

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, End-terrace
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 38
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	12.59 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	12.42 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	65.92 kWh _{PE} /m ²		
Dwelling primary energy	65.53 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	37.6 kWh/m ²		
Dwelling fabric energy efficiency	34.0 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	South	N/A	1.1 (!)
Front Windows, Windows	4.56	South	0.7	1.3
Side Windows, Windows	1.42	East	0.7	1.3
Rear Windows, Windows	6.01	North	0.7	1.3

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part 1 - Main Dwelling: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.024 (!)	MFF-150-E2-02
External wall	E3: Sill	Calculated by person with suitable expertise	0.022 (!)	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	1.2 kWp	
Orientation	South	
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 38	Prop Type Ref	SAP VG 21-0282
Property			

SAP Rating	91 B	DER	12.42	TER	12.59
Environmental	90 B	% DER < TER			1.35
CO ₂ Emissions (t/year)	0.86	DFEE	34.00	TFEE	37.62
Compliance Check	See BREL	% DFEE < TFEE			9.61
% DPER < TPER	0.60	DPER	65.53	TPER	65.92

Assessor Details	Miss Victoria Gartside	Assessor ID	AL30-0001
Client			

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

Orientation	South	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	House, End-Terrace	
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	Storey	Construction	Area (m²)
Internal Ceiling 1	+1	Plasterboard ceiling, carpeted chipboard floor	35.97

11.0 Heat Loss Floors

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

11.2 Internal Floors

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

12.0 Opening Types

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

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Front door	Front door	Brick wall	South	2.14	0
Front Windows	Windows	Brick wall	South	4.56	0
Side Windows	Windows	Brick wall	East	1.42	0
Rear Windows	Windows	Brick wall	North	6.01	0

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	9.61	0.02	0.02 MFF-150-E2-02	No
E3 Sill	Independently assessed	7.01	0.02	0.02 RCD E3.01	No
E4 Jamb	Independently assessed	25.50	0.02	0.02	No
E5 Ground floor (normal)	Independently assessed	16.97	0.09	0.09 Manufacturer Declaration	No
E6 Intermediate floor within a dwelling	Independently assessed	16.97	0.00	0.00 RCD E6.01	No
E16 Corner (normal)	Independently assessed	10.06	0.05	0.05 RCD E16.01	No
E18 Party wall between dwellings	Independently assessed	10.06	0.04	0.04 SMRF-P05-0.16	No
P1 Party wall - Ground floor	Independently assessed	8.23	0.07	0.07 Manufacturer Declaration	No
P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	16.46	0.00	0.00	No
P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	8.23	0.10	0.10 MPW-P4-01	No
E10 Eaves (insulation at ceiling level)	Independently assessed	8.74	0.06	0.06 RCD E10.01	No
E12 Gable (insulation at ceiling level)	Independently assessed	8.23	0.06	0.06 RCD E12.01	No

Y-value

0.04 W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present

No

19.1 Mechanical extract ventilation - Decentralised

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

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	3
Number of passive vents	0
Number of flueless gas fires	0

Summary for Input Data

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

Summary for Input Data

Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Summer Immersion	No
Cold Water Source	From mains
Bath Count	1
Supplementary Immersion	No
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder

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

31.0 Thermal Store

	None
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32.0 Photovoltaic Unit

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

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

34.0 Small-scale Hydro

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

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

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout



Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 38			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	91 B		DER	12.42		TER	12.59
Environmental	90 B		% DER < TER				1.35
CO ₂ Emissions (t/year)	0.86		DFEE	34.00		TFEE	37.62
Compliance Check	See BREL		% DFEE < TFEE				9.61
% DPER < TPER	0.60		DPER	65.53		TPER	65.92
Assessor Details	Miss Victoria Gartside					Assessor ID	AL30-0001
Client							

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

1. Overall dwelling characteristics

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

2. Ventilation rate

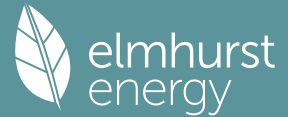
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1658 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3658 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3384 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4314	0.4230	0.4145	0.3722	0.3638	0.3215	0.3215	0.3130	0.3384	0.3638	0.3807	0.3976 (22b)
Effective ac	0.5931	0.5895	0.5859	0.5693	0.5662	0.5517	0.5517	0.5490	0.5572	0.5662	0.5725	0.5790 (25)

3. Heat losses and heat loss parameter

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

Full SAP Calculation Printout



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	
												1.0877	
												31	

