

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 10:34:44

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 8
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	12.52 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	12.37 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	65.55 kWh _{PE} /m ²		
Dwelling primary energy	65.34 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	37.7 kWh/m ²		
Dwelling fabric energy efficiency	34.2 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	South	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

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	1.45 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 8	Prop Type Ref	SAP VG 21-0282
Property			

SAP Rating	91 B	DER	12.37	TER	12.52
Environmental	90 B	% DER < TER			1.20
CO ₂ Emissions (t/year)	0.85	DFEE	34.21	TFEE	37.65
Compliance Check	See BREL	% DFEE < TFEE			9.14
% DPER < TPER	0.32	DPER	65.34	TPER	65.55

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/m²K
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

Summary for Input Data

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

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
1.45	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

kWh/Year

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						
SAP Rating	91 B	DER	12.37	TER	12.52	
Environmental	90 B	% DER < TER				1.20
CO ₂ Emissions (t/year)	0.85	DFEE	34.21	TFEE	37.65	
Compliance Check	See BREL	% DFEE < TFEE				9.14
% DPER < TPER	0.32	DPER	65.34	TPER	65.55	
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)
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)

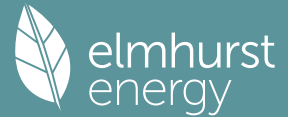
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4314	0.4230	0.4145	0.3722	0.3638	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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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	0.9922	0.9822	0.9579	0.8827	0.7403	0.5497	0.4027	0.4499	0.6978	0.9258	0.9836	0.9937	(86)
MIT	19.7717	19.9923	20.2967	20.6632	20.8913	20.9806	20.9967	20.9943	20.9393	20.6163	20.1309	19.7386	(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	0.9898	0.9771	0.9457	0.8516	0.6827	0.4716	0.3146	0.3569	0.6178	0.8984	0.9779	0.9919	(89)
MIT 2	18.5779	18.8585	19.2395	19.6833	19.9262	20.0121	20.0218	20.0226	19.9800	19.6428	19.0448	18.5426	(90)
Living area fraction									fLA = Living area /	(4) =		0.1795	(91)
MIT	18.7921	19.0620	19.4292	19.8591	20.0994	20.1859	20.1967	20.1970	20.1522	19.8175	19.2397	18.7572	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.6421	18.9120	19.2792	19.7091	19.9494	20.0359	20.0467	20.0470	20.0022	19.6675	19.0897	18.6072	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9852	0.9694	0.9345	0.8406	0.6788	0.4726	0.3168	0.3591	0.6163	0.8865	0.9705	0.9880	(94)
Useful gains	547.0288	631.6568	686.0206	698.9043	602.7019	414.3452	265.5464	279.9528	438.7063	545.2018	533.2883	522.4655	(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	1142.6902	1113.3611	1012.7062	845.8480	644.0087	419.6647	266.0927	280.9726	457.6270	707.8759	940.5098	1135.8093	(97)
Space heating kWh	443.1720	323.7053	243.0541	105.7994	30.7323	0.0000	0.0000	0.0000	0.0000	121.0295	293.1995	456.3277	(98a)
Space heating requirement - total per year (kWh/year)												2017.0198	
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	443.1720	323.7053	243.0541	105.7994	30.7323	0.0000	0.0000	0.0000	0.0000	121.0295	293.1995	456.3277	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2017.0198	
Space heating per m2										(98c) / (4) =		28.0375	(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	443.1720	323.7053	243.0541	105.7994	30.7323	0.0000	0.0000	0.0000	0.0000	121.0295	293.1995	456.3277	(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)	499.6303	364.9440	274.0181	119.2778	34.6474	0.0000	0.0000	0.0000	0.0000	136.4481	330.5518	514.4619	(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	84.4279	83.8948	82.8830	80.8564	78.2222	76.4000	76.4000	76.4000	76.4000	81.2406	83.6491	84.5478	(216)
Fuel for water heating, kWh/month	240.5977	213.0760	226.6333	198.3698	194.5821	174.8713	169.3134	178.7074	183.6011	197.7413	210.3594	236.9135	(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	-17.1558	-27.6111	-45.6983	-57.7208	-66.6152	-63.6818	-62.5435	-56.5505	-46.3889	-33.8725	-19.8097	-14.3224	(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	-5.8073	-14.3209	-34.5180	-61.2457	-89.3481	-93.1044	-90.7303	-71.5516	-45.7638	-22.2012	-8.1597	-4.3895	(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												2273.9794	(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												2424.7662	(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												-1053.1109	(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	3904.6871 (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	2273.9794	0.2100	477.5357 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2424.7662	0.2100	509.2009 (264)
Space and water heating			986.7366 (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	-511.9704	0.1324	-67.7630
PV Unit electricity exported	-541.1405	0.1220	-66.0084
Total			-133.7714 (269)
Total CO2, kg/year			889.8712 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.3700 (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	2273.9794	1.1300	2569.5968 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2424.7662	1.1300	2739.9858 (278)
Space and water heating			5309.5825 (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	-511.9704	1.4890	-762.3486
PV Unit electricity exported	-541.1405	0.4476	-242.1914
Total			-1004.5399 (283)
Total Primary energy kWh/year			4700.5769 (286)
Dwelling Primary energy Rate (DPER)			65.3400 (287)

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

1. Overall dwelling characteristics

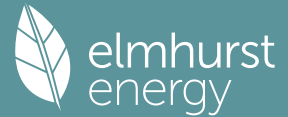
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	35.9700 (1b)	x 2.4000 (2b)	= 86.3280 (1b) - (3b)
First floor	35.9700 (1c)	x 2.6300 (2c)	= 94.6011 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.9400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 180.9291 (5)

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)								(32)
Party Wall 1			41.4000	0.0000	0.0000			(33)
								(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)

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

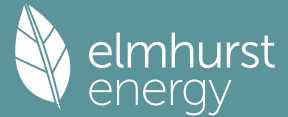
4. Water heating energy requirements (kWh/year)

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													1951.6620
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	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	(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	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)	107.5974	105.2632	100.7666	90.9111	84.8744	78.5645	74.6888	77.8907	81.6448	88.6463	98.0940	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	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d			Gains W	
East				6.0100	19.6403	0.6300	0.7000	0.7700			36.0739 (76)	
South				1.4200	46.7521	0.6300	0.7000	0.7700			20.2890 (78)	
West				4.5600	19.6403	0.6300	0.7000	0.7700			27.3706 (80)	

