check	See BREL	% DFEE < TFEE				8.68
% DPER < TPER	0.63	DPER	66.35	TPER	66.77	
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	35.9700 (1b)	x 2.4000 (2b)	= 86.3280 (1b) - (3b)
First floor	35.9700 (1c)	x 2.6300 (2c)	= 94.6011 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.9400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 180.9291 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1658 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3658 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3384 (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	0.4314	0.4230	0.4145	0.3722	0.3638	0.3215	0.3215	0.3130	0.3384	0.3638	0.3807	0.3976 (22b)
Effective ac	0.5931	0.5895	0.5859	0.5693	0.5662	0.5517	0.5517	0.5490	0.5572	0.5662	0.5725	0.5790 (25)

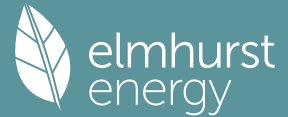
3. Heat losses and heat loss parameter

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
Front door			2.1400	1.1000	2.3540		(26)
Windows (Uw = 1.30)			11.9900	1.2357	14.8165		(27)
Heatloss Floor 1			35.9700	0.1300	4.6761	110.0000	3956.7000 (28a)
Brick wall	85.3600	14.1300	71.2300	0.1900	13.5337	110.0000	7835.3000 (29a)
Plane roof	35.9700		35.9700	0.0900	3.2373	9.0000	323.7300 (30)
Total net area of external elements Aum(A, m ²)			157.3000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.6176		(33)
Party Wall 1			41.4000	0.0000	0.0000	70.0000	2898.0000 (32)
Internal Wall 2			104.9400			9.0000	944.4600 (32c)
Internal Floor			35.9700			18.0000	647.4600 (32d)
Internal Ceiling 1			35.9700			9.0000	323.7300 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	16929.3800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							235.3264 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				9.6100	0.0240	0.2306	
E3 Sill				7.0100	0.0220	0.1542	
E4 Jamb				25.5000	0.0170	0.4335	

elmhurst
energy

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0233	59.1836	59.3416	60.0949	60.2380	60.9131	60.9131	61.0397	60.6512	60.2380	59.9492	59.6503	21.0000 (85)
alpha	4.9349	4.9456	4.9561	5.0063	5.0159	5.0609	5.0609	5.0693	5.0434	5.0159	4.9966	4.9767	
util living area	0.9932	0.9852	0.9642	0.8937	0.7518	0.5584	0.4107	0.4629	0.7203	0.9370	0.9860	0.9945	(86)
MIT	19.7442	19.9514	20.2559	20.6388	20.8834	20.9792	20.9964	20.9935	20.9300	20.5837	20.0999	19.7143	(87)
Th 2	19.9947	19.9972	19.9996	20.0108	20.0130	20.0228	20.0228	20.0247	20.0190	20.0130	20.0087	20.0042	(88)
util rest of house	0.9911	0.9808	0.9535	0.8644	0.6947	0.4795	0.3209	0.3675	0.6405	0.9127	0.9811	0.9929	(89)
MIT 2	18.5430	18.8072	19.1900	19.6566	19.9193	20.0113	20.0217	20.0224	19.9733	19.6062	19.0061	18.5117	(90)
Living area fraction									fLA = Living area /	(4) =		0.1795	(91)
MIT	18.7586	19.0126	19.3812	19.8329	20.0923	20.1850	20.1966	20.1966	20.1450	19.7816	19.2024	18.7276	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.6086	18.8626	19.2312	19.6829	19.9423	20.0350	20.0466	20.0466	19.9950	19.6316	19.0524	18.5776	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9870	0.9738	0.9429	0.8530	0.6903	0.4805	0.3231	0.3697	0.6384	0.9007	0.9743	0.9893	(94)
Useful gains	530.0800	606.9966	662.3050	685.7517	598.9877	413.8683	265.4826	279.7775	435.0158	527.5004	514.6953	507.4906	(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	1140.0155	1109.4366	1008.9049	843.7923	643.4533	419.5930	266.0818	280.9436	457.0712	705.0722	937.5809	1133.4719	(97)
Space heating kWh	453.7920	337.6396	257.8704	113.7892	33.0824	0.0000	0.0000	0.0000	0.0000	132.1134	304.4776	465.7301	(98a)
Space heating requirement - total per year (kWh/year)												2098.4948	
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	453.7920	337.6396	257.8704	113.7892	33.0824	0.0000	0.0000	0.0000	0.0000	132.1134	304.4776	465.7301	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2098.4948	
Space heating per m2										(98c) / (4) =		29.1701	(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 %)												88.7000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement	453.7920	337.6396	257.8704	113.7892	33.0824	0.0000	0.0000	0.0000	0.0000	132.1134	304.4776	465.7301	(98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000	(210)
Space heating fuel (main heating system)	511.6032	380.6535	290.7220	128.2855	37.2970	0.0000	0.0000	0.0000	0.0000	148.9441	343.2668	525.0621	(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	203.1316	178.7597	187.8406	160.3946	152.2064	133.6017	129.3554	136.5325	140.2712	160.6461	175.9637	200.3051	(64)
Efficiency of water heater	84.4937	84.0176	83.0641	81.0653	78.3396	76.4000	76.4000	76.4000	76.4000	81.5001	83.7610	76.4000	(216)
Fuel for water heating, kWh/month	240.4103	212.7645	226.1392	197.8586	194.2905	174.8713	169.3134	178.7074	183.6011	197.1117	210.0782	236.7570	(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	21.4424	17.2019	15.4884	11.3475	8.7651	7.1612	7.9958	10.3933	13.4998	17.7125	20.0062	22.0383	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-17.6572	-28.3554	-46.8116	-58.9613	-67.8955	-64.8486	-63.6947	-57.6705	-47.4163	-34.7332	-20.3697	-14.7472	(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)	-6.0978	-15.0225	-36.1708	-64.1075	-93.4459	-97.3440	-94.8645	-74.8489	-47.9141	-23.2741	-8.5642	-4.6099	(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												2365.8341	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												76.4000	
Water heating fuel used												2421.9032	(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)												173.0524	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1089.4251	(233)

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Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3957.3646 (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	2365.8341	0.2100	496.8252 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2421.9032	0.2100	508.5997 (264)
Space and water heating			1005.4248 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	173.0524	0.1443	24.9768 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-523.1611	0.1324	-69.2700
PV Unit electricity exported	-566.2640	0.1220	-69.0871
Total			-138.3571 (269)
Total CO2, kg/year			903.9738 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.5700 (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	2365.8341	1.1300	2673.3925 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2421.9032	1.1300	2736.7506 (278)
Space and water heating			5410.1431 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	173.0524	1.5338	265.4335 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-523.1611	1.4892	-779.1090
PV Unit electricity exported	-566.2640	0.4477	-253.4883
Total			-1032.5974 (283)
Total Primary energy kWh/year			4773.0801 (286)
Dwelling Primary energy Rate (DPER)			66.3500 (287)

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

1. Overall dwelling characteristics

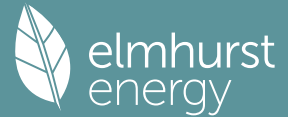
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	35.9700 (1b)	x 2.4000 (2b)	= 86.3280 (1b) - (3b)
First floor	35.9700 (1c)	x 2.6300 (2c)	= 94.6011 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.9400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	180.9291 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1658 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4158 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3846 (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	0.4904	0.4808	0.4712	0.4231	0.4135	0.3654	0.3654	0.3558	0.3846	0.4135	0.4327	0.4519 (22b)
Effective ac	0.6202	0.6156	0.6110	0.5895	0.5855	0.5668	0.5668	0.5633	0.5740	0.5855	0.5936	0.6021 (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 Opaque door			2.1400	1.0000	2.1400			(26)
TER Opening Type (Uw = 1.20)			11.9900	1.1450	13.7290			(27)
Heatloss Floor 1			35.9700	0.1300	4.6761			(28a)
Brick wall	85.3600	14.1300	71.2300	0.1800	12.8214			(29a)
Plane roof	35.9700		35.9700	0.1100	3.9567			(30)
Total net area of external elements Aum(A, m2)			157.3000					(31)
Fabric heat loss, W/K = Sum (A x U)								(33)
Party Wall 1			41.4000	0.0000	0.0000			(32)

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

235.3264 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	9.6100	0.0500	0.4805	
E3 Sill	7.0100	0.0500	0.3505	
E4 Jamb	25.5000	0.0500	1.2750	
E5 Ground floor (normal)	16.9700	0.1600	2.7152	
E6 Intermediate floor within a dwelling	16.9700	0.0000	0.0000	
E16 Corner (normal)	10.0600	0.0900	0.9054	
E18 Party wall between dwellings	10.0600	0.0600	0.6036	
P1 Party wall - Ground floor	8.2300	0.0800	0.6584	
P2 Party wall - Intermediate floor within a dwelling	16.4600	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	8.2300	0.1200	0.9876	
E10 Eaves (insulation at ceiling level)	8.7400	0.0600	0.5244	
E12 Gable (insulation at ceiling level)	8.2300	0.0600	0.4938	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				8.9944 (36)
Point Thermal bridges				0.0000
Total fabric heat loss				(33) + (36) + (36a) = 46.3176 (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	37.0327	36.7539	36.4806	35.1971	34.9570	33.8391	33.8391	33.6321	34.2697	34.9570	35.4428	35.9507	(38)
Heat transfer coeff	83.3503	83.0715	82.7983	81.5147	81.2746	80.1567	80.1567	79.9497	80.5873	81.2746	81.7604	82.2683	(39)
Average = Sum(39)m / 12 =												81.5136	
HLP	1.1586	1.1547	1.1509	1.1331	1.1298	1.1142	1.1142	1.1113	1.1202	1.1298	1.1365	1.1436	(40)
HLP (average)												1.1331	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

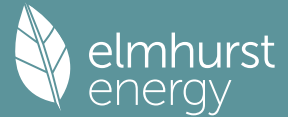
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2923 (42)
Hot water usage for mixer showers													
62.6538	61.7122	60.3402	57.7150	55.7777	53.6172	52.3892	53.7509	55.2435	57.5632	60.2448	62.4137	62.4137	(42a)
Hot water usage for baths													
27.0664	26.6644	26.0984	25.0546	24.2731	23.4065	22.9384	23.5005	24.1126	25.0399	26.1051	26.9749	26.9749	(42b)
Hot water usage for other uses													
38.1053	36.7197	35.3340	33.9484	32.5627	31.1771	31.1771	32.5627	33.9484	35.3340	36.7197	38.1053	38.1053	(42c)
Average daily hot water use (litres/day)												117.5007	(43)
Daily hot water use													
127.8255	125.0963	121.7725	116.7180	112.6135	108.2008	106.5048	109.8142	113.3045	117.9371	123.0695	127.4939	127.4939	(44)
Energy conte	202.4443	178.1355	187.1599	159.7811	151.5995	133.0456	128.8083	135.9729	139.7158	160.0395	175.3350	199.6247	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
30.3666	26.7203	28.0740	23.9672	22.7399	19.9568	19.3212	20.3959	20.9574	24.0059	26.3003	29.9437	29.9437	(46)
Water storage loss:													
Total storage loss													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
253.4032	224.1629	238.1188	209.0962	202.5584	182.3606	179.7672	186.9318	189.0308	210.9984	224.6501	250.5836	250.5836	(62)
WWHRS	-28.6427	-25.3318	-26.5260	-21.9646	-20.4702	-17.5165	-16.4189	-17.4599	-18.1233	-21.3653	-24.2043	-28.1123	(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	224.7605	198.8310	211.5927	187.1316	182.0882	164.8441	163.3482	169.4719	170.9076	189.6331	200.4458	222.4713	(64)
12Total per year (kWh/year)												2285.5261	(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	80.0525	70.7369	74.9704	65.4560	63.1466	56.5664	55.5685	57.9507	58.7843	65.9529	70.6277	79.1149	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
105.3508	116.6383	105.3508	108.8625	105.3508	108.8625	105.3508	105.3508	108.8625	105.3508	108.8625	105.3508	105.3508	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
201.7819	203.8757	198.5993	187.3663	173.1867	159.8598	150.9567	148.8628	154.1393	165.3722	179.5519	192.8787	192.8787	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	(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)													
-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	(71)
Water heating gains (Table 5)													
107.5974	105.2632	100.7666	90.9111	84.8744	78.5645	74.6888	77.8907	81.6448	88.6463	98.0940	106.3373	106.3373	(72)
Total internal gains													

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475.1143 486.1616 465.1010 447.5241 423.7961 404.6710 388.3805 389.4886 402.0308 419.7536 446.8926 464.9511 (73)