4. Water heating energy requirements (kWh/year)													

Assumed occupancy													2.2923 (42)
Hot water usage for mixer showers													
	62.6538	61.7122	60.3402	57.7150	55.7777	53.6172	52.3892	53.7509	55.2435	57.5632	60.2448	62.4137	(42a)
Hot water usage for baths													
	27.0664	26.6644	26.0984	25.0546	24.2731	23.4065	22.9384	23.5005	24.1126	25.0399	26.1051	26.9749	(42b)
Hot water usage for other uses													
	38.1053	36.7197	35.3340	33.9484	32.5627	31.1771	31.1771	32.5627	33.9484	35.3340	36.7197	38.1053	(42c)
Average daily hot water use (litres/day)												117.5007	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	127.8255	125.0963	121.7725	116.7180	112.6135	108.2008	106.5048	109.8142	113.3045	117.9371	123.0695	127.4939	(44)
Energy conte	202.4443	178.1355	187.1599	159.7811	151.5995	133.0456	128.8083	135.9729	139.7158	160.0395	175.3350	199.6247	(45)
Energy content (annual)													
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)
												1959.0085	(64)
												1959	(64)
12Total per year (kWh/year)													
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)
Heat gains from water heating, kWh/month													
	67.4846	59.3861	62.4008	53.2806	50.5586	44.3767	42.9655	45.3509	46.5944	53.3648	58.4561	66.5453	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	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)
Appliances gains (calculated in Appendix L, equation L13 or L13a), 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)
Cooking gains (calculated in Appendix L, equation L15 or L15a), 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)
Pumps, fans	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)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
	-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	458.2220	469.2705	448.2064	430.6139	406.8768	387.7409	371.4411	372.5534	385.1004	402.8342	429.9876	448.0564	(73)

6. Solar gains													

[Jan]				Area		Solar flux		g		FF		Access	Gains
				m2		Table 6a		Specific data		Specific data		factor	W
						W/m2		or Table 6b		or Table 6c		Table 6d	
North				6.0100		10.6334		0.7300		0.7000		0.7700	22.6308 (74)
East				1.4200		19.6403		0.7300		0.7000		0.7700	9.8762 (76)
South				4.5600		46.7521		0.7300		0.7000		0.7700	75.4953 (78)
Solar gains	108.0023	186.2104	262.8050	342.4540	401.3790	406.9596	388.7741	343.0847	289.8885	207.7659	129.7201	92.2227	(83)
Total gains	566.2243	655.4810	711.0114	773.0678	808.2558	794.7005	760.2152	715.6381	674.9890	610.6001	559.7077	540.2791	(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	0.9915	0.9818	0.9625	0.9056	0.7861	0.5992	0.4426	0.4880	0.7251	0.9276	0.9823	0.9931 (86)
MIT	19.7883	19.9979	20.2671	20.6097	20.8565	20.9717	20.9949	20.9918	20.9279	20.6115	20.1456	19.7560 (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	0.9889	0.9765	0.9515	0.8784	0.7311	0.5169	0.3465	0.3882	0.6455	0.9006	0.9762	0.9911 (89)
MIT 2	18.5989	18.8655	19.2036	19.6245	19.8952	20.0068	20.0212	20.0217	19.9718	19.6375	19.0631	18.5647 (90)
Living area fraction									fLA = Living area /	(4) =		0.1795 (91)
MIT	18.8123	19.0687	19.3945	19.8013	20.0677	20.1799	20.1959	20.1958	20.1433	19.8123	19.2574	18.7785 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.6623	18.9187	19.2445	19.6513	19.9177	20.0299	20.0459	20.0458	19.9933	19.6623	19.1074	18.6285 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9841	0.9688	0.9407	0.8667	0.7253	0.5175	0.3488	0.3904	0.6432	0.8887	0.9685	0.9869 (94)
Useful gains	557.2024	635.0140	668.8372	670.0059	586.2143	411.2551	265.1772	279.3841	434.1505	542.6232	542.0724	533.2193 (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	1144.2978	1113.8960	1009.9517	841.3212	641.5307	419.2003	266.0300	280.8788	456.9407	707.4679	941.8958	1137.4900 (97)
Space heating kWh	436.7990	321.8088	253.7892	123.3470	41.1554	0.0000	0.0000	0.0000	0.0000	122.6444	287.8728	449.5773 (98a)
Space heating requirement - total per year (kWh/year)												2036.9941
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	436.7990	321.8088	253.7892	123.3470	41.1554	0.0000	0.0000	0.0000	0.0000	122.6444	287.8728	449.5773 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2036.9941
Space heating per m2										(98c) / (4) =		28.3152 (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	436.7990	321.8088	253.7892	123.3470	41.1554	0.0000	0.0000	0.0000	0.0000	122.6444	287.8728	449.5773 (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)	492.4454	362.8058	286.1208	139.0609	46.3985	0.0000	0.0000	0.0000	0.0000	138.2688	324.5466	506.8516 (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	84.3874	83.8776	83.0154	81.3010	78.7235	76.4000	76.4000	76.4000	76.4000	81.2795	83.5944	76.4000 (216)
Fuel for water heating, kWh/month	240.7131	213.1197	226.2720	197.2849	193.3430	174.8713	169.3134	178.7074	183.6011	197.6465	210.4970	237.0287 (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	-21.5075	-31.7262	-47.7724	-56.3257	-62.9605	-59.5830	-58.8137	-54.3787	-46.9494	-37.3675	-24.1235	-18.4278 (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	-8.5444	-18.4218	-37.6353	-58.1375	-78.4491	-79.4452	-78.3773	-65.4857	-46.9284	-26.7400	-11.5224	-6.7205 (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												2296.4984 (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												2422.3981 (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												-1036.3436 (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	3941.6052 (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	2296.4984	0.2100	482.2647 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2422.3981	0.2100	508.7036 (264)
Space and water heating			990.9683 (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	-519.9360	0.1336	-69.4814
PV Unit electricity exported	-516.4076	0.1251	-64.6215
Total			-134.1029 (269)
Total CO2, kg/year			893.7714 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.4200 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2296.4984	1.1300	2595.0432 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2422.3981	1.1300	2737.3099 (278)
Space and water heating			5332.3530 (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	-519.9360	1.4938	-776.6993
PV Unit electricity exported	-516.4076	0.4593	-237.1859
Total			-1013.8852 (283)
Total Primary energy kWh/year			4714.0022 (286)
Dwelling Primary energy Rate (DPER)			65.5300 (287)