Solar gains	83.7335	157.3391	246.7199	345.9335	415.1774	421.9514	402.9152	351.3553	281.9329	183.1078	103.1573	69.7053 (83)
Total gains	558.8479	643.5007	711.8208	793.4577	838.9735	826.6224	791.2958	740.8439	683.9637	602.8614	550.0499	534.6563 (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	0.9922	0.9840	0.9649	0.9053	0.7833	0.5966	0.4410	0.4883	0.7346	0.9356	0.9843	0.9936 (86)
MIT	19.6935	19.9005	20.1974	20.5799	20.8452	20.9687	20.9941	20.9906	20.9157	20.5588	20.0678	19.6688 (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	0.9898	0.9792	0.9543	0.8777	0.7269	0.5121	0.3421	0.3853	0.6532	0.9104	0.9788	0.9917 (89)
MIT 2	18.4488	18.7131	19.0872	19.5589	19.8502	19.9717	19.9873	19.9882	19.9291	19.5473	18.9379	18.4260 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.6722	18.9262	19.2864	19.7422	20.0287	20.1506	20.1680	20.1681	20.1061	19.7289	19.1407	18.6491 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.6722	18.9262	19.2864	19.7422	20.0287	20.1506	20.1680	20.1681	20.1061	19.7289	19.1407	18.6491 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9857	0.9728	0.9455	0.8704	0.7300	0.5261	0.3599	0.4037	0.6638	0.9028	0.9726	0.9881 (94)
Useful gains	550.8463	626.0038	673.0390	690.5987	612.4913	434.8538	284.7648	299.1145	454.0216	544.2602	534.9912	528.2960 (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	1197.9265	1165.1754	1058.6917	883.7961	676.9143	444.9175	286.0008	301.2583	484.0177	741.9441	984.4502	1188.6993 (97)
Space heating kWh	481.4276	362.3233	286.9256	139.1021	47.9307	0.0000	0.0000	0.0000	0.0000	147.0768	323.6105	491.3401 (98a)
Space heating requirement - total per year (kWh/year)	2279.7367											
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	481.4276	362.3233	286.9256	139.1021	47.9307	0.0000	0.0000	0.0000	0.0000	147.0768	323.6105	491.3401 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2279.7367											
Space heating per m2	(98c) / (4) = 31.6894 (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	481.4276	362.3233	286.9256	139.1021	47.9307	0.0000	0.0000	0.0000	0.0000	147.0768	323.6105	491.3401 (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)	521.0256	392.1247	310.5256	150.5434	51.8731	0.0000	0.0000	0.0000	0.0000	159.1740	350.2278	531.7533 (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	85.9696	85.6498	85.0346	83.7547	81.9520	80.3000	80.3000	80.3000	80.3000	83.8428	85.4016	80.3000 (216)
Fuel for water heating, kWh/month	261.4419	232.1442	248.8314	223.4282	222.1888	205.2853	203.4225	211.0484	212.8363	226.1768	234.7096	258.6020 (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)												
(233a)m	-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)												
(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	-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													2467.2475	(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													2740.1155	(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													3692.1190	(238)

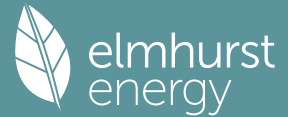
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2467.2475	0.2100	518.1220 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2740.1155	0.2100	575.4243 (264)
Space and water heating			1093.5462 (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			900.8880 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.5200 (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	2467.2475	1.1300	2787.9897 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2740.1155	1.1300	3096.3306 (278)
Space and water heating			5884.3202 (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			4715.4637 (286)
Target Primary Energy Rate (TPER)			65.5500 (287)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 8			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	91 B	DER	12.37	TER	12.52		
Environmental	90 B	% DER < TER				1.20	
CO ₂ Emissions (t/year)	0.85	DFEE	34.21	TFEE	37.65		
Compliance Check	See BREL	% DFEE < TFEE				9.14	
% DPER < TPER	0.32	DPER	65.34	TPER	65.55		
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

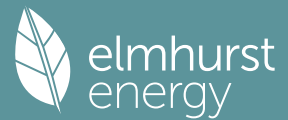
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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)
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)
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 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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	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 content (annual)	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)
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 (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	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]												Gains
				Area	Solar flux		g		FF	Access		W
				m2	Table 6a	Specific data	or Table 6b	Specific data	or Table 6c	factor	Table 6d	
East				6.0100	19.6403		0.7300		0.7000		0.7700	41.8000 (76)
South				1.4200	46.7521		0.7300		0.7000		0.7700	23.5095 (78)
West				4.5600	19.6403		0.7300		0.7000		0.7700	31.7151 (80)
Solar gains	97.0246	182.3136	285.8817	400.8436	481.0785	488.9278	466.8700	407.1260	326.6842	212.1725	119.5314	80.7696 (83)
Total gains	507.8819	605.3853	690.5878	794.4715	854.8012	850.5628	814.9746	754.4986	684.3764	580.0835	508.3785	482.3478 (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	0.9946	0.9868	0.9664	0.8974	0.7592	0.5647	0.4139	0.4642	0.7181	0.9391	0.9881	0.9958 (86)	
MIT	19.6997	19.9252	20.2403	20.6301	20.8780	20.9782	20.9962	20.9935	20.9310	20.5773	20.0706	19.6672 (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	0.9930	0.9829	0.9563	0.8687	0.7025	0.4852	0.3235	0.3686	0.6383	0.9153	0.9838	0.9945 (89)	
MIT 2	18.8193	19.0442	19.3539	19.7273	19.9362	20.0134	20.0219	20.0228	19.9840	19.6903	19.1987	18.7944 (90)	
Living area fraction									fLA = Living area / (4) =				0.1795 (91)
MIT	18.9773	19.2023	19.5129	19.8893	20.1053	20.1865	20.1967	20.1970	20.1539	19.8495	19.3552	18.9510 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.9773	19.2023	19.5129	19.8893	20.1053	20.1865	20.1967	20.1970	20.1539	19.8495	19.3552	18.9510 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9907	0.9788	0.9501	0.8647	0.7082	0.4989	0.3397	0.3858	0.6500	0.9104	0.9800	0.9926 (94)
Useful gains	503.1610	592.5221	656.1573	686.9729	605.3474	424.3380	276.8861	291.0551	444.8635	528.1308	498.2278	478.7922 (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	1169.3922	1136.4290	1031.2273	859.9481	656.1741	431.2891	277.6745	292.5293	469.3913	722.0817	961.3342	1162.9147 (97)
Space heating kWh	495.6760	365.5054	279.0520	124.5421	37.8151	0.0000	0.0000	0.0000	0.0000	144.2995	333.4366	508.9872 (98a)
Space heating requirement - total per year (kWh/year)												2289.3139
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	495.6760	365.5054	279.0520	124.5421	37.8151	0.0000	0.0000	0.0000	0.0000	144.2995	333.4366	508.9872 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2289.3139
Space heating per m2										(98c) / (4) =		31.8225 (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	0.9253	0.9628	0.9461	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	671.5244	550.0611	553.9523	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	951.7088	912.2654	843.6579	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	201.7327	269.4800	215.5410	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	50.4332	67.3700	53.8852	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												171.6884 (107)
Energy for space heating												31.8225 (99)
Energy for space cooling												2.3866 (108)
Total												34.2091 (109)
Fabric Energy Efficiency (DFEE)												34.2 (109)