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					1.4200	10.6334	0.6300		0.7000	0.7700	4.6146 (74)	
East					6.0100	19.6403	0.6300		0.7000	0.7700	36.0739 (76)	
West					4.5600	19.6403	0.6300		0.7000	0.7700	27.3706 (80)	
Solar gains	68.0591	132.9296	219.3782	322.1650	397.7511	408.6882	388.4487	331.5453	255.7345	157.7656	84.8005	56.0206 (83)
Total gains	543.1734	619.0913	684.4791	769.6892	821.5472	813.3592	776.8292	721.0339	657.7654	577.5192	531.6932	520.9717 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.4198	56.6091	56.7960	57.6902	57.8607	58.6677	58.6677	58.8196	58.3542	57.8607	57.5169	57.1618
alpha	4.7613	4.7739	4.7864	4.8460	4.8574	4.9112	4.9112	4.9213	4.8903	4.8574	4.8345	4.8108
util living area	0.9931	0.9863	0.9696	0.9137	0.7930	0.6048	0.4488	0.5008	0.7539	0.9442	0.9863	0.9943 (86)
MIT	19.6700	19.8652	20.1612	20.5563	20.8363	20.9668	20.9937	20.9895	20.9054	20.5295	20.0411	19.6481 (87)
Th 2	19.9533	19.9564	19.9595	19.9739	19.9766	19.9892	19.9892	19.9916	19.9844	19.9766	19.9711	19.9654 (88)
util rest of house	0.9909	0.9821	0.9602	0.8877	0.7374	0.5197	0.3484	0.3957	0.6734	0.9216	0.9814	0.9925 (89)
MIT 2	18.4190	18.6688	19.0429	19.5325	19.8419	19.9705	19.9872	19.9878	19.9213	19.5139	18.9046	18.3997 (90)
Living area fraction	18.6435	18.8835	19.2436	19.7162	20.0204	20.1493	20.1678	20.1676	20.0979	19.6962	19.1086	18.6237 (92)
MIT	18.6435	18.8835	19.2436	19.7162	20.0204	20.1493	20.1678	20.1676	20.0979	19.6962	19.1086	18.6237 (93)
Temperature adjustment	18.6435	18.8835	19.2436	19.7162	20.0204	20.1493	20.1678	20.1676	20.0979	19.6962	19.1086	18.6237 (93)
adjusted MIT	18.6435	18.8835	19.2436	19.7162	20.0204	20.1493	20.1678	20.1676	20.0979	19.6962	19.1086	18.6237 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9871	0.9762	0.9518	0.8800	0.7400	0.5337	0.3664	0.4144	0.6833	0.9138	0.9757	0.9892 (94)
Useful gains	536.1724	604.3693	651.4842	677.3290	607.9232	434.1094	284.6446	298.8117	449.4220	527.7142	518.7663	515.3540 (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	1195.5331	1161.6294	1055.1488	881.6836	676.2356	444.8143	285.9836	301.2155	483.3563	739.2886	981.8246	1186.6141 (97)
Space heating kWh	490.5643	374.4788	300.3265	147.1353	50.8244	0.0000	0.0000	0.0000	0.0000	157.4114	333.4020	499.4175 (98a)
Space heating requirement - total per year (kWh/year)												2353.5602
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	490.5643	374.4788	300.3265	147.1353	50.8244	0.0000	0.0000	0.0000	0.0000	157.4114	333.4020	499.4175 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2353.5602
Space heating per m2										(98c) / (4) =		32.7156 (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	490.5643	374.4788	300.3265	147.1353	50.8244	0.0000	0.0000	0.0000	0.0000	157.4114	333.4020	499.4175 (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)	530.9138	405.2801	325.0286	159.2373	55.0047	0.0000	0.0000	0.0000	0.0000	170.3586	360.8247	540.4952 (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	224.7605	198.8310	211.5927	187.1316	182.0882	164.8441	163.3482	169.4719	170.9076	189.6331	200.4458	222.4713 (64)
Efficiency of water heater	86.0058	85.7162	85.1315	83.8714	82.0316	80.3000	80.3000	80.3000	80.3000	83.9851	85.4633	80.3000 (216)
Fuel for water heating, kWh/month	261.3318	231.9643	248.5482	223.1174	221.9731	205.2853	203.4225	211.0484	212.8363	225.7937	234.5402	258.5086 (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	21.8898	17.5608	15.8116	11.5842	8.9480	7.3106	8.1627	10.6101	13.7815	18.0821	20.4237	22.4982 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-33.7431	-47.6165	-68.5151	-77.1284	-83.2597	-77.7597	-76.8093	-72.4726	-64.8234	-54.5001	-37.1167	-29.1684 (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)	-18.9241	-39.8281	-79.1918	-118.9811	-157.3561	-158.1076	-156.2363	-132.2608	-96.9188	-56.9593	-25.2681	-14.9624 (233b)

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Electricity generated by wind turbines (Appendix M) (negative quantity)														
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)														
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													2547.1431	(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													2738.3698	(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)													176.6633	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-1777.9074	(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													3770.2687	(238)

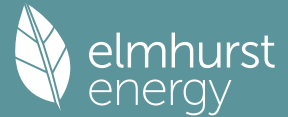
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2547.1431	0.2100	534.9000 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2738.3698	0.2100	575.0577 (264)
Space and water heating			1109.9577 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	176.6633	0.1443	25.4980 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-722.9129	0.1346	-97.2747
PV Unit electricity exported	-1054.9945	0.1259	-132.8108
Total			-230.0855 (269)
Total CO2, kg/year			917.2994 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.7500 (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	2547.1431	1.1300	2878.2716 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2738.3698	1.1300	3094.3578 (278)
Space and water heating			5972.6295 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	176.6633	1.5338	270.9721 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-722.9129	1.4973	-1082.4225
PV Unit electricity exported	-1054.9945	0.4621	-487.5069
Total			-1569.9293 (283)
Total Primary energy kWh/year			4803.7730 (286)
Target Primary Energy Rate (TPER)			66.7700 (287)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 15			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	91 B	DER	12.57	TER	12.75		
Environmental	90 B	% DER < TER				1.41	
CO ₂ Emissions (t/year)	0.87	DFEE	35.32	TFEE	38.67		
Compliance Check	See BREL	% DFEE < TFEE				8.68	
% DPER < TPER	0.63	DPER	66.35	TPER	66.77		
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	35.9700 (1b)	x 2.4000 (2b)	= 86.3280 (1b) - (3b)
First floor	35.9700 (1c)	x 2.6300 (2c)	= 94.6011 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.9400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 180.9291 (5)

2. Ventilation rate

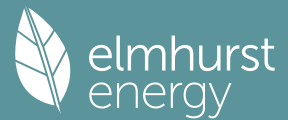
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1658 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3658 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3384 (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	0.4314	0.4230	0.4145	0.3722	0.3638	0.3215	0.3215	0.3130	0.3384	0.3638	0.3807	0.3976 (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	0.5931	0.5895	0.5859	0.5693	0.5662	0.5517	0.5517	0.5490	0.5572	0.5662	0.5725	0.5790 (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
Front door			2.1400	1.1000	2.3540		(26)
Windows (Uw = 1.30)			11.9900	1.2357	14.8165		(27)
Heatloss Floor 1			35.9700	0.1300	4.6761	110.0000	3956.7000 (28a)
Brick wall	85.3600	14.1300	71.2300	0.1900	13.5337	110.0000	7835.3000 (29a)
Plane roof	35.9700		35.9700	0.0900	3.2373	9.0000	323.7300 (30)
Total net area of external elements Aum(A, m ²)			157.3000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.6176		(33)
Party Wall 1			41.4000	0.0000	0.0000	70.0000	2898.0000 (32)
Internal Wall 2			104.9400			9.0000	944.4600 (32c)
Internal Floor			35.9700			18.0000	647.4600 (32d)
Internal Ceiling 1			35.9700			9.0000	323.7300 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	16929.3800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							235.3264 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				9.6100	0.0240	0.2306	

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E3 Sill	7.0100	0.0220	0.1542
E4 Jamb	25.5000	0.0170	0.4335
E5 Ground floor (normal)	16.9700	0.0920	1.5612
E6 Intermediate floor within a dwelling	16.9700	0.0010	0.0170
E16 Corner (normal)	10.0600	0.0460	0.4628
E18 Party wall between dwellings	10.0600	0.0400	0.4024
P1 Party wall - Ground floor	8.2300	0.0690	0.5679
P2 Party wall - Intermediate floor within a dwelling	16.4600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	8.2300	0.1010	0.8312
E10 Eaves (insulation at ceiling level)	8.7400	0.0600	0.5244
E12 Gable (insulation at ceiling level)	8.2300	0.0560	0.4609
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.6461 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	44.2637 (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	35.4099	35.1941	34.9826	33.9892	33.8034	32.9382	32.9382	32.7779	33.2714	33.8034	34.1794	34.5725 (38)
Average = Sum(39)m / 12 =	79.6737	79.4579	79.2464	78.2530	78.0671	77.2019	77.2019	77.0417	77.5352	78.0671	78.4431	78.8362 (39)
												78.2521
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1075	1.1045	1.1016	1.0878	1.0852	1.0731	1.0731	1.0709	1.0778	1.0852	1.0904	1.0959 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.2923 (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	27.0664	26.6644	26.0984	25.0546	24.2731	23.4065	22.9384	23.5005	24.1126	25.0399	26.1051	26.9749 (42b)
Hot water usage for other uses	38.1053	36.7197	35.3340	33.9484	32.5627	31.1771	31.1771	32.5627	33.9484	35.3340	36.7197	38.1053 (42c)
Average daily hot water use (litres/day)												59.7360 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	65.1717	63.3841	61.4324	59.0030	56.8358	54.5836	54.1155	56.0633	58.0609	60.3739	62.8247	65.0802 (44)
Distribution loss (46)m = 0.15 x (45)m	103.2161	90.2581	94.4193	80.7722	76.5120	67.1169	65.4480	69.4180	71.5949	81.9268	89.5053	101.8999 (45)
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	87.7336	76.7194	80.2564	68.6563	65.0352	57.0494	55.6308	59.0053	60.8557	69.6378	76.0795	86.6149 (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	87.7336	76.7194	80.2564	68.6563	65.0352	57.0494	55.6308	59.0053	60.8557	69.6378	76.0795	86.6149 (64)
12Total per year (kWh/year)												843.2744 (64)
Electric shower(s)	50.1752	44.7065	48.8178	46.5863	47.4604	45.2726	46.7817	47.4604	46.5863	48.8178	47.8999	50.1752 (64a)
Heat gains from water heating, kWh/month	34.4772	30.3565	32.2686	28.8107	28.1239	25.5805	25.6031	26.6164	26.8605	29.6139	30.9949	34.1975 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												
												570.7403 (64a)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	105.3508	105.3508	105.3508	105.3508	105.3508	105.3508	105.3508	105.3508	105.3508	105.3508	105.3508	105.3508 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.7819	203.8757	198.5993	187.3663	173.1867	159.8598	150.9567	148.8628	154.1393	165.3722	179.5519	192.8787 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614 (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)	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915 (71)
Water heating gains (Table 5)	46.3403	45.1733	43.3717	40.0148	37.8009	35.5285	34.4128	35.7748	37.3062	39.8036	43.0484	45.9644 (72)
Total internal gains	410.8573	423.0717	404.7060	393.6278	373.7227	361.6351	348.1046	347.3727	357.6923	367.9109	388.8470	401.5782 (73)

6. Solar gains												
[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
North	1.4200	10.6334	0.7300	0.7000	0.7700	5.3471 (74)						
East	6.0100	19.6403	0.7300	0.7000	0.7700	41.8000 (76)						
West	4.5600	19.6403	0.7300	0.7000	0.7700	31.7151 (80)						
Solar gains	78.8621	154.0296	254.2001	373.3023	460.8862	473.5593	450.1072	384.1716	296.3273	182.8078	98.2609	64.9128 (83)
Total gains	489.7194	577.1013	658.9061	766.9302	834.6089	835.1944	798.2117	731.5442	654.0196	550.7187	487.1080	466.4910 (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	59.0233	59.1836	59.3416	60.0949	60.2380	60.9131	60.9131	61.0397	60.6512	60.2380	59.9492	59.6503
alpha	4.9349	4.9456	4.9561	5.0063	5.0159	5.0609	5.0609	5.0693	5.0434	5.0159	4.9966	4.9767
util living area	0.9954	0.9892	0.9719	0.9079	0.7708	0.5739	0.4223	0.4780	0.7411	0.9492	0.9900	0.9964 (86)
MIT	19.6718	19.8833	20.1977	20.6037	20.8691	20.9766	20.9959	20.9926	20.9203	20.5425	20.0388	19.6427 (87)
Th 2	19.9947	19.9972	19.9996	20.0108	20.0130	20.0228	20.0228	20.0247	20.0190	20.0130	20.0087	20.0042 (88)
util rest of house	0.9940	0.9859	0.9632	0.8811	0.7148	0.4936	0.3302	0.3799	0.6620	0.9284	0.9864	0.9953 (89)
MIT 2	18.7916	19.0031	19.3132	19.7046	19.9300	20.0126	20.0218	20.0226	19.9778	19.6593	19.1677	18.7700 (90)
Living area fraction	fLA = Living area / (4) = 0.1795 (91)											
MIT	18.9496	19.1611	19.4720	19.8659	20.0986	20.1856	20.1966	20.1966	20.1470	19.8178	19.3240	18.9266 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.9496	19.1611	19.4720	19.8659	20.0986	20.1856	20.1966	20.1966	20.1470	19.8178	19.3240	18.9266 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9920	0.9822	0.9574	0.8766	0.7200	0.5073	0.3468	0.3975	0.6732	0.9233	0.9830	0.9936 (94)
Useful gains	485.7857	566.8501	630.8211	672.2981	600.9407	423.7325	276.7973	290.8096	440.2553	508.4798	478.8395	463.4928 (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	1167.1875	1133.1548	1027.9809	858.1153	655.6525	431.2197	277.6636	292.4996	468.8535	719.6040	958.8882	1160.9928 (97)
Space heating kWh	506.9629	380.5568	295.4869	133.7884	40.7056	0.0000	0.0000	0.0000	0.0000	157.0764	345.6351	518.9400 (98a)
Space heating requirement - total per year (kWh/year)	2379.1520											
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	506.9629	380.5568	295.4869	133.7884	40.7056	0.0000	0.0000	0.0000	0.0000	157.0764	345.6351	518.9400 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2379.1520											
Space heating per m2	(98c) / (4) = 33.0713 (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	725.6980	571.2942	585.5169	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9205	0.9597	0.9396	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	668.0330	548.2649	550.1668	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	933.7456	892.6725	816.8281	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	191.3131	256.2392	198.3960	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	47.8283	64.0598	49.5990	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	161.4871 (107)											
Energy for space heating	33.0713 (99)											
Energy for space cooling	2.2447 (108)											
Total	35.3161 (109)											
Fabric Energy Efficiency (DFEE)	35.3 (109)											

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

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

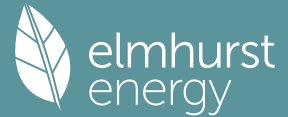
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	35.9700 (1b)	x 2.4000 (2b)	= 86.3280 (1b) - (3b)
First floor	35.9700 (1c)	x 2.6300 (2c)	= 94.6011 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.9400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 180.9291 (5)

2. Ventilation rate

m3 per hour

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

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Number of flueless gas fires

0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =
Pressure test
Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered

Air changes per hour
30.0000 / (5) = 0.1658 (8)
Yes
Blower Door
5.0000 (17)
0.4158 (18)
1 (19)

Shelter factor
Infiltration rate adjusted to include shelter factor

(20) = 1 - [0.075 x (19)] = 0.9250 (20)
(21) = (18) x (20) = 0.3846 (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	0.4904	0.4808	0.4712	0.4231	0.4135	0.3654	0.3654	0.3558	0.3846	0.4135	0.4327	0.4519 (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	0.6202	0.6156	0.6110	0.5895	0.5855	0.5668	0.5668	0.5633	0.5740	0.5855	0.5936	0.6021 (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 Opaque door			2.1400	1.0000	2.1400		(26)
TER Opening Type (Uw = 1.20)			11.9900	1.1450	13.7290		(27)
Heatloss Floor 1			35.9700	0.1300	4.6761		(28a)
Brick wall	85.3600	14.1300	71.2300	0.1800	12.8214		(29a)
Plane roof	35.9700		35.9700	0.1100	3.9567		(30)
Total net area of external elements Aum(A, m2)			157.3000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 37.3232		(33)
Party Wall 1			41.4000	0.0000	0.0000		(32)

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

235.3264 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.6100	0.0500	0.4805
E3 Sill	7.0100	0.0500	0.3505
E4 Jamb	25.5000	0.0500	1.2750
E5 Ground floor (normal)	16.9700	0.1600	2.7152
E6 Intermediate floor within a dwelling	16.9700	0.0000	0.0000
E16 Corner (normal)	10.0600	0.0900	0.9054
E18 Party wall between dwellings	10.0600	0.0600	0.6036
P1 Party wall - Ground floor	8.2300	0.0800	0.6584
P2 Party wall - Intermediate floor within a dwelling	16.4600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	8.2300	0.1200	0.9876
E10 Eaves (insulation at ceiling level)	8.7400	0.0600	0.5244
E12 Gable (insulation at ceiling level)	8.2300	0.0600	0.4938

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

8.9944 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 46.3176 (37)

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

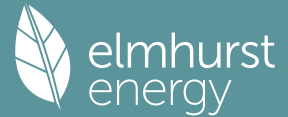
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	37.0327	36.7539	36.4806	35.1971	34.9570	33.8391	33.8391	33.6321	34.2697	34.9570	35.4428	35.9507 (38)
Heat transfer coeff	83.3503	83.0715	82.7983	81.5147	81.2746	80.1567	80.1567	79.9497	80.5873	81.2746	81.7604	82.2683 (39)
Average = Sum(39)m / 12 =												81.5136

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1586	1.1547	1.1509	1.1331	1.1298	1.1142	1.1142	1.1113	1.1202	1.1298	1.1365	1.1436 (40)
HLP (average)												1.1331
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2923 (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	27.0664	26.6644	26.0984	25.0546	24.2731	23.4065	22.9384	23.5005	24.1126	25.0399	26.1051	26.9749 (42b)
Hot water usage for other uses	38.1053	36.7197	35.3340	33.9484	32.5627	31.1771	31.1771	32.5627	33.9484	35.3340	36.7197	38.1053 (42c)
Average daily hot water use (litres/day)												59.7360 (43)
Daily hot water use	65.1717	63.3841	61.4324	59.0030	56.8358	54.5836	54.1155	56.0633	58.0609	60.3739	62.8247	65.0802 (44)
Energy conte	103.2161	90.2581	94.4193	80.7722	76.5120	67.1169	65.4480	69.4180	71.5949	81.9268	89.5053	101.8999 (45)
Energy content (annual)										Total = Sum(45)m =		992.0875
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	87.7336	76.7194	80.2564	68.6563	65.0352	57.0494	55.6308	59.0053	60.8557	69.6378	76.0795	86.6149 (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 (64d)
Output from w/h	87.7336	76.7194	80.2564	68.6563	65.0352	57.0494	55.6308	59.0053	60.8557	69.6378	76.0795	86.6149 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		843.2744 (64)
Electric shower(s)	50.1752	44.7065	48.8178	46.5863	47.4604	45.2726	46.7817	47.4604	46.5863	48.8178	47.8999	50.1752 (64a)

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Heat gains from water heating, kWh/month
34.4772 30.3565 32.2686 28.8107 28.1239 25.5805 25.6031 26.6164 26.8605 29.6139 30.9949 34.1975 (65)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 570.7403 (64a)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	105.3508	116.6383	105.3508	108.8625	105.3508	108.8625	105.3508	105.3508	108.8625	105.3508	108.8625	105.3508 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.7819	203.8757	198.5993	187.3663	173.1867	159.8598	150.9567	148.8628	154.1393	165.3722	179.5519	192.8787 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614 (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)	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915 (71)
Water heating gains (Table 5)	46.3403	45.1733	43.3717	40.0148	37.8009	35.5285	34.4128	35.7748	37.3062	39.8036	43.0484	45.9644 (72)
Total internal gains	410.8573	423.0717	404.7060	393.6278	373.7227	361.6351	348.1046	347.3727	357.6923	367.9109	388.8470	401.5782 (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			1.4200	10.6334	0.6300	0.7000	0.7700	4.6146 (74)				
East			6.0100	19.6403	0.6300	0.7000	0.7700	36.0739 (76)				
West			4.5600	19.6403	0.6300	0.7000	0.7700	27.3706 (80)				
Solar gains	68.0591	132.9296	219.3782	322.1650	397.7511	408.6882	388.4487	331.5453	255.7345	157.7656	84.8005	56.0206 (83)
Total gains	478.9164	556.0014	624.0842	715.7928	771.4738	770.3232	736.5532	678.9180	613.4268	525.6765	473.6476	457.5988 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	56.4198	56.6091	56.7960	57.6902	57.8607	58.6677	58.6677	58.8196	58.3542	57.8607	57.5169	57.1618
alpha	4.7613	4.7739	4.7864	4.8460	4.8574	4.9112	4.9112	4.9213	4.8903	4.8574	4.8345	4.8108
util living area	0.9959	0.9911	0.9786	0.9315	0.8207	0.6327	0.4720	0.5292	0.7870	0.9599	0.9915	0.9967 (86)
MIT	19.5726	19.7723	20.0784	20.4990	20.8075	20.9597	20.9921	20.9867	20.8849	20.4656	19.9553	19.5512 (87)
Th 2	19.9533	19.9564	19.9595	19.9739	19.9766	19.9892	19.9892	19.9916	19.9844	19.9766	19.9711	19.9654 (88)
util rest of house	0.9946	0.9883	0.9716	0.9094	0.7680	0.5459	0.3671	0.4194	0.7092	0.9424	0.9883	0.9957 (89)
MIT 2	18.6610	18.8616	19.1657	19.5792	19.8508	19.9712	19.9872	19.9878	19.9228	19.5583	19.0558	18.6491 (90)
Living area fraction									FLA = Living area / (4) =			0.1795 (91)
MIT	18.8246	19.0250	19.3295	19.7443	20.0225	20.1486	20.1676	20.1670	20.0955	19.7211	19.2172	18.8110 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8246	19.0250	19.3295	19.7443	20.0225	20.1486	20.1676	20.1670	20.0955	19.7211	19.2172	18.8110 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9927	0.9849	0.9661	0.9035	0.7706	0.5603	0.3860	0.4391	0.7187	0.9368	0.9851	0.9940 (94)
Useful gains	475.4004	547.6155	602.9226	646.6951	594.4791	431.5834	284.2789	298.0794	440.8643	492.4439	466.5755	454.8685 (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	1210.6280	1173.3872	1062.2586	883.9694	676.4041	444.7589	285.9637	301.1734	483.1590	741.3122	990.7106	1202.0195 (97)
Space heating kWh	547.0094	420.5186	341.7460	170.8375	60.9521	0.0000	0.0000	0.0000	0.0000	185.1580	377.3773	555.8803 (98a)
Space heating requirement - total per year (kWh/year)												2659.4792
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	547.0094	420.5186	341.7460	170.8375	60.9521	0.0000	0.0000	0.0000	0.0000	185.1580	377.3773	555.8803 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2659.4792
Space heating per m ²										(98c) / (4) =		36.9680 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
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	753.4730	593.1596	607.6176	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8799	0.9340	0.9075	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	662.9732	554.0236	551.3956	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	857.9222	820.6041	755.3169	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	140.3633	198.3359	151.7174	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	35.0908	49.5840	37.9294	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												122.6041 (107)
Energy for space heating												36.9680 (99)

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Energy for space cooling
Total
Fabric Energy Efficiency (TFEE)

1.7043 (108)
38.6723 (109)
38.7 (109)

Full SAP Calculation Printout



Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 15			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	91 B		DER	12.57		TER	12.75
Environmental	90 B		% DER < TER				1.41
CO ₂ Emissions (t/year)	0.87		DFEE	35.32		TFEE	38.67
Compliance Check	See BREL		% DFEE < TFEE				8.68
% DPER < TPER	0.63		DPER	66.35		TPER	66.77
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	35.9700 (1b)	x 2.4000 (2b)	= 86.3280 (1b) - (3b)
First floor	35.9700 (1c)	x 2.6300 (2c)	= 94.6011 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.9400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 180.9291 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1658 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3658 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3384 (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	0.4314	0.4230	0.4145	0.3722	0.3638	0.3215	0.3215	0.3130	0.3384	0.3638	0.3807	0.3976 (22b)
Effective ac	0.5931	0.5895	0.5859	0.5693	0.5662	0.5517	0.5517	0.5490	0.5572	0.5662	0.5725	0.5790 (25)

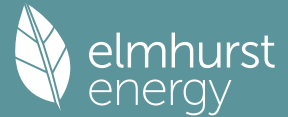
3. Heat losses and heat loss parameter

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
Front door			2.1400	1.1000	2.3540		(26)
Windows (Uw = 1.30)			11.9900	1.2357	14.8165		(27)
Heatloss Floor 1			35.9700	0.1300	4.6761	110.0000	3956.7000 (28a)
Brick wall	85.3600	14.1300	71.2300	0.1900	13.5337	110.0000	7835.3000 (29a)
Plane roof	35.9700		35.9700	0.0900	3.2373	9.0000	323.7300 (30)
Total net area of external elements Aum(A, m ²)			157.3000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.6176		(33)
Party Wall 1			41.4000	0.0000	0.0000	70.0000	2898.0000 (32)
Internal Wall 2			104.9400			9.0000	944.4600 (32c)
Internal Floor			35.9700			18.0000	647.4600 (32d)
Internal Ceiling 1			35.9700			9.0000	323.7300 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	16929.3800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							235.3264 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				9.6100	0.0240	0.2306	
E3 Sill				7.0100	0.0220	0.1542	
E4 Jamb				25.5000	0.0170	0.4335	

elmhurst
energy

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.0233	59.1836	59.3416	60.0949	60.2380	60.9131	60.9131	61.0397	60.6512	60.2380	59.9492	59.6503	21.0000 (85)
alpha	4.9349	4.9456	4.9561	5.0063	5.0159	5.0609	5.0609	5.0693	5.0434	5.0159	4.9966	4.9767	
util living area	0.9932	0.9852	0.9642	0.8937	0.7518	0.5584	0.4107	0.4629	0.7203	0.9370	0.9860	0.9945	(86)
MIT	19.7442	19.9514	20.2559	20.6388	20.8834	20.9792	20.9964	20.9935	20.9300	20.5837	20.0999	19.7143	(87)
Th 2	19.9947	19.9972	19.9996	20.0108	20.0130	20.0228	20.0228	20.0247	20.0190	20.0130	20.0087	20.0042	(88)
util rest of house	0.9911	0.9808	0.9535	0.8644	0.6947	0.4795	0.3209	0.3675	0.6405	0.9127	0.9811	0.9929	(89)
MIT 2	18.5430	18.8072	19.1900	19.6566	19.9193	20.0113	20.0217	20.0224	19.9733	19.6062	19.0061	18.5117	(90)
Living area fraction									fLA = Living area /	(4) =		0.1795	(91)
MIT	18.7586	19.0126	19.3812	19.8329	20.0923	20.1850	20.1966	20.1966	20.1450	19.7816	19.2024	18.7276	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.6086	18.8626	19.2312	19.6829	19.9423	20.0350	20.0466	20.0466	19.9950	19.6316	19.0524	18.5776	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9870	0.9738	0.9429	0.8530	0.6903	0.4805	0.3231	0.3697	0.6384	0.9007	0.9743	0.9893	(94)
Useful gains	530.0800	606.9966	662.3050	685.7517	598.9877	413.8683	265.4826	279.7775	435.0158	527.5004	514.6953	507.4906	(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	1140.0155	1109.4366	1008.9049	843.7923	643.4533	419.5930	266.0818	280.9436	457.0712	705.0722	937.5809	1133.4719	(97)
Space heating kWh	453.7920	337.6396	257.8704	113.7892	33.0824	0.0000	0.0000	0.0000	0.0000	132.1134	304.4776	465.7301	(98a)
Space heating requirement - total per year (kWh/year)												2098.4948	
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	453.7920	337.6396	257.8704	113.7892	33.0824	0.0000	0.0000	0.0000	0.0000	132.1134	304.4776	465.7301	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2098.4948	
Space heating per m2										(98c) / (4) =		29.1701	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)