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

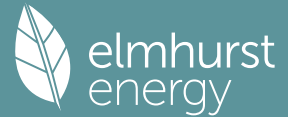
1. Overall dwelling characteristics

	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)

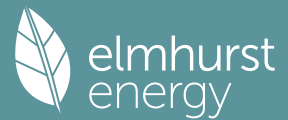
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	37.0327	36.7539	36.4806	35.1971	34.9570	33.8391	33.8391	33.6321	34.2697	34.9570	35.4428	35.9507 (38)
Heat transfer coeff	83.3503	83.0715	82.7983	81.5147	81.2746	80.1567	80.1567	79.9497	80.5873	81.2746	81.7604	82.2683 (39)
Average = Sum(39)m / 12 =												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	
East					6.0100	19.6403	0.6300	0.7000	0.7700		36.0739 (76)	
South					1.4200	46.7521	0.6300	0.7000	0.7700		20.2890 (78)	
West					4.5600	19.6403	0.6300	0.7000	0.7700		27.3706 (80)	
Solar gains	83.7335	157.3391	246.7199	345.9335	415.1774	421.9514	402.9152	351.3553	281.9329	183.1078	103.1573	69.7053 (83)
Total gains	494.5908	580.4108	651.4259	739.5614	788.9000	783.5864	751.0198	698.7279	639.6252	551.0187	492.0043	471.2835 (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	0.9953	0.9894	0.9748	0.9239	0.8111	0.6239	0.4635	0.5155	0.7674	0.9526	0.9900	0.9963 (86)
MIT	19.5965	19.8085	20.1164	20.5249	20.8180	20.9621	20.9927	20.9881	20.8975	20.4974	19.9827	19.5722 (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	0.9938	0.9861	0.9667	0.9000	0.7572	0.5376	0.3602	0.4079	0.6878	0.9326	0.9863	0.9951 (89)
MIT 2	18.6847	18.8973	19.2022	19.6023	19.8585	19.9724	19.9874	19.9882	19.9305	19.5873	19.0828	18.6700 (90)
Living area fraction									FLA = Living area / (4) =			0.1795 (91)
MIT	18.8483	19.0608	19.3663	19.7679	20.0307	20.1500	20.1678	20.1677	20.1040	19.7506	19.2442	18.8319 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8483	19.0608	19.3663	19.7679	20.0307	20.1500	20.1678	20.1677	20.1040	19.7506	19.2442	18.8319 (93)

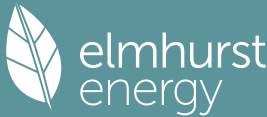
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9917	0.9823	0.9608	0.8944	0.7604	0.5520	0.3787	0.4272	0.6981	0.9270	0.9828	0.9933 (94)
Useful gains	490.4724	570.1507	625.9089	661.4430	599.8559	432.5054	284.4332	298.4773	446.5471	510.8102	483.5348	468.1197 (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	1212.6079	1176.3589	1065.3053	885.8901	677.0725	444.8680	285.9831	301.2224	483.8502	743.7109	992.9186	1203.7399 (97)
Space heating kWh	537.2688	407.3719	326.9109	161.6020	57.4491	0.0000	0.0000	0.0000	0.0000	173.2782	366.7563	547.3015 (98a)
Space heating requirement - total per year (kWh/year)												2577.9386
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	537.2688	407.3719	326.9109	161.6020	57.4491	0.0000	0.0000	0.0000	0.0000	173.2782	366.7563	547.3015 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2577.9386
Space heating per m ²										(98c) / (4) =		35.8346 (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	0.8859	0.9384	0.9157	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	667.4665	556.6041	556.4202	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	873.4246	837.5130	778.4714	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	148.2898	208.9963	165.2061	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	37.0725	52.2491	41.3015	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												130.6230 (107)
Energy for space heating												35.8346 (99)

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Energy for space cooling	1.8157 (108)
Total	37.6503 (109)
Fabric Energy Efficiency (TFEE)	37.7 (109)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 8			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	91 B		DER	12.37		TER	12.52
Environmental	90 B		% DER < TER				1.20
CO ₂ Emissions (t/year)	0.85		DFEE	34.21		TFEE	37.65
Compliance Check	See BREL		% DFEE < TFEE				9.14
% DPER < TPER	0.32		DPER	65.34		TPER	65.55
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)
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)

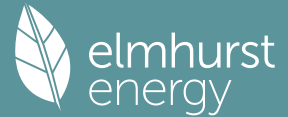
3. Heat losses and heat loss parameter

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)