Fraction of space heat from main system(s)

Efficiency of main space heating system 1 (in %)

Efficiency of main space heating system 2 (in %)

Efficiency of secondary/supplementary heating system, %

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	453.7920	337.6396	257.8704	113.7892	33.0824	0.0000	0.0000	0.0000	0.0000	132.1134	304.4776	465.7301	(98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000	(210)
Space heating fuel (main heating system)	511.6032	380.6535	290.7220	128.2855	37.2970	0.0000	0.0000	0.0000	0.0000	148.9441	343.2668	525.0621	(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	203.1316	178.7597	187.8406	160.3946	152.2064	133.6017	129.3554	136.5325	140.2712	160.6461	175.9637	200.3051	(64)
Efficiency of water heater (217)m	84.4937	84.0176	83.0641	81.0653	78.3396	76.4000	76.4000	76.4000	76.4000	81.5001	83.7610	84.6037	(216)
Fuel for water heating, kWh/month	240.4103	212.7645	226.1392	197.8586	194.2905	174.8713	169.3134	178.7074	183.6011	197.1117	210.0782	236.7570	(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	21.4424	17.2019	15.4884	11.3475	8.7651	7.1612	7.9958	10.3933	13.4998	17.7125	20.0062	22.0383	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-17.6572	-28.3554	-46.8116	-58.9613	-67.8955	-64.8486	-63.6947	-57.6705	-47.4163	-34.7332	-20.3697	-14.7472	(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	-6.0978	-15.0225	-36.1708	-64.1075	-93.4459	-97.3440	-94.8645	-74.8489	-47.9141	-23.2741	-8.5642	-4.6099	(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												2365.8341	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												76.4000	
Water heating fuel used												2421.9032	(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)												173.0524	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1089.4251	(233)

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Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3957.3646 (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	2365.8341	0.2100	496.8252 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2421.9032	0.2100	508.5997 (264)
Space and water heating			1005.4248 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	173.0524	0.1443	24.9768 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-523.1611	0.1324	-69.2700
PV Unit electricity exported	-566.2640	0.1220	-69.0871
Total			-138.3571 (269)
Total CO2, kg/year			903.9738 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.5700 (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	2365.8341	1.1300	2673.3925 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2421.9032	1.1300	2736.7506 (278)
Space and water heating			5410.1431 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	173.0524	1.5338	265.4335 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-523.1611	1.4892	-779.1090
PV Unit electricity exported	-566.2640	0.4477	-253.4883
Total			-1032.5974 (283)
Total Primary energy kWh/year			4773.0801 (286)
Dwelling Primary energy Rate (DPER)			66.3500 (287)

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

1. Overall dwelling characteristics

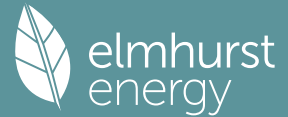
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	35.9700 (1b)	x 2.4000 (2b)	= 86.3280 (1b) - (3b)
First floor	35.9700 (1c)	x 2.6300 (2c)	= 94.6011 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.9400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 180.9291 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1658 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4158 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3846 (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	0.4904	0.4808	0.4712	0.4231	0.4135	0.3654	0.3654	0.3558	0.3846	0.4135	0.4327	0.4519 (22b)
Effective ac	0.6202	0.6156	0.6110	0.5895	0.5855	0.5668	0.5668	0.5633	0.5740	0.5855	0.5936	0.6021 (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 Opaque door			2.1400	1.0000	2.1400			(26)
TER Opening Type (Uw = 1.20)			11.9900	1.1450	13.7290			(27)
Heatloss Floor 1			35.9700	0.1300	4.6761			(28a)
Brick wall	85.3600	14.1300	71.2300	0.1800	12.8214			(29a)
Plane roof	35.9700		35.9700	0.1100	3.9567			(30)
Total net area of external elements Aum(A, m2)			157.3000					(31)
Fabric heat loss, W/K = Sum (A x U)								(33)
Party Wall 1			41.4000	0.0000	0.0000			(32)

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

235.3264 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	9.6100	0.0500	0.4805	
E3 Sill	7.0100	0.0500	0.3505	
E4 Jamb	25.5000	0.0500	1.2750	
E5 Ground floor (normal)	16.9700	0.1600	2.7152	
E6 Intermediate floor within a dwelling	16.9700	0.0000	0.0000	
E16 Corner (normal)	10.0600	0.0900	0.9054	
E18 Party wall between dwellings	10.0600	0.0600	0.6036	
P1 Party wall - Ground floor	8.2300	0.0800	0.6584	
P2 Party wall - Intermediate floor within a dwelling	16.4600	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	8.2300	0.1200	0.9876	
E10 Eaves (insulation at ceiling level)	8.7400	0.0600	0.5244	
E12 Gable (insulation at ceiling level)	8.2300	0.0600	0.4938	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				8.9944 (36)
Point Thermal bridges				0.0000
Total fabric heat loss				(33) + (36) + (36a) = 46.3176 (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	37.0327	36.7539	36.4806	35.1971	34.9570	33.8391	33.8391	33.6321	34.2697	34.9570	35.4428	35.9507	(38)
Heat transfer coeff	83.3503	83.0715	82.7983	81.5147	81.2746	80.1567	80.1567	79.9497	80.5873	81.2746	81.7604	82.2683	(39)
Average = Sum(39)m / 12 =												81.5136	
HLP	1.1586	1.1547	1.1509	1.1331	1.1298	1.1142	1.1142	1.1113	1.1202	1.1298	1.1365	1.1436	(40)
HLP (average)												1.1331	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

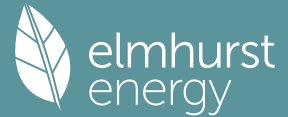
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2923 (42)
Hot water usage for mixer showers													
62.6538	61.7122	60.3402	57.7150	55.7777	53.6172	52.3892	53.7509	55.2435	57.5632	60.2448	62.4137	62.4137	(42a)
Hot water usage for baths													
27.0664	26.6644	26.0984	25.0546	24.2731	23.4065	22.9384	23.5005	24.1126	25.0399	26.1051	26.9749	26.9749	(42b)
Hot water usage for other uses													
38.1053	36.7197	35.3340	33.9484	32.5627	31.1771	31.1771	32.5627	33.9484	35.3340	36.7197	38.1053	38.1053	(42c)
Average daily hot water use (litres/day)												117.5007	(43)
Daily hot water use													
127.8255	125.0963	121.7725	116.7180	112.6135	108.2008	106.5048	109.8142	113.3045	117.9371	123.0695	127.4939	127.4939	(44)
Energy conte	202.4443	178.1355	187.1599	159.7811	151.5995	133.0456	128.8083	135.9729	139.7158	160.0395	175.3350	199.6247	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
30.3666	26.7203	28.0740	23.9672	22.7399	19.9568	19.3212	20.3959	20.9574	24.0059	26.3003	29.9437	29.9437	(46)
Water storage loss:													
Total storage loss													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
253.4032	224.1629	238.1188	209.0962	202.5584	182.3606	179.7672	186.9318	189.0308	210.9984	224.6501	250.5836	250.5836	(62)
WWHRS	-28.6427	-25.3318	-26.5260	-21.9646	-20.4702	-17.5165	-16.4189	-17.4599	-18.1233	-21.3653	-24.2043	-28.1123	(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	224.7605	198.8310	211.5927	187.1316	182.0882	164.8441	163.3482	169.4719	170.9076	189.6331	200.4458	222.4713	(64)
12Total per year (kWh/year)												2285.5261	(64)
Electric shower(s)												2286	(64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
80.0525	70.7369	74.9704	65.4560	63.1466	56.5664	55.5685	57.9507	58.7843	65.9529	70.6277	79.1149	79.1149	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
105.3508	116.6383	105.3508	108.8625	105.3508	108.8625	105.3508	105.3508	108.8625	105.3508	108.8625	105.3508	105.3508	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
201.7819	203.8757	198.5993	187.3663	173.1867	159.8598	150.9567	148.8628	154.1393	165.3722	179.5519	192.8787	192.8787	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	(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)													
-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	(71)
Water heating gains (Table 5)													
107.5974	105.2632	100.7666	90.9111	84.8744	78.5645	74.6888	77.8907	81.6448	88.6463	98.0940	106.3373	106.3373	(72)
Total internal gains													

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475.1143 486.1616 465.1010 447.5241 423.7961 404.6710 388.3805 389.4886 402.0308 419.7536 446.8926 464.9511 (73)

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					1.4200	10.6334	0.6300		0.7000	0.7700		4.6146 (74)
East					6.0100	19.6403	0.6300		0.7000	0.7700		36.0739 (76)
West					4.5600	19.6403	0.6300		0.7000	0.7700		27.3706 (80)
Solar gains	68.0591	132.9296	219.3782	322.1650	397.7511	408.6882	388.4487	331.5453	255.7345	157.7656	84.8005	56.0206 (83)
Total gains	543.1734	619.0913	684.4791	769.6892	821.5472	813.3592	776.8292	721.0339	657.7654	577.5192	531.6932	520.9717 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.4198	56.6091	56.7960	57.6902	57.8607	58.6677	58.6677	58.8196	58.3542	57.8607	57.5169	57.1618
alpha	4.7613	4.7739	4.7864	4.8460	4.8574	4.9112	4.9112	4.9213	4.8903	4.8574	4.8345	4.8108
util living area	0.9931	0.9863	0.9696	0.9137	0.7930	0.6048	0.4488	0.5008	0.7539	0.9442	0.9863	0.9943 (86)
MIT	19.6700	19.8652	20.1612	20.5563	20.8363	20.9668	20.9937	20.9895	20.9054	20.5295	20.0411	19.6481 (87)
Th 2	19.9533	19.9564	19.9595	19.9739	19.9766	19.9892	19.9892	19.9916	19.9844	19.9766	19.9711	19.9654 (88)
util rest of house	0.9909	0.9821	0.9602	0.8877	0.7374	0.5197	0.3484	0.3957	0.6734	0.9216	0.9814	0.9925 (89)
MIT 2	18.4190	18.6688	19.0429	19.5325	19.8419	19.9705	19.9872	19.9878	19.9213	19.5139	18.9046	18.3997 (90)
Living area fraction	18.6435	18.8835	19.2436	19.7162	20.0204	20.1493	20.1678	20.1676	20.0979	19.6962	19.1086	18.6237 (92)
MIT	18.6435	18.8835	19.2436	19.7162	20.0204	20.1493	20.1678	20.1676	20.0979	19.6962	19.1086	18.6237 (93)
Temperature adjustment	18.6435	18.8835	19.2436	19.7162	20.0204	20.1493	20.1678	20.1676	20.0979	19.6962	19.1086	18.6237 (93)
adjusted MIT	18.6435	18.8835	19.2436	19.7162	20.0204	20.1493	20.1678	20.1676	20.0979	19.6962	19.1086	18.6237 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9871	0.9762	0.9518	0.8800	0.7400	0.5337	0.3664	0.4144	0.6833	0.9138	0.9757	0.9892 (94)
Useful gains	536.1724	604.3693	651.4842	677.3290	607.9232	434.1094	284.6446	298.8117	449.4220	527.7142	518.7663	515.3540 (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	1195.5331	1161.6294	1055.1488	881.6836	676.2356	444.8143	285.9836	301.2155	483.3563	739.2886	981.8246	1186.6141 (97)
Space heating kWh	490.5643	374.4788	300.3265	147.1353	50.8244	0.0000	0.0000	0.0000	0.0000	157.4114	333.4020	499.4175 (98a)
Space heating requirement - total per year (kWh/year)												2353.5602
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	490.5643	374.4788	300.3265	147.1353	50.8244	0.0000	0.0000	0.0000	0.0000	157.4114	333.4020	499.4175 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2353.5602
Space heating per m2										(98c) / (4) =		32.7156 (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	490.5643	374.4788	300.3265	147.1353	50.8244	0.0000	0.0000	0.0000	0.0000	157.4114	333.4020	499.4175 (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)	530.9138	405.2801	325.0286	159.2373	55.0047	0.0000	0.0000	0.0000	0.0000	170.3586	360.8247	540.4952 (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	224.7605	198.8310	211.5927	187.1316	182.0882	164.8441	163.3482	169.4719	170.9076	189.6331	200.4458	222.4713 (64)
Efficiency of water heater	86.0058	85.7162	85.1315	83.8714	82.0316	80.3000	80.3000	80.3000	80.3000	83.9851	85.4633	80.3000 (216)
Fuel for water heating, kWh/month	261.3318	231.9643	248.5482	223.1174	221.9731	205.2853	203.4225	211.0484	212.8363	225.7937	234.5402	258.5086 (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	21.8898	17.5608	15.8116	11.5842	8.9480	7.3106	8.1627	10.6101	13.7815	18.0821	20.4237	22.4982 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-33.7431	-47.6165	-68.5151	-77.1284	-83.2597	-77.7597	-76.8093	-72.4726	-64.8234	-54.5001	-37.1167	-29.1684 (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)	-18.9241	-39.8281	-79.1918	-118.9811	-157.3561	-158.1076	-156.2363	-132.2608	-96.9188	-56.9593	-25.2681	-14.9624 (233b)

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Electricity generated by wind turbines (Appendix M) (negative quantity)														
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)														
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													2547.1431	(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													2738.3698	(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)													176.6633	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-1777.9074	(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													3770.2687	(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	2547.1431	0.2100	534.9000 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2738.3698	0.2100	575.0577 (264)
Space and water heating			1109.9577 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	176.6633	0.1443	25.4980 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-722.9129	0.1346	-97.2747
PV Unit electricity exported	-1054.9945	0.1259	-132.8108
Total			-230.0855 (269)
Total CO2, kg/year			917.2994 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.7500 (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	2547.1431	1.1300	2878.2716 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2738.3698	1.1300	3094.3578 (278)
Space and water heating			5972.6295 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	176.6633	1.5338	270.9721 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-722.9129	1.4973	-1082.4225
PV Unit electricity exported	-1054.9945	0.4621	-487.5069
Total			-1569.9293 (283)
Total Primary energy kWh/year			4803.7730 (286)
Target Primary Energy Rate (TPER)			66.7700 (287)

Full SAP Calculation Printout



Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024
Assessment Reference	Plot 15		Prop Type Ref	SAP VG 21-0282		
Property						
SAP Rating	91 B	DER	12.57	TER	12.75	
Environmental	90 B	% DER < TER				1.41
CO ₂ Emissions (t/year)	0.87	DFEE	35.32	TFEE	38.67	
Compliance Check	See BREL	% DFEE < TFEE				8.68
% DPER < TPER	0.63	DPER	66.35	TPER	66.77	
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	35.9700 (1b)	x 2.4000 (2b)	= 86.3280 (1b) - (3b)
First floor	35.9700 (1c)	x 2.6300 (2c)	= 94.6011 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.9400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 180.9291 (5)

2. Ventilation rate

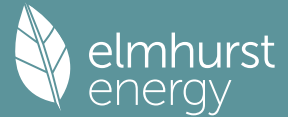
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1658 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3658 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3384 (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	0.4314	0.4230	0.4145	0.3722	0.3638	0.3215	0.3215	0.3130	0.3384	0.3638	0.3807	0.3976 (22b)
Effective ac	0.5931	0.5895	0.5859	0.5693	0.5662	0.5517	0.5517	0.5490	0.5572	0.5662	0.5725	0.5790 (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
Front door			2.1400	1.1000	2.3540		(26)
Windows (Uw = 1.30)			11.9900	1.2357	14.8165		(27)
Heatloss Floor 1			35.9700	0.1300	4.6761	110.0000	3956.7000 (28a)
Brick wall	85.3600	14.1300	71.2300	0.1900	13.5337	110.0000	7835.3000 (29a)
Plane roof	35.9700		35.9700	0.0900	3.2373	9.0000	323.7300 (30)
Total net area of external elements Aum(A, m ²)			157.3000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.6176		(33)
Party Wall 1			41.4000	0.0000	0.0000	70.0000	2898.0000 (32)
Internal Wall 2			104.9400			9.0000	944.4600 (32c)
Internal Floor			35.9700			18.0000	647.4600 (32d)
Internal Ceiling 1			35.9700			9.0000	323.7300 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	16929.3800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							235.3264 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				9.6100	0.0240	0.2306	
E3 Sill				7.0100	0.0220	0.1542	
E4 Jamb				25.5000	0.0170	0.4335	

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E5 Ground floor (normal)	16.9700	0.0920	1.5612
E6 Intermediate floor within a dwelling	16.9700	0.0010	0.0170
E16 Corner (normal)	10.0600	0.0460	0.4628
E18 Party wall between dwellings	10.0600	0.0400	0.4024
P1 Party wall - Ground floor	8.2300	0.0690	0.5679
P2 Party wall - Intermediate floor within a dwelling	16.4600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	8.2300	0.1010	0.8312
E10 Eaves (insulation at ceiling level)	8.7400	0.0600	0.5244
E12 Gable (insulation at ceiling level)	8.2300	0.0560	0.4609
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.6461 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	44.2637 (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	35.4099	35.1941	34.9826	33.9892	33.8034	32.9382	32.9382	32.7779	33.2714	33.8034	34.1794	34.5725 (38)
Average = Sum(39)m / 12 =	79.6737	79.4579	79.2464	78.2530	78.0671	77.2019	77.2019	77.0417	77.5352	78.0671	78.4431	78.8362 (39)
												78.2521
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1075	1.1045	1.1016	1.0878	1.0852	1.0731	1.0731	1.0709	1.0778	1.0852	1.0904	1.0959 (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												2.2923 (42)
Hot water usage for mixer showers												
	62.6538	61.7122	60.3402	57.7150	55.7777	53.6172	52.3892	53.7509	55.2435	57.5632	60.2448	62.4137 (42a)
Hot water usage for baths	27.0664	26.6644	26.0984	25.0546	24.2731	23.4065	22.9384	23.5005	24.1126	25.0399	26.1051	26.9749 (42b)
Hot water usage for other uses	38.1053	36.7197	35.3340	33.9484	32.5627	31.1771	31.1771	32.5627	33.9484	35.3340	36.7197	38.1053 (42c)
Average daily hot water use (litres/day)												117.5007 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	127.8255	125.0963	121.7725	116.7180	112.6135	108.2008	106.5048	109.8142	113.3045	117.9371	123.0695	127.4939 (44)
Energy conte	202.4443	178.1355	187.1599	159.7811	151.5995	133.0456	128.8083	135.9729	139.7158	160.0395	175.3350	199.6247 (45)
Energy content (annual)										Total = Sum(45)m =		1951.6620
Distribution loss (46)m = 0.15 x (45)m												
	30.3666	26.7203	28.0740	23.9672	22.7399	19.9568	19.3212	20.3959	20.9574	24.0059	26.3003	29.9437 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.6873	0.6242	0.6807	0.6134	0.6069	0.5561	0.5472	0.5596	0.5555	0.6066	0.6286	0.6804 (61)
Total heat required for water heating calculated for each month												
	203.1316	178.7597	187.8406	160.3946	152.2064	133.6017	129.3554	136.5325	140.2712	160.6461	175.9637	200.3051 (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	203.1316	178.7597	187.8406	160.3946	152.2064	133.6017	129.3554	136.5325	140.2712	160.6461	175.9637	200.3051 (64)
								Total per year (kWh/year) = Sum(64)m =				1959.0085 (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												
	67.4846	59.3861	62.4008	53.2806	50.5586	44.3767	42.9655	45.3509	46.5944	53.3648	58.4561	66.5453 (65)

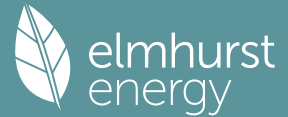
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	24.4974	21.7583	17.6951	13.3963	10.0139	8.4542	9.1350	11.8740	15.9373	20.2361	23.6185	25.1782 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	301.1670	304.2921	296.4168	279.6512	258.4875	238.5967	225.3085	222.1833	230.0586	246.8243	267.9879	287.8787 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460 (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)												
	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915 (71)
Water heating gains (Table 5)												
	90.7051	88.3722	83.8721	74.0008	67.9550	61.6343	57.7494	60.9555	64.7144	71.7269	81.1890	89.4426 (72)
Total internal gains	516.2611	514.3144	497.8757	466.9400	436.3482	405.5769	389.0846	391.9045	407.6020	438.6789	472.6871	502.3912 (73)

6. Solar gains

[Jan]												
		Area	Solar flux	g	FF	Access	Gains					
		m2	Table 6a	Specific data	Specific data	factor	W					
			W/m2	or Table 6b	or Table 6c	Table 6d						
North		1.4200	10.6334	0.7300	0.7000	0.7700	5.3471 (74)					
East		6.0100	19.6403	0.7300	0.7000	0.7700	41.8000 (76)					
West		4.5600	19.6403	0.7300	0.7000	0.7700	31.7151 (80)					
Solar gains	78.8621	154.0296	254.2001	373.3023	460.8862	473.5593	450.1072	384.1716	296.3273	182.8078	98.2609	64.9128 (83)
Total gains	595.1233	668.3440	752.0758	840.2423	897.2345	879.1362	839.1918	776.0761	703.9294	621.4867	570.9480	567.3040 (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	59.0233	59.1836	59.3416	60.0949	60.2380	60.9131	60.9131	61.0397	60.6512	60.2380	59.9492	59.6503
alpha	4.9349	4.9456	4.9561	5.0063	5.0159	5.0609	5.0609	5.0693	5.0434	5.0159	4.9966	4.9767
util living area	0.9895	0.9803	0.9540	0.8791	0.7351	0.5483	0.4023	0.4519	0.7036	0.9232	0.9808	0.9915 (86)
MIT	19.8316	20.0163	20.3194	20.6707	20.8948	20.9808	20.9967	20.9942	20.9370	20.6233	20.1617	19.7970 (87)
Th 2	19.9947	19.9972	19.9996	20.0108	20.0130	20.0228	20.0228	20.0247	20.0190	20.0130	20.0087	20.0042 (88)
util rest of house	0.9864	0.9747	0.9410	0.8474	0.6773	0.4703	0.3143	0.3585	0.6236	0.8952	0.9743	0.9890 (89)
MIT 2	18.6536	18.8884	19.2667	19.6914	19.9292	20.0123	20.0218	20.0226	19.9784	19.6505	19.0831	18.6167 (90)
Living area fraction									fLA = Living area / (4) =			0.1795 (91)
MIT	18.8650	19.0908	19.4556	19.8672	20.1025	20.1861	20.1967	20.1970	20.1504	19.8251	19.2767	18.8285 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.7150	18.9408	19.3056	19.7172	19.9525	20.0361	20.0467	20.0470	20.0004	19.6751	19.1267	18.6785 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9808	0.9666	0.9295	0.8366	0.6735	0.4714	0.3164	0.3607	0.6220	0.8833	0.9662	0.9843 (94)
Useful gains	583.7118	646.0240	699.0711	702.9243	604.3141	414.4181	265.5496	279.9271	437.8097	548.9440	551.6677	558.3711 (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	1148.4948	1115.6517	1014.7985	846.4746	644.2493	419.6757	266.0932	280.9683	457.4921	708.4676	943.4112	1141.4278 (97)
Space heating kWh	420.1985	315.5898	234.9012	103.3561	29.7117	0.0000	0.0000	0.0000	0.0000	118.6855	282.0553	433.7942 (98a)
Space heating requirement - total per year (kWh/year)												1938.2924
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	420.1985	315.5898	234.9012	103.3561	29.7117	0.0000	0.0000	0.0000	0.0000	118.6855	282.0553	433.7942 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1938.2924
Space heating per m2										(98c) / (4) =		26.9432 (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 %)													88.7000 (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	420.1985	315.5898	234.9012	103.3561	29.7117	0.0000	0.0000	0.0000	0.0000	118.6855	282.0553	433.7942 (98)	
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)	
Space heating fuel (main heating system)	473.7300	355.7946	264.8266	116.5233	33.4969	0.0000	0.0000	0.0000	0.0000	133.8055	317.9880	489.0577 (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	203.1316	178.7597	187.8406	160.3946	152.2064	133.6017	129.3554	136.5325	140.2712	160.6461	175.9637	200.3051 (64)	
Efficiency of water heater	84.2783	83.8203	82.7783	80.7902	78.1704	76.4000	76.4000	76.4000	76.4000	81.1833	83.5333	76.4000 (216)	
Fuel for water heating, kWh/month	241.0248	213.2655	226.9199	198.5323	194.7110	174.8713	169.3134	178.7074	183.6011	197.8808	210.6509	237.3076 (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	21.4424	17.2019	15.4884	11.3475	8.7651	7.1612	7.9958	10.3933	13.4998	17.7125	20.0062	22.0383 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-17.6572	-28.3554	-46.8116	-58.9613	-67.8955	-64.8486	-63.6947	-57.6705	-47.4163	-34.7332	-20.3697	-14.7472 (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)	-6.0978	-15.0225	-36.1708	-64.1075	-93.4459	-97.3440	-94.8645	-74.8489	-47.9141	-23.2741	-8.5642	-4.6099 (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													2185.2225 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													76.4000
Water heating fuel used													2426.7859 (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)													173.0524 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-1089.4251 (233)
Wind generation													0.0000 (234)

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Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3781.6358 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2185.2225	3.6400	79.5421 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2426.7859	3.6400	88.3350 (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	173.0524	16.4900	28.5363 (250)
Additional standing charges			92.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-523.1611	16.4900	-86.2693
PV Unit electricity exported	-566.2640	5.5900	-31.6542
Total			-117.9234 (252)
Total energy cost			184.6714 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.5685 (257)
SAP value		90.7844
SAP rating (Section 12)		91 (258)
SAP band		B

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	2185.2225	0.2100	458.8967 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2426.7859	0.2100	509.6250 (264)
Space and water heating			968.5218 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	173.0524	0.1443	24.9768 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-523.1611	0.1324	-69.2700
PV Unit electricity exported	-566.2640	0.1220	-69.0871
Total			-138.3571 (269)
Total CO2, kg/year			867.0708 (272)
CO2 emissions per m2			12.0500 (273)
EI value			90.0644
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