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	0.9922	0.9822	0.9579	0.8827	0.7403	0.5497	0.4027	0.4499	0.6978	0.9258	0.9836	0.9937 (86)
MIT	19.7717	19.9923	20.2967	20.6632	20.8913	20.9806	20.9967	20.9943	20.9393	20.6163	20.1309	19.7386 (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	0.9898	0.9771	0.9457	0.8516	0.6827	0.4716	0.3146	0.3569	0.6178	0.8984	0.9779	0.9919 (89)
MIT 2	18.5779	18.8585	19.2395	19.6833	19.9262	20.0121	20.0218	20.0226	19.9800	19.6428	19.0448	18.5426 (90)
Living area fraction									fLA = Living area / (4) =			0.1795 (91)
MIT	18.7921	19.0620	19.4292	19.8591	20.0994	20.1859	20.1967	20.1970	20.1522	19.8175	19.2397	18.7572 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.6421	18.9120	19.2792	19.7091	19.9494	20.0359	20.0467	20.0470	20.0022	19.6675	19.0897	18.6072 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9852	0.9694	0.9345	0.8406	0.6788	0.4726	0.3168	0.3591	0.6163	0.8865	0.9705	0.9880 (94)
Useful gains	547.0288	631.6568	686.0206	698.9043	602.7019	414.3452	265.5464	279.9528	438.7063	545.2018	533.2883	522.4655 (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	1142.6902	1113.3611	1012.7062	845.8480	644.0087	419.6647	266.0927	280.9726	457.6270	707.8759	940.5098	1135.8093 (97)
Space heating kWh	443.1720	323.7053	243.0541	105.7994	30.7323	0.0000	0.0000	0.0000	0.0000	121.0295	293.1995	456.3277 (98a)
Space heating requirement - total per year (kWh/year)												2017.0198
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	443.1720	323.7053	243.0541	105.7994	30.7323	0.0000	0.0000	0.0000	0.0000	121.0295	293.1995	456.3277 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2017.0198
Space heating per m2										(98c) / (4) =		28.0375 (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	443.1720	323.7053	243.0541	105.7994	30.7323	0.0000	0.0000	0.0000	0.0000	121.0295	293.1995	456.3277 (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)	499.6303	364.9440	274.0181	119.2778	34.6474	0.0000	0.0000	0.0000	0.0000	136.4481	330.5518	514.4619 (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	84.4279	83.8948	82.8830	80.8564	78.2222	76.4000	76.4000	76.4000	76.4000	81.2406	83.6491	76.4000 (216)
Fuel for water heating, kWh/month	240.5977	213.0760	226.6333	198.3698	194.5821	174.8713	169.3134	178.7074	183.6011	197.7413	210.3594	236.9135 (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	-17.1558	-27.6111	-45.6983	-57.7208	-66.6152	-63.6818	-62.5435	-56.5505	-46.3889	-33.8725	-19.8097	-14.3224 (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	-5.8073	-14.3209	-34.5180	-61.2457	-89.3481	-93.1044	-90.7303	-71.5516	-45.7638	-22.2012	-8.1597	-4.3895 (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												2273.9794 (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												2424.7662 (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

-1053.1109 (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	3904.6871 (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	2273.9794	0.2100	477.5357 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2424.7662	0.2100	509.2009 (264)
Space and water heating			986.7366 (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	-511.9704	0.1324	-67.7630
PV Unit electricity exported	-541.1405	0.1220	-66.0084
Total			-133.7714 (269)
Total CO2, kg/year			889.8712 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.3700 (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	2273.9794	1.1300	2569.5968 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2424.7662	1.1300	2739.9858 (278)
Space and water heating			5309.5825 (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	-511.9704	1.4890	-762.3486
PV Unit electricity exported	-541.1405	0.4476	-242.1914
Total			-1004.5399 (283)
Total Primary energy kWh/year			4700.5769 (286)
Dwelling Primary energy Rate (DPER)			65.3400 (287)

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

1. Overall dwelling characteristics

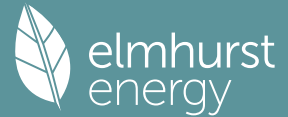
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	35.9700 (1b)	x 2.4000 (2b)	= 86.3280 (1b) - (3b)
First floor	35.9700 (1c)	x 2.6300 (2c)	= 94.6011 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.9400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 180.9291 (5)

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)

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

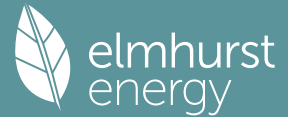
4. Water heating energy requirements (kWh/year)

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													1951.6620
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		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	6.0100		19.6403		0.6300	0.7000	0.7700	36.0739	(76)
South	1.4200		46.7521		0.6300	0.7000	0.7700	20.2890	(78)
West	4.5600		19.6403		0.6300	0.7000	0.7700	27.3706	(80)
Solar gains	83.7335	157.3391	246.7199	345.9335	415.1774	421.9514	351.3553	281.9329	183.1078 103.1573 69.7053 (83)
Total gains	558.8479	643.5007	711.8208	793.4577	838.9735	826.6224	791.2958	740.8439	683.9637 602.8614 550.0499 534.6563 (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	0.9922	0.9840	0.9649	0.9053	0.7833	0.5966	0.4410	0.4883	0.7346	0.9356	0.9843	0.9936 (86)
MIT	19.6935	19.9005	20.1974	20.5799	20.8452	20.9687	20.9941	20.9906	20.9157	20.5588	20.0678	19.6688 (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	0.9898	0.9792	0.9543	0.8777	0.7269	0.5121	0.3421	0.3853	0.6532	0.9104	0.9788	0.9917 (89)
MIT 2	18.4488	18.7131	19.0872	19.5589	19.8502	19.9717	19.9873	19.9882	19.9291	19.5473	18.9379	18.4260 (90)
Living area fraction									fLA = Living area / (4) =			0.1795 (91)
MIT	18.6722	18.9262	19.2864	19.7422	20.0287	20.1506	20.1680	20.1681	20.1061	19.7289	19.1407	18.6491 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6722	18.9262	19.2864	19.7422	20.0287	20.1506	20.1680	20.1681	20.1061	19.7289	19.1407	18.6491 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9857	0.9728	0.9455	0.8704	0.7300	0.5261	0.3599	0.4037	0.6638	0.9028	0.9726	0.9881 (94)
Useful gains	550.8463	626.0038	673.0390	690.5987	612.4913	434.8538	284.7648	299.1145	454.0216	544.2602	534.9912	528.2960 (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	1197.9265	1165.1754	1058.6917	883.7961	676.9143	444.9175	286.0008	301.2583	484.0177	741.9441	984.4502	1188.6993 (97)
Space heating kWh	481.4276	362.3233	286.9256	139.1021	47.9307	0.0000	0.0000	0.0000	0.0000	147.0768	323.6105	491.3401 (98a)
Space heating requirement - total per year (kWh/year)												2279.7367
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	481.4276	362.3233	286.9256	139.1021	47.9307	0.0000	0.0000	0.0000	0.0000	147.0768	323.6105	491.3401 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2279.7367
Space heating per m2										(98c) / (4) =		31.6894 (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	481.4276	362.3233	286.9256	139.1021	47.9307	0.0000	0.0000	0.0000	0.0000	147.0768	323.6105	491.3401 (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)	521.0256	392.1247	310.5256	150.5434	51.8731	0.0000	0.0000	0.0000	0.0000	159.1740	350.2278	531.7533 (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	85.9696	85.6498	85.0346	83.7547	81.9520	80.3000	80.3000	80.3000	80.3000	83.8428	85.4016	80.3000 (216)
Fuel for water heating, kWh/month	261.4419	232.1442	248.8314	223.4282	222.1888	205.2853	203.4225	211.0484	212.8363	226.1768	234.7096	258.6020 (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)												
(233a)m	-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)												
(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	-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													2467.2475	(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													2740.1155	(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													3692.1190	(238)