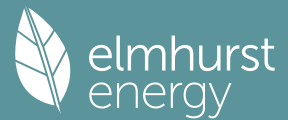
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	35.9700 (1b)	x 2.4000 (2b)	= 86.3280 (1b) - (3b)
First floor	35.9700 (1c)	x 2.6300 (2c)	= 94.6011 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.9400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	180.9291 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1658 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3658 (18)

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Number of sides sheltered

1 (19)

Shelter factor

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

Infiltration rate adjusted to include shelter factor

$$(21) = (18) \times (20) = 0.3384 \quad (21)$$

Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4314	0.4230	0.4145	0.3722	0.3638	0.3215	0.3215	0.3130	0.3384	0.3638	0.3807	0.3976 (22b)
Effective ac	0.5931	0.5895	0.5859	0.5693	0.5662	0.5517	0.5517	0.5490	0.5572	0.5662	0.5725	0.5790 (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	
Front door			2.1400	1.1000	2.3540			(26)
Windows (Uw = 1.30)			11.9900	1.2357	14.8165			(27)
Heatloss Floor 1			35.9700	0.1300	4.6761	110.0000	3956.7000	(28a)
Brick wall	85.3600	14.1300	71.2300	0.1900	13.5337	110.0000	7835.3000	(29a)
Plane roof	35.9700		35.9700	0.0900	3.2373	9.0000	323.7300	(30)
Total net area of external elements Aum(A, m2)			157.3000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.6176			(33)
Party Wall 1			41.4000	0.0000	0.0000	70.0000	2898.0000	(32)
Internal Wall 2			104.9400			9.0000	944.4600	(32c)
Internal Floor			35.9700			18.0000	647.4600	(32d)
Internal Ceiling 1			35.9700			9.0000	323.7300	(32e)

Heat capacity Cm = Sum(A x k)

$$(28)...(30) + (32) + (32a)...(32e) = 16929.3800 \quad (34)$$

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

$$235.3264 \quad (35)$$

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	9.6100	0.0240	0.2306	
E3 Sill	7.0100	0.0220	0.1542	
E4 Jamb	25.5000	0.0170	0.4335	
E5 Ground floor (normal)	16.9700	0.0920	1.5612	
E6 Intermediate floor within a dwelling	16.9700	0.0010	0.0170	
E16 Corner (normal)	10.0600	0.0460	0.4628	
E18 Party wall between dwellings	10.0600	0.0400	0.4024	
P1 Party wall - Ground floor	8.2300	0.0690	0.5679	
P2 Party wall - Intermediate floor within a dwelling	16.4600	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	8.2300	0.1010	0.8312	
E10 Eaves (insulation at ceiling level)	8.7400	0.0600	0.5244	
E12 Gable (insulation at ceiling level)	8.2300	0.0560	0.4609	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.6461	(36)
Point Thermal Bridges			0.0000	(36a) =
Total fabric heat loss			44.2637	(33) + (36) + (36a) = (37)

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

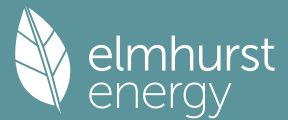
(38)m	Jan 35.4099	Feb 35.1941	Mar 34.9826	Apr 33.9892	May 33.8034	Jun 32.9382	Jul 32.9382	Aug 32.7779	Sep 33.2714	Oct 33.8034	Nov 34.1794	Dec 34.5725 (38)
Heat transfer coeff	79.6737	79.4579	79.2464	78.2530	78.0671	77.2019	77.2019	77.0417	77.5352	78.0671	78.4431	78.8362 (39)
Average = Sum(39)m / 12 =												78.2521

HLP	Jan 1.1075	Feb 1.1045	Mar 1.1016	Apr 1.0878	May 1.0852	Jun 1.0731	Jul 1.0731	Aug 1.0709	Sep 1.0778	Oct 1.0852	Nov 1.0904	Dec 1.0959 (40)
HLP (average)												1.0877
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2923 (42)
Hot water usage for mixer showers	62.6538	61.7122	60.3402	57.7150	55.7777	53.6172	52.3892	53.7509	55.2435	57.5632	60.2448	62.4137 (42a)
Hot water usage for baths	27.0664	26.6644	26.0984	25.0546	24.2731	23.4065	22.9384	23.5005	24.1126	25.0399	26.1051	26.9749 (42b)
Hot water usage for other uses	38.1053	36.7197	35.3340	33.9484	32.5627	31.1771	31.1771	32.5627	33.9484	35.3340	36.7197	38.1053 (42c)
Average daily hot water use (litres/day)												117.5007 (43)
Daily hot water use	127.8255	125.0963	121.7725	116.7180	112.6135	108.2008	106.5048	109.8142	113.3045	117.9371	123.0695	127.4939 (44)
Energy conte	202.4443	178.1355	187.1599	159.7811	151.5995	133.0456	128.8083	135.9729	139.7158	160.0395	175.3350	199.6247 (45)
Energy content (annual)										Total = Sum(45)m =		1951.6620
Distribution loss (46)m = 0.15 x (45)m	30.3666	26.7203	28.0740	23.9672	22.7399	19.9568	19.3212	20.3959	20.9574	24.0059	26.3003	29.9437 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.6873	0.6242	0.6807	0.6134	0.6069	0.5561	0.5472	0.5596	0.5555	0.6066	0.6286	0.6804 (61)
Total heat required for water heating calculated for each month	203.1316	178.7597	187.8406	160.3946	152.2064	133.6017	129.3554	136.5325	140.2712	160.6461	175.9637	200.3051 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Output from w/h	203.1316	178.7597	187.8406	160.3946	152.2064	133.6017	129.3554	136.5325	140.2712	160.6461	175.9637	200.3051 (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	67.4846	59.3861	62.4008	53.2806	50.5586	44.3767	42.9655	45.3509	46.5944	53.3648	58.4561	66.5453 (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	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.4974	21.7583	17.6951	13.3963	10.0139	8.4542	9.1350	11.8740	15.9373	20.2361	23.6185	25.1782	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	301.1670	304.2921	296.4168	279.6512	258.4875	238.5967	225.3085	222.1833	230.0586	246.8243	267.9879	287.8787	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	(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)	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	(71)
Water heating gains (Table 5)	90.7051	88.3722	83.8721	74.0008	67.9550	61.6343	57.7494	60.9555	64.7144	71.7269	81.1890	89.4426	(72)
Total internal gains	516.2611	514.3144	497.8757	466.9400	436.3482	405.5769	389.0846	391.9045	407.6020	438.6789	472.6871	502.3912	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g Specific data or Table 6c	FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				1.4200	10.6334		0.7300	0.7000		0.7700		5.3471 (74)
East				6.0100	19.6403		0.7300	0.7000		0.7700		41.8000 (76)
West				4.5600	19.6403		0.7300	0.7000		0.7700		31.7151 (80)
Solar gains	78.8621	154.0296	254.2001	373.3023	460.8862	473.5593	450.1072	384.1716	296.3273	182.8078	98.2609	64.9128 (83)
Total gains	595.1233	668.3440	752.0758	840.2423	897.2345	879.1362	839.1918	776.0761	703.9294	621.4867	570.9480	567.3040 (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	59.0233	59.1836	59.3416	60.0949	60.2380	60.9131	60.9131	61.0397	60.6512	60.2380	59.9492	59.6503	
alpha	4.9349	4.9456	4.9561	5.0063	5.0159	5.0609	5.0609	5.0693	5.0434	5.0159	4.9966	4.9767	
util living area	0.9895	0.9803	0.9540	0.8791	0.7351	0.5483	0.4023	0.4519	0.7036	0.9232	0.9808	0.9915	(86)
MIT	19.8316	20.0163	20.3194	20.6707	20.8948	20.9808	20.9967	20.9942	20.9370	20.6233	20.1617	19.7970	(87)
Th 2	19.9947	19.9972	19.9996	20.0108	20.0130	20.0228	20.0228	20.0247	20.0190	20.0130	20.0087	20.0042	(88)
util rest of house	0.9864	0.9747	0.9410	0.8474	0.6773	0.4703	0.3143	0.3585	0.6236	0.8952	0.9743	0.9890	(89)
MIT 2	18.6536	18.8884	19.2667	19.6914	19.9292	20.0123	20.0218	20.0226	19.9784	19.6505	19.0831	18.6167	(90)
Living area fraction	18.8650	19.0908	19.4556	19.8672	20.1025	20.1861	20.1967	20.1970	20.1504	19.8251	19.2767	18.8285	(91)
MIT	18.7150	18.9408	19.3056	19.7172	19.9525	20.0361	20.0467	20.0470	20.0004	19.6751	19.1267	18.6785	(93)
Temperature adjustment												-0.1500	
adjusted MIT													

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9808	0.9666	0.9295	0.8366	0.6735	0.4714	0.3164	0.3607	0.6220	0.8833	0.9662	0.9843	(94)
Useful gains	583.7118	646.0240	699.0711	702.9243	604.3141	414.4181	265.5496	279.9271	437.8097	548.9440	551.6677	558.3711	(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	1148.4948	1115.6517	1014.7985	846.4746	644.2493	419.6757	266.0932	280.9683	457.4921	708.4676	943.4112	1141.4278	(97)
Space heating kWh	420.1985	315.5898	234.9012	103.3561	29.7117	0.0000	0.0000	0.0000	0.0000	118.6855	282.0553	433.7942	(98a)
Space heating requirement - total per year (kWh/year)												1938.2924	
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	420.1985	315.5898	234.9012	103.3561	29.7117	0.0000	0.0000	0.0000	0.0000	118.6855	282.0553	433.7942	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1938.2924	
Space heating per m2										(98c) / (4) =		26.9432	(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 %)													88.7000 (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	
	420.1985	315.5898	234.9012	103.3561	29.7117	0.0000	0.0000	0.0000	0.0000	118.6855	282.0553	433.7942	(98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000	(210)
Space heating fuel (main heating system)	473.7300	355.7946	264.8266	116.5233	33.4969	0.0000	0.0000	0.0000	0.0000	133.8055	317.9880	489.0577	(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	203.1316	178.7597	187.8406	160.3946	152.2064	133.6017	129.3554	136.5325	140.2712	160.6461	175.9637	200.3051	(64)
Efficiency of water heater												76.4000	(216)

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(217)m	84.2783	83.8203	82.7783	80.7902	78.1704	76.4000	76.4000	76.4000	76.4000	81.1833	83.5333	84.4073	(217)
Fuel for water heating, kWh/month	241.0248	213.2655	226.9199	198.5323	194.7110	174.8713	169.3134	178.7074	183.6011	197.8808	210.6509	237.3076	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	(231)
Lighting	21.4424	17.2019	15.4884	11.3475	8.7651	7.1612	7.9958	10.3933	13.4998	17.7125	20.0062	22.0383	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-17.6572	-28.3554	-46.8116	-58.9613	-67.8955	-64.8486	-63.6947	-57.6705	-47.4163	-34.7332	-20.3697	-14.7472	(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	-6.0978	-15.0225	-36.1708	-64.1075	-93.4459	-97.3440	-94.8645	-74.8489	-47.9141	-23.2741	-8.5642	-4.6099	(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												2185.2225	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												76.4000	
Water heating fuel used												2426.7859	(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)												173.0524	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1089.4251	(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												3781.6358	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2185.2225	5.6000	122.3725 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2426.7859	5.6000	135.9000 (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	173.0524	26.0600	45.0975 (250)
Additional standing charges			99.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-523.1611	26.0600	-136.3358
PV Unit electricity exported	-566.2640	5.8100	-32.8999
Total			-169.2357 (252)
Total energy cost			255.5458 (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	2185.2225	0.2100	458.8967 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2426.7859	0.2100	509.6250 (264)
Space and water heating			968.5218 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	173.0524	0.1443	24.9768 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-523.1611	0.1324	-69.2700
PV Unit electricity exported	-566.2640	0.1220	-69.0871
Total			-138.3571 (269)
Total CO2, kg/year			867.0708 (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	2185.2225	1.1300	2469.3015 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2426.7859	1.1300	2742.2681 (278)
Space and water heating			5211.5696 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	173.0524	1.5338	265.4335 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-523.1611	1.4892	-779.1090
PV Unit electricity exported	-566.2640	0.4477	-253.4883
Total			-1032.5974 (283)
Total Primary energy kWh/year			4574.5065 (286)

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SAP 10 EPC IMPROVEMENTS

Plot 15

Current energy efficiency rating: B 91
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 + 0.7 -£ 22 -144 kg (16.6%)

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

Potential energy efficiency rating: B 91
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	£68	£68	£0
Mains gas	£357	£357	£0
Space heating	£244	£244	£0
Water heating	£136	£136	£0
Lighting	£45	£45	£0
Generated (PV)	-£169	-£169	£0
Total cost of fuels	£256	£256	£0
Total cost of uses	£256	£256	£0
Delivered energy	53 kWh/m²	53 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.9 tonnes	0.0 tonnes
CO2 emissions per m²	12 kg/m²	12 kg/m²	0 kg/m²
Primary energy	64 kWh/m²	64 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

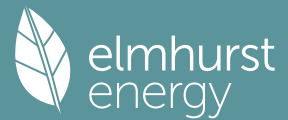
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	35.9700 (1b)	x 2.4000 (2b)	= 86.3280 (1b) - (3b)
First floor	35.9700 (1c)	x 2.6300 (2c)	= 94.6011 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.9400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	180.9291 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1658 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3658 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3384 (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	0.4314	0.4230	0.4145	0.3722	0.3638	0.3215	0.3215	0.3130	0.3384	0.3638	0.3807	0.3976 (22b)
Effective ac	0.5931	0.5895	0.5859	0.5693	0.5662	0.5517	0.5517	0.5490	0.5572	0.5662	0.5725	0.5790 (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	
Front door			2.1400	1.1000	2.3540			(26)
Windows (Uw = 1.30)			11.9900	1.2357	14.8165			(27)
Heatloss Floor 1			35.9700	0.1300	4.6761	110.0000	3956.7000	(28a)
Brick wall	85.3600	14.1300	71.2300	0.1900	13.5337	110.0000	7835.3000	(29a)
Plane roof	35.9700		35.9700	0.0900	3.2373	9.0000	323.7300	(30)
Total net area of external elements Aum(A, m2)			157.3000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.6176			(33)
Party Wall 1			41.4000	0.0000	0.0000	70.0000	2898.0000	(32)
Internal Wall 2			104.9400			9.0000	944.4600	(32c)
Internal Floor			35.9700			18.0000	647.4600	(32d)
Internal Ceiling 1			35.9700			9.0000	323.7300	(32e)

Heat capacity Cm = Sum(A x k)

(28)...(30) + (32) + (32a)...(32e) = 16929.3800 (34)

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

235.3264 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.6100	0.0240	0.2306
E3 Sill	7.0100	0.0220	0.1542
E4 Jamb	25.5000	0.0170	0.4335
E5 Ground floor (normal)	16.9700	0.0920	1.5612
E6 Intermediate floor within a dwelling	16.9700	0.0010	0.0170
E16 Corner (normal)	10.0600	0.0460	0.4628
E18 Party wall between dwellings	10.0600	0.0400	0.4024
P1 Party wall - Ground floor	8.2300	0.0690	0.5679
P2 Party wall - Intermediate floor within a dwelling	16.4600	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	8.2300	0.1010	0.8312
E10 Eaves (insulation at ceiling level)	8.7400	0.0600	0.5244
E12 Gable (insulation at ceiling level)	8.2300	0.0560	0.4609

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

5.6461 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 44.2637 (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	35.4099	35.1941	34.9826	33.9892	33.8034	32.9382	32.9382	32.7779	33.2714	33.8034	34.1794	34.5725
Heat transfer coeff	79.6737	79.4579	79.2464	78.2530	78.0671	77.2019	77.2019	77.0417	77.5352	78.0671	78.4431	78.8362
Average = Sum(39)m / 12 =												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1075	1.1045	1.1016	1.0878	1.0852	1.0731	1.0731	1.0709	1.0778	1.0852	1.0904	1.0959
HLP (average)												1.0877
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

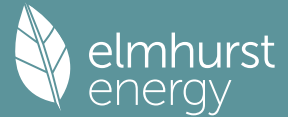
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2923 (42)
Hot water usage for mixer showers													
62.6538	61.7122	60.3402	57.7150	55.7777	53.6172	52.3892	53.7509	55.2435	57.5632	60.2448	62.4137	62.4137	(42a)
Hot water usage for baths													
27.0664	26.6644	26.0984	25.0546	24.2731	23.4065	22.9384	23.5005	24.1126	25.0399	26.1051	26.9749	26.9749	(42b)
Hot water usage for other uses													
38.1053	36.7197	35.3340	33.9484	32.5627	31.1771	31.1771	32.5627	33.9484	35.3340	36.7197	38.1053	38.1053	(42c)
Average daily hot water use (litres/day)													117.5007 (43)
Daily hot water use													
127.8255	125.0963	121.7725	116.7180	112.6135	108.2008	106.5048	109.8142	113.3045	117.9371	123.0695	127.4939	127.4939	(44)
Energy conte	202.4443	178.1355	187.1599	159.7811	151.5995	133.0456	128.8083	135.9729	139.7158	160.0395	175.3350	199.6247	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
30.3666	26.7203	28.0740	23.9672	22.7399	19.9568	19.3212	20.3959	20.9574	24.0059	26.3003	29.9437	29.9437	(46)
Water storage loss:													
Total storage loss													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.6873	0.6242	0.6807	0.6134	0.6069	0.5561	0.5472	0.5596	0.5555	0.6066	0.6286	0.6804	(61)
Total heat required for water heating calculated for each month													
203.1316	178.7597	187.8406	160.3946	152.2064	133.6017	129.3554	136.5325	140.2712	160.6461	175.9637	200.3051	200.3051	(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													
203.1316	178.7597	187.8406	160.3946	152.2064	133.6017	129.3554	136.5325	140.2712	160.6461	175.9637	200.3051	200.3051	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month													
67.4846	59.3861	62.4008	53.2806	50.5586	44.3767	42.9655	45.3509	46.5944	53.3648	58.4561	66.5453	66.5453	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
24.4974	21.7583	17.6951	13.3963	10.0139	8.4542	9.1350	11.8740	15.9373	20.2361	23.6185	25.1782	25.1782	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
301.1670	304.2921	296.4168	279.6512	258.4875	238.5967	225.3085	222.1833	230.0586	246.8243	267.9879	287.8787	287.8787	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

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Losses e.g. evaporation (negative values) (Table 5)	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915 (71)
Water heating gains (Table 5)	90.7051	88.3722	83.8721	74.0008	67.9550	61.6343	57.7494	60.9555	64.7144	71.7269	81.1890	89.4426 (72)
Total internal gains	516.2611	514.3144	497.8757	466.9400	436.3482	405.5769	389.0846	391.9045	407.6020	438.6789	472.6871	502.3912 (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				1.4200	10.6334	0.7300	0.7000	0.7700		5.3471 (74)		
East				6.0100	19.6403	0.7300	0.7000	0.7700		41.8000 (76)		
West				4.5600	19.6403	0.7300	0.7000	0.7700		31.7151 (80)		
Solar gains	78.8621	154.0296	254.2001	373.3023	460.8862	473.5593	450.1072	384.1716	296.3273	182.8078	98.2609	64.9128 (83)
Total gains	595.1233	668.3440	752.0758	840.2423	897.2345	879.1362	839.1918	776.0761	703.9294	621.4867	570.9480	567.3040 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	59.0233	59.1836	59.3416	60.0949	60.2380	60.9131	60.9131	61.0397	60.6512	60.2380	59.9492	59.6503
alpha	4.9349	4.9456	4.9561	5.0063	5.0159	5.0609	5.0609	5.0693	5.0434	5.0159	4.9966	4.9767
util living area	0.9895	0.9803	0.9540	0.8791	0.7351	0.5483	0.4023	0.4519	0.7036	0.9232	0.9808	0.9915 (86)
MIT	19.8316	20.0163	20.3194	20.6707	20.8948	20.9808	20.9967	20.9942	20.9370	20.6233	20.1617	19.7970 (87)
Th 2	19.9947	19.9972	19.9996	20.0108	20.0130	20.0228	20.0228	20.0247	20.0190	20.0130	20.0087	20.0042 (88)
util rest of house	0.9864	0.9747	0.9410	0.8474	0.6773	0.4703	0.3143	0.3585	0.6236	0.8952	0.9743	0.9890 (89)
MIT 2	18.6536	18.8884	19.2667	19.6914	19.9292	20.0123	20.0218	20.0226	19.9784	19.6505	19.0831	18.6167 (90)
Living area fraction	18.8650	19.0908	19.4556	19.8672	20.1025	20.1861	20.1967	20.1970	20.1504	19.8251	19.2767	18.8285 (92)
MIT	18.8650	19.0908	19.4556	19.8672	20.1025	20.1861	20.1967	20.1970	20.1504	19.8251	19.2767	18.8285 (92)
Temperature adjustment	18.7150	18.9408	19.3056	19.7172	19.9525	20.0361	20.0467	20.0470	20.0004	19.6751	19.1267	-0.1500
adjusted MIT	18.7150	18.9408	19.3056	19.7172	19.9525	20.0361	20.0467	20.0470	20.0004	19.6751	19.1267	18.6785 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9808	0.9666	0.9295	0.8366	0.6735	0.4714	0.3164	0.3607	0.6220	0.8833	0.9662	0.9843 (94)
Ext temp.	583.7118	646.0240	699.0711	702.9243	604.3141	414.4181	265.5496	279.9271	437.8097	548.9440	551.6677	558.3711 (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	1148.4948	1115.6517	1014.7985	846.4746	644.2493	419.6757	266.0932	280.9683	457.4921	708.4676	943.4112	1141.4278 (97)
Space heating requirement - total per year (kWh/year)	420.1985	315.5898	234.9012	103.3561	29.7117	0.0000	0.0000	0.0000	0.0000	118.6855	282.0553	433.7942 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	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	420.1985	315.5898	234.9012	103.3561	29.7117	0.0000	0.0000	0.0000	0.0000	118.6855	282.0553	433.7942 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1938.2924 (98c)
Space heating per m ²										(98c) / (4) =		26.9432 (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 %)												88.7000 (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	420.1985	315.5898	234.9012	103.3561	29.7117	0.0000	0.0000	0.0000	0.0000	118.6855	282.0553	433.7942 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	473.7300	355.7946	264.8266	116.5233	33.4969	0.0000	0.0000	0.0000	0.0000	133.8055	317.9880	489.0577 (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	203.1316	178.7597	187.8406	160.3946	152.2064	133.6017	129.3554	136.5325	140.2712	160.6461	175.9637	200.3051 (64)
Efficiency of water heater (217)m	84.2783	83.8203	82.7783	80.7902	78.1704	76.4000	76.4000	76.4000	76.4000	81.1833	83.5333	76.4000 (216)
Fuel for water heating, kWh/month	241.0248	213.2655	226.9199	198.5323	194.7110	174.8713	169.3134	178.7074	183.6011	197.8808	210.6509	84.4073 (217)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	21.4424	17.2019	15.4884	11.3475	8.7651	7.1612	7.9958	10.3933	13.4998	17.7125	20.0062	22.0383 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-17.6572	-28.3554	-46.8116	-58.9613	-67.8955	-64.8486	-63.6947	-57.6705	-47.4163	-34.7332	-20.3697	-14.7472 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												

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(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.0978	-15.0225	-36.1708	-64.1075	-93.4459	-97.3440	-94.8645	-74.8489	-47.9141	-23.2741	-8.5642	-4.6099	(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												2185.2225	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												76.4000	
Water heating fuel used												2426.7859	(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)												173.0524	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1089.4251	(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												3781.6358	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2185.2225	3.6400	79.5421 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2426.7859	3.6400	88.3350 (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	173.0524	16.4900	28.5363 (250)
Additional standing charges			92.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-523.1611	16.4900	-86.2693
PV Unit electricity exported	-566.2640	5.5900	-31.6542
Total			-117.9234 (252)
Total energy cost			184.6714 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.5685 (257)
SAP value		90.7844
SAP rating (Section 12)		91 (258)
SAP band		B

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

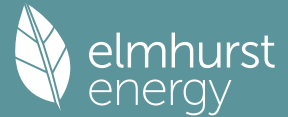
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2185.2225	0.2100	458.8967 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2426.7859	0.2100	509.6250 (264)
Space and water heating			968.5218 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	173.0524	0.1443	24.9768 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-523.1611	0.1324	-69.2700
PV Unit electricity exported	-566.2640	0.1220	-69.0871
Total			-138.3571 (269)
Total CO2, kg/year			867.0708 (272)
CO2 emissions per m2			12.0500 (273)
EI value			90.0644
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	35.9700 (1b)	x 2.4000 (2b)	= 86.3280 (1b) - (3b)

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First floor
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 71.9400 35.9700 (1c) x 2.6300 (2c) = 94.6011 (1c) - (3c)
Dwelling volume (4)
(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 180.9291 (5)

2. Ventilation rate

m3 per hour

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

Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 30.0000 / (5) = 0.1658 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 4.0000 (17)
Infiltration rate 0.3658 (18)
Number of sides sheltered 1 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3384 (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	0.4314	0.4230	0.4145	0.3722	0.3638	0.3215	0.3215	0.3130	0.3384	0.3638	0.3807	0.3976 (22b)
	0.5931	0.5895	0.5859	0.5693	0.5662	0.5517	0.5517	0.5490	0.5572	0.5662	0.5725	0.5790 (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
Front door			2.1400	1.1000	2.3540		
Windows (Uw = 1.30)			11.9900	1.2357	14.8165		
Heatloss Floor 1			35.9700	0.1300	4.6761	110.0000	3956.7000 (28a)
Brick wall	85.3600	14.1300	71.2300	0.1900	13.5337	110.0000	7835.3000 (29a)
Plane roof	35.9700		35.9700	0.0900	3.2373	9.0000	323.7300 (30)
Total net area of external elements Aum(A, m2)			157.3000				
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.6176		
Party Wall 1			41.4000	0.0000	0.0000	70.0000	2898.0000 (32)
Internal Wall 2			104.9400			9.0000	944.4600 (32c)
Internal Floor			35.9700			18.0000	647.4600 (32d)
Internal Ceiling 1			35.9700			9.0000	323.7300 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 16929.3800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							235.3264 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				9.6100	0.0240	0.2306	
E3 Sill				7.0100	0.0220	0.1542	
E4 Jamb				25.5000	0.0170	0.4335	
E5 Ground floor (normal)				16.9700	0.0920	1.5612	
E6 Intermediate floor within a dwelling				16.9700	0.0010	0.0170	
E16 Corner (normal)				10.0600	0.0460	0.4628	
E18 Party wall between dwellings				10.0600	0.0400	0.4024	
P1 Party wall - Ground floor				8.2300	0.0690	0.5679	
P2 Party wall - Intermediate floor within a dwelling				16.4600	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)				8.2300	0.1010	0.8312	
E10 Eaves (insulation at ceiling level)				8.7400	0.0600	0.5244	
E12 Gable (insulation at ceiling level)				8.2300	0.0560	0.4609	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.6461 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	44.2637 (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	35.4099	35.1941	34.9826	33.9892	33.8034	32.9382	32.9382	32.7779	33.2714	33.8034	34.1794	34.5725 (38)
Heat transfer coeff	79.6737	79.4579	79.2464	78.2530	78.0671	77.2019	77.2019	77.0417	77.5352	78.0671	78.4431	78.8362 (39)
Average = Sum(39)m / 12 =												78.2521