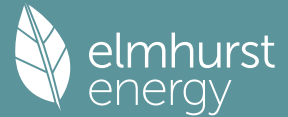
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2467.2475	0.2100	518.1220 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2740.1155	0.2100	575.4243 (264)
Space and water heating			1093.5462 (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			900.8880 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.5200 (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	2467.2475	1.1300	2787.9897 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2740.1155	1.1300	3096.3306 (278)
Space and water heating			5884.3202 (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			4715.4637 (286)
Target Primary Energy Rate (TPER)			65.5500 (287)

Full SAP Calculation Printout



Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 8			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	91 B	DER	12.37	TER	12.52		
Environmental	90 B	% DER < TER				1.20	
CO ₂ Emissions (t/year)	0.85	DFEE	34.21	TFEE	37.65		
Compliance Check	See BREL	% DFEE < TFEE				9.14	
% DPER < TPER	0.32	DPER	65.34	TPER	65.55		
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)

Point Thermal Bridges

Total fabric heat loss

$$(33) + (36) + (36a) = 44.2637 \quad (37)$$

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)
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)
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)

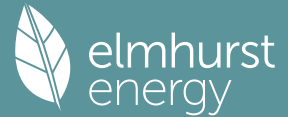
5. Internal gains (see Table 5 and 5a)

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
East						6.0100	19.6403	0.7300	0.7000			0.7700	41.8000 (76)
South						1.4200	46.7521	0.7300	0.7000			0.7700	23.5095 (78)
West						4.5600	19.6403	0.7300	0.7000			0.7700	31.7151 (80)
Solar gains	97.0246	182.3136	285.8817	400.8436	481.0785	488.9278	466.8700	407.1260	326.6842	212.1725	119.5314		80.7696 (83)
Total gains	613.2857	696.6280	783.7574	867.7837	917.4268	894.5047	855.9546	799.0305	734.2862	650.8515	592.2185		583.1608 (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												
	0.9881	0.9768	0.9468	0.8676	0.7238	0.5398	0.3946	0.4395	0.6816	0.9110	0.9778	0.9905 (86)
MIT	19.8585	20.0561	20.3581	20.6933	20.9019	20.9821	20.9970	20.9949	20.9453	20.6536	20.1919	19.8208 (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												
	0.9846	0.9703	0.9322	0.8343	0.6657	0.4626	0.3082	0.3484	0.6017	0.8800	0.9704	0.9877 (89)
MIT 2	18.6876	18.9380	19.3131	19.7157	19.9354	20.0130	20.0219	20.0229	19.9843	19.6839	19.1205	18.6469 (90)
Living area fraction												
									fLA = Living area / (4) =			0.1795 (91)
MIT	18.8977	19.1386	19.5006	19.8911	20.1088	20.1869	20.1968	20.1973	20.1568	19.8579	19.3127	18.8575 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.7477	18.9886	19.3506	19.7411	19.9588	20.0369	20.0468	20.0473	20.0068	19.7079	19.1627	18.7075 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9786	0.9615	0.9203	0.8239	0.6623	0.4638	0.3103	0.3505	0.6007	0.8684	0.9617	0.9825 (94)
Useful gains	600.1576	669.8348	721.3128	714.9923	607.6287	414.8506	265.6066	280.0808	441.0705	565.1673	569.5424	572.9731 (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	1151.1041	1119.4541	1018.3636	848.3503	644.7428	419.7407	266.1029	280.9938	457.9821	711.0275	946.2383	1143.7186 (97)
Space heating kWh	409.9042	302.1442	221.0058	96.0178	27.6129	0.0000	0.0000	0.0000	0.0000	108.5199	271.2211	424.6346 (98a)
Space heating requirement - total per year (kWh/year)												1861.0606
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	409.9042	302.1442	221.0058	96.0178	27.6129	0.0000	0.0000	0.0000	0.0000	108.5199	271.2211	424.6346 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1861.0606
Space heating per m2										(98c) / (4) =		25.8696 (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	409.9042	302.1442	221.0058	96.0178	27.6129	0.0000	0.0000	0.0000	0.0000	108.5199	271.2211	424.6346 (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)	462.1243	340.6361	249.1610	108.2500	31.1307	0.0000	0.0000	0.0000	0.0000	122.3449	305.7735	478.7312 (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	84.2078	83.6915	82.5910	80.5845	78.0623	76.4000	76.4000	76.4000	76.4000	80.9243	83.4156	76.4000 (216)	
Fuel for water heating, kWh/month	241.2265	213.5935	227.4348	199.0389	194.9808	174.8713	169.3134	178.7074	183.6011	198.5141	210.9481	237.4760 (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	-17.1558	-27.6111	-45.6983	-57.7208	-66.6152	-63.6818	-62.5435	-56.5505	-46.3889	-33.8725	-19.8097	-14.3224 (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	-5.8073	-14.3209	-34.5180	-61.2457	-89.3481	-93.1044	-90.7303	-71.5516	-45.7638	-22.2012	-8.1597	-4.3895 (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													2098.1517 (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													2429.7060 (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													-1053.1109 (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	3733.7992 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2098.1517	3.6400	76.3727 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2429.7060	3.6400	88.4413 (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	-511.9704	16.4900	-84.4239
PV Unit electricity exported	-541.1405	5.5900	-30.2498
Total			-114.6737 (252)
Total energy cost			184.8581 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.5691 (257)
SAP value		90.7751
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	2098.1517	0.2100	440.6119 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2429.7060	0.2100	510.2383 (264)
Space and water heating			950.8501 (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	-511.9704	0.1324	-67.7630
PV Unit electricity exported	-541.1405	0.1220	-66.0084
Total			-133.7714 (269)
Total CO2, kg/year			853.9848 (272)
CO2 emissions per m2			11.8700 (273)
EI value			90.2143
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

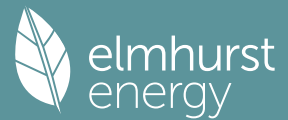
1. Overall dwelling characteristics

	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)

$$5.6461 \quad (36)$$

Point Thermal Bridges

$$(36a) = 0.0000$$

Total fabric heat loss

$$(33) + (36) + (36a) = 44.2637 \quad (37)$$

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

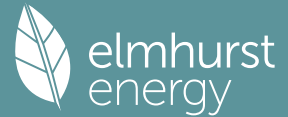
(38)m	Jan 35.4099	Feb 35.1941	Mar 34.9826	Apr 33.9892	May 33.8034	Jun 32.9382	Jul 32.9382	Aug 32.7779	Sep 33.2714	Oct 33.8034	Nov 34.1794	Dec 34.5725	(38)
Heat transfer coeff	79.6737	79.4579	79.2464	78.2530	78.0671	77.2019	77.2019	77.0417	77.5352	78.0671	78.4431	78.8362	(39)
Average = Sum(39)m / 12 =													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	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	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	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														
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
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	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	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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	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)