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1075	1.1045	1.1016	1.0878	1.0852	1.0731	1.0731	1.0709	1.0778	1.0852	1.0904	1.0959 (40)
HLP (average)												1.0877
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2923 (42)

Hot water usage for mixer showers 62.6538 61.7122 60.3402 57.7150 55.7777 53.6172 52.3892 53.7509 55.2435 57.5632 60.2448 62.4137 (42a)

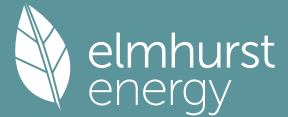
Hot water usage for baths 27.0664 26.6644 26.0984 25.0546 24.2731 23.4065 22.9384 23.5005 24.1126 25.0399 26.1051 26.9749 (42b)

Hot water usage for other uses 38.1053 36.7197 35.3340 33.9484 32.5627 31.1771 31.1771 32.5627 33.9484 35.3340 36.7197 38.1053 (42c)

Average daily hot water use (litres/day) 117.5007 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	127.8255	125.0963	121.7725	116.7180	112.6135	108.2008	106.5048	109.8142	113.3045	117.9371	123.0695	127.4939 (44)
Energy conte	202.4443	178.1355	187.1599	159.7811	151.5995	133.0456	128.8083	135.9729	139.7158	160.0395	175.3350	199.6247 (45)

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Energy content (annual)												Total = Sum(45)m =	1951.6620
Distribution loss (46)m = 0.15 x (45)m													
	30.3666	26.7203	28.0740	23.9672	22.7399	19.9568	19.3212	20.3959	20.9574	24.0059	26.3003	29.9437 (46)	
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)	
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)	
Combi loss	0.6873	0.6242	0.6807	0.6134	0.6069	0.5561	0.5472	0.5596	0.5555	0.6066	0.6286	0.6804 (61)	
Total heat required for water heating calculated for each month													
	203.1316	178.7597	187.8406	160.3946	152.2064	133.6017	129.3554	136.5325	140.2712	160.6461	175.9637	200.3051 (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	203.1316	178.7597	187.8406	160.3946	152.2064	133.6017	129.3554	136.5325	140.2712	160.6461	175.9637	200.3051 (64)	
	Total per year (kWh/year) = Sum(64)m =											1959.0085 (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													
	67.4846	59.3861	62.4008	53.2806	50.5586	44.3767	42.9655	45.3509	46.5944	53.3648	58.4561	66.5453 (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	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.4974	21.7583	17.6951	13.3963	10.0139	8.4542	9.1350	11.8740	15.9373	20.2361	23.6185	25.1782	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	301.1670	304.2921	296.4168	279.6512	258.4875	238.5967	225.3085	222.1833	230.0586	246.8243	267.9879	287.8787	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	(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)	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	(71)
Water heating gains (Table 5)	90.7051	88.3722	83.8721	74.0008	67.9550	61.6343	57.7494	60.9555	64.7144	71.7269	81.1890	89.4426	(72)
Total internal gains	516.2611	514.3144	497.8757	466.9400	436.3482	405.5769	389.0846	391.9045	407.6020	438.6789	472.6871	502.3912	(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				1.4200	10.6334	0.7300	0.7000		0.7700		5.3471 (74)	
East				6.0100	19.6403	0.7300	0.7000		0.7700		41.8000 (76)	
West				4.5600	19.6403	0.7300	0.7000		0.7700		31.7151 (80)	
Solar gains	78.8621	154.0296	254.2001	373.3023	460.8862	473.5593	450.1072	384.1716	296.3273	182.8078	98.2609	64.9128 (83)
Total gains	595.1233	668.3440	752.0758	840.2423	897.2345	879.1362	839.1918	776.0761	703.9294	621.4867	570.9480	567.3040 (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	59.0233	59.1836	59.3416	60.0949	60.2380	60.9131	60.9131	61.0397	60.6512	60.2380	59.9492	59.6503
alpha	4.9349	4.9456	4.9561	5.0063	5.0159	5.0609	5.0609	5.0693	5.0434	5.0159	4.9966	4.9767
util living area	0.9895	0.9803	0.9540	0.8791	0.7351	0.5483	0.4023	0.4519	0.7036	0.9232	0.9808	0.9915 (86)
MIT	19.8316	20.0163	20.3194	20.6707	20.8948	20.9808	20.9967	20.9942	20.9370	20.6233	20.1617	19.7970 (87)
Th 2	19.9947	19.9972	19.9996	20.0108	20.0130	20.0228	20.0228	20.0247	20.0190	20.0130	20.0087	20.0042 (88)
util rest of house	0.9864	0.9747	0.9410	0.8474	0.6773	0.4703	0.3143	0.3585	0.6236	0.8952	0.9743	0.9890 (89)
MIT 2	18.6536	18.8884	19.2667	19.6914	19.9292	20.0123	20.0218	20.0226	19.9784	19.6505	19.0831	18.6167 (90)
Living area fraction	18.8650	19.0908	19.4556	19.8672	20.1025	20.1861	20.1967	20.1970	20.1504	19.8251	19.2767	18.8285 (91)
MIT	18.8650	19.0908	19.4556	19.8672	20.1025	20.1861	20.1967	20.1970	20.1504	19.8251	19.2767	18.8285 (92)
Temperature adjustment	18.7150	18.9408	19.3056	19.7172	19.9525	20.0361	20.0467	20.0470	20.0004	19.6751	19.1267	-0.1500
adjusted MIT	18.7150	18.9408	19.3056	19.7172	19.9525	20.0361	20.0467	20.0470	20.0004	19.6751	19.1267	18.6785 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	583.7118	646.0240	699.0711	702.9243	604.3141	414.4181	265.5496	279.9271	437.8097	548.9440	551.6677	558.3711	(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	1148.4948	1115.6517	1014.7985	846.4746	644.2493	419.6757	266.0932	280.9683	457.4921	708.4676	943.4112	1141.4278	(97)
Space heating kWh	420.1985	315.5898	234.9012	103.3561	29.7117	0.0000	0.0000	0.0000	0.0000	118.6855	282.0553	433.7942	(98a)
Space heating requirement - total per year (kWh/year)												1938.2924	
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	420.1985	315.5898	234.9012	103.3561	29.7117	0.0000	0.0000	0.0000	0.0000	118.6855	282.0553	433.7942	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1938.2924	
Space heating per m ²												26.9432	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												88.7000 (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	420.1985	315.5898	234.9012	103.3561	29.7117	0.0000	0.0000	0.0000	0.0000	118.6855	282.0553	433.7942 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	473.7300	355.7946	264.8266	116.5233	33.4969	0.0000	0.0000	0.0000	0.0000	133.8055	317.9880	489.0577 (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	203.1316	178.7597	187.8406	160.3946	152.2064	133.6017	129.3554	136.5325	140.2712	160.6461	175.9637	200.3051 (64)
Efficiency of water heater (217)m	84.2783	83.8203	82.7783	80.7902	78.1704	76.4000	76.4000	76.4000	76.4000	81.1833	83.5333	76.4000 (216)
Fuel for water heating, kWh/month	241.0248	213.2655	226.9199	198.5323	194.7110	174.8713	169.3134	178.7074	183.6011	197.8808	210.6509	237.3076 (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	21.4424	17.2019	15.4884	11.3475	8.7651	7.1612	7.9958	10.3933	13.4998	17.7125	20.0062	22.0383 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-17.6572	-28.3554	-46.8116	-58.9613	-67.8955	-64.8486	-63.6947	-57.6705	-47.4163	-34.7332	-20.3697	-14.7472 (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	-6.0978	-15.0225	-36.1708	-64.1075	-93.4459	-97.3440	-94.8645	-74.8489	-47.9141	-23.2741	-8.5642	-4.6099 (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												2185.2225 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												76.4000
Water heating fuel used												2426.7859 (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)												173.0524 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1089.4251 (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												3781.6358 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2185.2225	5.6000	122.3725 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2426.7859	5.6000	135.9000 (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	173.0524	26.0600	45.0975 (250)
Additional standing charges			99.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-523.1611	26.0600	-136.3358
PV Unit electricity exported	-566.2640	5.8100	-32.8999
Total			-169.2357 (252)
Total energy cost			255.5458 (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	2185.2225	0.2100	458.8967 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2426.7859	0.2100	509.6250 (264)
Space and water heating			968.5218 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	173.0524	0.1443	24.9768 (268)
Energy saving/generation technologies			

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PV Unit electricity used in dwelling	-523.1611	0.1324	-69.2700
PV Unit electricity exported	-566.2640	0.1220	-69.0871
Total			-138.3571 (269)
Total CO2, kg/year			867.0708 (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	2185.2225	1.1300	2469.3015 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2426.7859	1.1300	2742.2681 (278)
Space and water heating			5211.5696 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	173.0524	1.5338	265.4335 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-523.1611	1.4892	-779.1090
PV Unit electricity exported	-566.2640	0.4477	-253.4883
Total			-1032.5974 (283)
Total Primary energy kWh/year			4574.5065 (286)

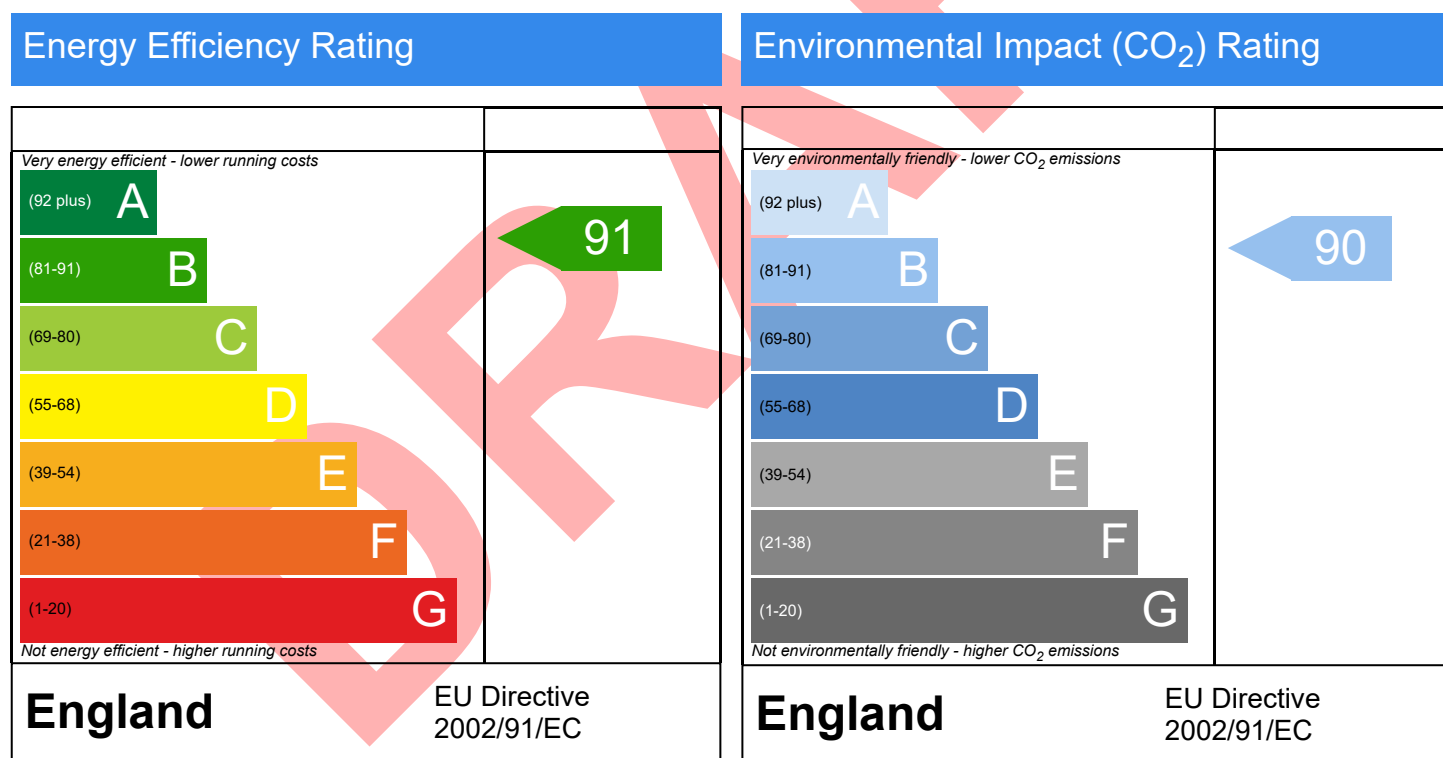
Predicted Energy Assessment



Dwelling type: House, Semi-Detached
Date of assessment: 15/11/2024
Produced by: Victoria Gartside
Total floor area: 71.94 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.