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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	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W	
East				6.0100	19.6403	0.7300	0.7000		0.7700		41.8000 (76)	
South				1.4200	46.7521	0.7300	0.7000		0.7700		23.5095 (78)	
West				4.5600	19.6403	0.7300	0.7000		0.7700		31.7151 (80)	
Solar gains	97.0246	182.3136	285.8817	400.8436	481.0785	488.9278	466.8700	407.1260	326.6842	212.1725	119.5314	80.7696 (83)
Total gains	613.2857	696.6280	783.7574	867.7837	917.4268	894.5047	855.9546	799.0305	734.2862	650.8515	592.2185	583.1608 (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	0.9881	0.9768	0.9468	0.8676	0.7238	0.5398	0.3946	0.4395	0.6816	0.9110	0.9778	0.9905	(86)
MIT	19.8585	20.0561	20.3581	20.6933	20.9019	20.9821	20.9970	20.9949	20.9453	20.6536	20.1919	19.8208	(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	0.9846	0.9703	0.9322	0.8343	0.6657	0.4626	0.3082	0.3484	0.6017	0.8800	0.9704	0.9877	(89)
MIT 2	18.6876	18.9380	19.3131	19.7157	19.9354	20.0130	20.0219	20.0229	19.9843	19.6839	19.1205	18.6469	(90)
Living area fraction	18.8977	19.1386	19.5006	19.8911	20.1088	20.1869	20.1968	20.1973	20.1568	19.8579	19.3127	18.8575	(91)
MIT	18.8977	19.1386	19.5006	19.8911	20.1088	20.1869	20.1968	20.1973	20.1568	19.8579	19.3127	18.8575	(92)
Temperature adjustment	18.7477	18.9886	19.3506	19.7411	19.9588	20.0369	20.0468	20.0473	20.0068	19.7079	19.1627	18.7075	(93)
adjusted MIT	18.7477	18.9886	19.3506	19.7411	19.9588	20.0369	20.0468	20.0473	20.0068	19.7079	19.1627	18.7075	(93)

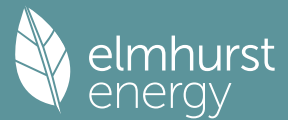
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9786	0.9615	0.9203	0.8239	0.6623	0.4638	0.3103	0.3505	0.6007	0.8684	0.9617	0.9825	(94)
Useful gains	600.1576	669.8348	721.3128	714.9923	607.6287	414.8506	265.6066	280.0808	441.0705	565.1673	569.5424	572.9731	(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	1151.1041	1119.4541	1018.3636	848.3503	644.7428	419.7407	266.1029	280.9938	457.9821	711.0275	946.2383	1143.7186	(97)
Space heating kWh	409.9042	302.1442	221.0058	96.0178	27.6129	0.0000	0.0000	0.0000	0.0000	108.5199	271.2211	424.6346	(98a)
Space heating requirement - total per year (kWh/year)												1861.0606	
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	409.9042	302.1442	221.0058	96.0178	27.6129	0.0000	0.0000	0.0000	0.0000	108.5199	271.2211	424.6346	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1861.0606	
Space heating per m2										(98c) / (4) =		25.8696	(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	
409.9042	302.1442	221.0058	96.0178	27.6129	0.0000	0.0000	0.0000	0.0000	0.0000	108.5199	271.2211	424.6346	(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)	462.1243	340.6361	249.1610	108.2500	31.1307	0.0000	0.0000	0.0000	0.0000	122.3449	305.7735	478.7312	(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	84.2078	83.6915	82.5910	80.5845	78.0623	76.4000	76.4000	76.4000	76.4000	80.9243	83.4156	84.3475	(217)
Fuel for water heating, kWh/month	241.2265	213.5935	227.4348	199.0389	194.9808	174.8713	169.3134	178.7074	183.6011	198.5141	210.9481	237.4760	(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	-17.1558	-27.6111	-45.6983	-57.7208	-66.6152	-63.6818	-62.5435	-56.5505	-46.3889	-33.8725	-19.8097	-14.3224	(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	-5.8073	-14.3209	-34.5180	-61.2457	-89.3481	-93.1044	-90.7303	-71.5516	-45.7638	-22.2012	-8.1597	-4.3895	(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												2098.1517	(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												2429.7060	(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												-1053.1109	(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												3733.7992	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2098.1517	5.6000	117.4965 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2429.7060	5.6000	136.0635 (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	-511.9704	26.0600	-133.4195
PV Unit electricity exported	-541.1405	5.8100	-31.4403
Total			-164.8598 (252)
Total energy cost			255.2093 (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	2098.1517	0.2100	440.6119 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2429.7060	0.2100	510.2383 (264)
Space and water heating			950.8501 (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	-511.9704	0.1324	-67.7630
PV Unit electricity exported	-541.1405	0.1220	-66.0084
Total			-133.7714 (269)
Total CO2, kg/year			853.9848 (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	2098.1517	1.1300	2370.9114 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2429.7060	1.1300	2745.5678 (278)
Space and water heating			5116.4792 (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	-511.9704	1.4890	-762.3486
PV Unit electricity exported	-541.1405	0.4476	-242.1914
Total			-1004.5399 (283)
Total Primary energy kWh/year			4507.4736 (286)

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SAP 10 EPC IMPROVEMENTS

Plot 8

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 (16.9%)

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	£353	£353	£0
Space heating	£239	£239	£0
Water heating	£136	£136	£0
Lighting	£45	£45	£0
Generated (PV)	-£165	-£165	£0
Total cost of fuels	£256	£256	£0
Total cost of uses	£255	£255	£0
Delivered energy	52 kWh/m²	52 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	63 kWh/m²	63 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)

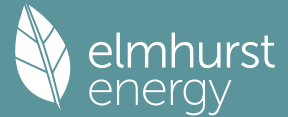
2. Ventilation rate

	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

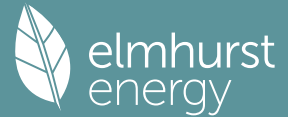
4. Water heating energy requirements (kWh/year)

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)
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	
East				6.0100	19.6403	0.7300	0.7000		0.7700		41.8000 (76)	
South				1.4200	46.7521	0.7300	0.7000		0.7700		23.5095 (78)	
West				4.5600	19.6403	0.7300	0.7000		0.7700		31.7151 (80)	
Solar gains	97.0246	182.3136	285.8817	400.8436	481.0785	488.9278	466.8700	407.1260	326.6842	212.1725	119.5314	80.7696 (83)
Total gains	613.2857	696.6280	783.7574	867.7837	917.4268	894.5047	855.9546	799.0305	734.2862	650.8515	592.2185	583.1608 (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	0.9881	0.9768	0.9468	0.8676	0.7238	0.5398	0.3946	0.4395	0.6816	0.9110	0.9778	0.9905 (86)
MIT	19.8585	20.0561	20.3581	20.6933	20.9019	20.9821	20.9970	20.9949	20.9453	20.6536	20.1919	19.8208 (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	0.9846	0.9703	0.9322	0.8343	0.6657	0.4626	0.3082	0.3484	0.6017	0.8800	0.9704	0.9877 (89)
MIT 2	18.6876	18.9380	19.3131	19.7157	19.9354	20.0130	20.0219	20.0229	19.9843	19.6839	19.1205	18.6469 (90)
Living area fraction									fLA = Living area / (4) =			0.1795 (91)
MIT	18.8977	19.1386	19.5006	19.8911	20.1088	20.1869	20.1968	20.1973	20.1568	19.8579	19.3127	18.8575 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.7477	18.9886	19.3506	19.7411	19.9588	20.0369	20.0468	20.0473	20.0068	19.7079	19.1627	18.7075 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	600.1576	669.8348	721.3128	714.9923	607.6287	414.8506	265.6066	280.0808	441.0705	565.1673	569.5424	572.9731 (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	1151.1041	1119.4541	1018.3636	848.3503	644.7428	419.7407	266.1029	280.9938	457.9821	711.0275	946.2383	1143.7186 (97)
Space heating kWh	409.9042	302.1442	221.0058	96.0178	27.6129	0.0000	0.0000	0.0000	0.0000	108.5199	271.2211	424.6346 (98a)
Space heating requirement - total per year (kWh/year)												1861.0606
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	409.9042	302.1442	221.0058	96.0178	27.6129	0.0000	0.0000	0.0000	0.0000	108.5199	271.2211	424.6346 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1861.0606
Space heating per m2										(98c) / (4) =		25.8696 (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	409.9042	302.1442	221.0058	96.0178	27.6129	0.0000	0.0000	0.0000	0.0000	108.5199	271.2211	424.6346 (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)	462.1243	340.6361	249.1610	108.2500	31.1307	0.0000	0.0000	0.0000	0.0000	122.3449	305.7735	478.7312 (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	84.2078	83.6915	82.5910	80.5845	78.0623	76.4000	76.4000	76.4000	76.4000	80.9243	83.4156	76.4000 (216)
Fuel for water heating, kWh/month	241.2265	213.5935	227.4348	199.0389	194.9808	174.8713	169.3134	178.7074	183.6011	198.5141	210.9481	84.3475 (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	-17.1558	-27.6111	-45.6983	-57.7208	-66.6152	-63.6818	-62.5435	-56.5505	-46.3889	-33.8725	-19.8097	-14.3224 (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	-5.8073	-14.3209	-34.5180	-61.2457	-89.3481	-93.1044	-90.7303	-71.5516	-45.7638	-22.2012	-8.1597	-4.3895	(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												2098.1517	(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												2429.7060	(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												-1053.1109	(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												3733.7992	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2098.1517	3.6400	76.3727	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2429.7060	3.6400	88.4413	(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	-511.9704	16.4900	-84.4239	
PV Unit electricity exported	-541.1405	5.5900	-30.2498	
Total			-114.6737	(252)
Total energy cost			184.8581	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.5691	(257)
SAP value		90.7751	
SAP rating (Section 12)		91	(258)
SAP band		B	

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

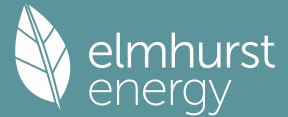
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2098.1517	0.2100	440.6119	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2429.7060	0.2100	510.2383	(264)
Space and water heating			950.8501	(265)
Pumps, fans and 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	-511.9704	0.1324	-67.7630	
PV Unit electricity exported	-541.1405	0.1220	-66.0084	
Total			-133.7714	(269)
Total CO2, kg/year			853.9848	(272)
CO2 emissions per m2			11.8700	(273)
EI value			90.2143	
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												
	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		
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	
East					6.0100	19.6403	0.7300	0.7000			0.7700	41.8000 (76)	
South					1.4200	46.7521	0.7300	0.7000			0.7700	23.5095 (78)	
West					4.5600	19.6403	0.7300	0.7000			0.7700	31.7151 (80)	
Solar gains	97.0246	182.3136	285.8817	400.8436	481.0785	488.9278	466.8700	407.1260	326.6842	212.1725	119.5314	80.7696 (83)	
Total gains	613.2857	696.6280	783.7574	867.7837	917.4268	894.5047	855.9546	799.0305	734.2862	650.8515	592.2185	583.1608 (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	0.9881	0.9768	0.9468	0.8676	0.7238	0.5398	0.3946	0.4395	0.6816	0.9110	0.9778	0.9905 (86)
MIT	19.8585	20.0561	20.3581	20.6933	20.9019	20.9821	20.9970	20.9949	20.9453	20.6536	20.1919	19.8208 (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	0.9846	0.9703	0.9322	0.8343	0.6657	0.4626	0.3082	0.3484	0.6017	0.8800	0.9704	0.9877 (89)
MIT 2	18.6876	18.9380	19.3131	19.7157	19.9354	20.0130	20.0219	20.0229	19.9843	19.6839	19.1205	18.6469 (90)
Living area fraction	18.8977	19.1386	19.5006	19.8911	20.1088	20.1869	20.1968	20.1973	20.1568	19.8579	19.3127	18.8575 (91)
MIT	18.8977	19.1386	19.5006	19.8911	20.1088	20.1869	20.1968	20.1973	20.1568	19.8579	19.3127	18.8575 (92)
Temperature adjustment	18.7477	18.9886	19.3506	19.7411	19.9588	20.0369	20.0468	20.0473	20.0068	19.7079	19.1627	-0.1500
adjusted MIT	18.7477	18.9886	19.3506	19.7411	19.9588	20.0369	20.0468	20.0473	20.0068	19.7079	19.1627	18.7075 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	600.1576	669.8348	721.3128	714.9923	607.6287	414.8506	265.6066	280.0808	441.0705	565.1673	569.5424	572.9731	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1151.1041	1119.4541	1018.3636	848.3503	644.7428	419.7407	266.1029	280.9938	457.9821	711.0275	946.2383	1143.7186	(97)
Space heating kWh	409.9042	302.1442	221.0058	96.0178	27.6129	0.0000	0.0000	0.0000	0.0000	108.5199	271.2211	424.6346	(98a)
Space heating requirement - total per year (kWh/year)												1861.0606	
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	409.9042	302.1442	221.0058	96.0178	27.6129	0.0000	0.0000	0.0000	0.0000	108.5199	271.2211	424.6346	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1861.0606	
Space heating per m ²												25.8696	(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	409.9042	302.1442	221.0058	96.0178	27.6129	0.0000	0.0000	0.0000	0.0000	108.5199	271.2211	424.6346 (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)	462.1243	340.6361	249.1610	108.2500	31.1307	0.0000	0.0000	0.0000	0.0000	122.3449	305.7735	478.7312 (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	84.2078	83.6915	82.5910	80.5845	78.0623	76.4000	76.4000	76.4000	76.4000	80.9243	83.4156	76.4000 (216)
Fuel for water heating, kWh/month	241.2265	213.5935	227.4348	199.0389	194.9808	174.8713	169.3134	178.7074	183.6011	198.5141	210.9481	84.3475 (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	-17.1558	-27.6111	-45.6983	-57.7208	-66.6152	-63.6818	-62.5435	-56.5505	-46.3889	-33.8725	-19.8097	-14.3224 (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	-5.8073	-14.3209	-34.5180	-61.2457	-89.3481	-93.1044	-90.7303	-71.5516	-45.7638	-22.2012	-8.1597	-4.3895 (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												2098.1517 (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												2429.7060 (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												-1053.1109 (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												3733.7992 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2098.1517	5.6000	117.4965 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2429.7060	5.6000	136.0635 (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	-511.9704	26.0600	-133.4195
PV Unit electricity exported	-541.1405	5.8100	-31.4403
Total			-164.8598 (252)
Total energy cost			255.2093 (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	2098.1517	0.2100	440.6119 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2429.7060	0.2100	510.2383 (264)
Space and water heating			950.8501 (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	-511.9704	0.1324	-67.7630
PV Unit electricity exported	-541.1405	0.1220	-66.0084
Total			-133.7714 (269)
Total CO2, kg/year			853.9848 (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	2098.1517	1.1300	2370.9114 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2429.7060	1.1300	2745.5678 (278)
Space and water heating			5116.4792 (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	-511.9704	1.4890	-762.3486
PV Unit electricity exported	-541.1405	0.4476	-242.1914
Total			-1004.5399 (283)
Total Primary energy kWh/year			4507.4736 (286)

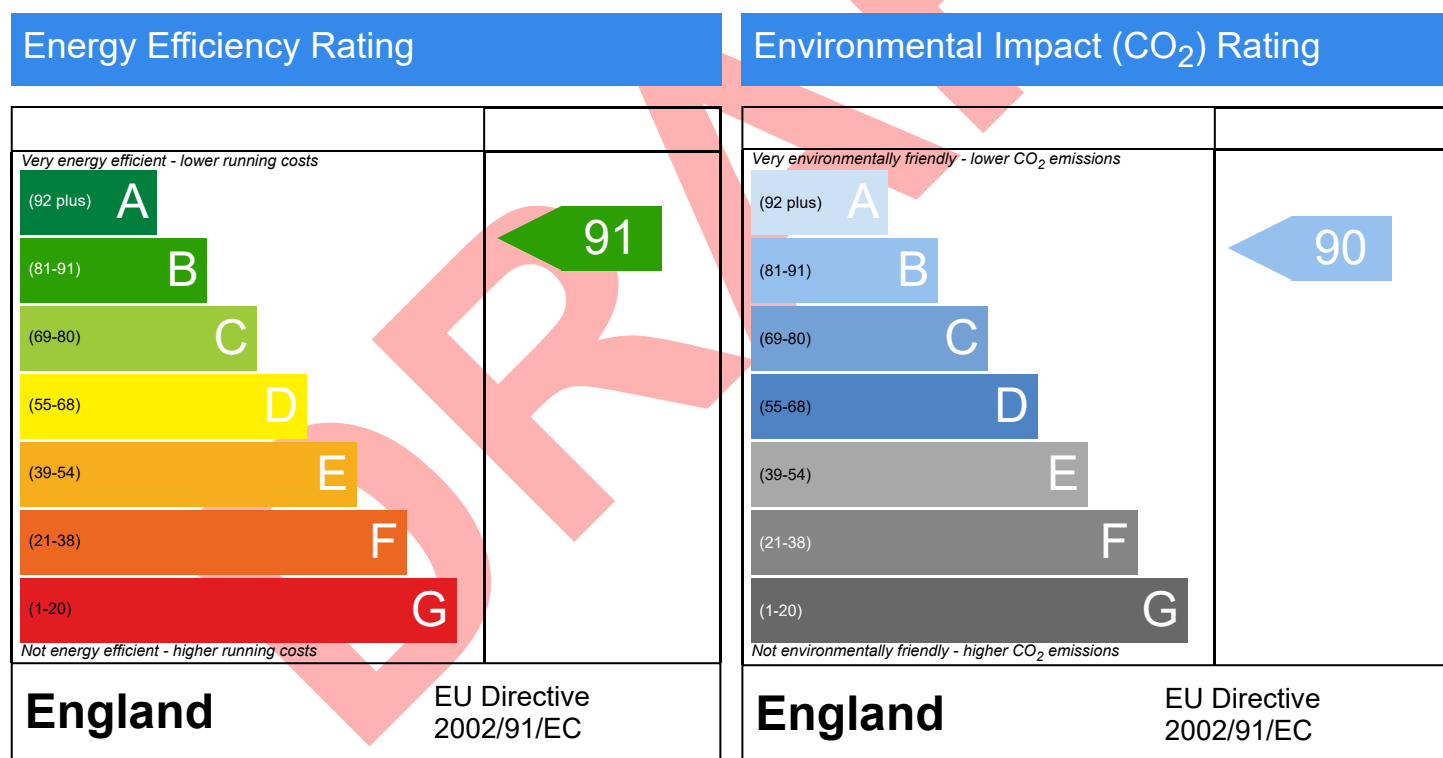
Predicted Energy Assessment



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.