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

1. Overall dwelling characteristics

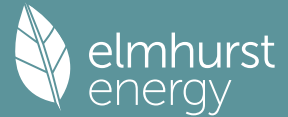
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	35.9700 (1b)	x 2.4000 (2b)	= 86.3280 (1b) - (3b)
First floor	35.9700 (1c)	x 2.6300 (2c)	= 94.6011 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.9400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	180.9291 (5)

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)								(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	

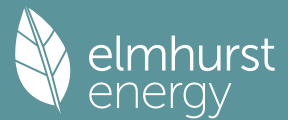
4. Water heating energy requirements (kWh/year)

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	108.8625	(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	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W		
North				6.0100	10.6334	0.6300	0.7000		0.7700	19.5307 (74)		
East				1.4200	19.6403	0.6300	0.7000		0.7700	8.5233 (76)		
South				4.5600	46.7521	0.6300	0.7000		0.7700	65.1535 (78)		

Solar gains	93.2075	160.7021	226.8043	295.5425	346.3956	351.2118	335.5174	296.0868	250.1778	179.3048	111.9503	79.5895 (83)
Total gains	568.3218	646.8638	691.9053	743.0666	770.1917	755.8828	723.8979	685.5754	652.2086	599.0585	558.8429	544.5406 (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	0.9916	0.9836	0.9684	0.9227	0.8214	0.6425	0.4798	0.5245	0.7580	0.9369	0.9833	0.9931 (86)
MIT	19.7077	19.9054	20.1711	20.5286	20.8067	20.9570	20.9916	20.9872	20.9031	20.5545	20.0804	19.6837 (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	0.9891	0.9788	0.9587	0.8986	0.7687	0.5552	0.3734	0.4155	0.6778	0.9121	0.9774	0.9910 (89)
MIT 2	18.4668	18.7191	19.0551	19.5013	19.8144	19.9644	19.9864	19.9869	19.9195	19.5424	18.9537	18.4450 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.6895	18.9320	19.2554	19.6857	19.9924	20.1425	20.1668	20.1664	20.0960	19.7241	19.1559	18.6673 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.6895	18.9320	19.2554	19.6857	19.9924	20.1425	20.1668	20.1664	20.0960	19.7241	19.1559	18.6673 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9848	0.9723	0.9501	0.8905	0.7697	0.5691	0.3924	0.4349	0.6875	0.9045	0.9711	0.9873 (94)
Useful gains	559.6672	628.9579	657.3988	661.7262	592.7789	430.1945	284.0917	298.1551	448.3662	541.8313	542.6808	537.6005 (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	1199.3666	1165.6600	1056.1209	879.1898	673.9655	444.2698	285.9045	301.1229	483.2039	741.5548	985.6957	1190.1998 (97)
Space heating kWh	475.9364	360.6638	296.6492	156.5738	60.4028	0.0000	0.0000	0.0000	0.0000	148.5943	318.9707	485.5339 (98a)
Space heating requirement - total per year (kWh/year)	2303.3248											
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	475.9364	360.6638	296.6492	156.5738	60.4028	0.0000	0.0000	0.0000	0.0000	148.5943	318.9707	485.5339 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2303.3248											
Space heating per m2	(98c) / (4) = 32.0173 (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	475.9364	360.6638	296.6492	156.5738	60.4028	0.0000	0.0000	0.0000	0.0000	148.5943	318.9707	485.5339 (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)	515.0826	390.3288	321.0489	169.4522	65.3710	0.0000	0.0000	0.0000	0.0000	160.8163	345.2064	525.4695 (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	85.9474	85.6405	85.1054	84.0018	82.2827	80.3000	80.3000	80.3000	80.3000	83.8642	85.3716	86.0057 (216)
Fuel for water heating, kWh/month	261.5094	232.1694	248.6244	222.7708	221.2957	205.2853	203.4225	211.0484	212.8363	226.1191	234.7921	258.6705 (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													2492.7758	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													80.3000	
Water heating fuel used													2738.5440	(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													3716.0758	(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	2492.7758	0.2100	523.4829 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2738.5440	0.2100	575.0942 (264)
Space and water heating			1098.5772 (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			905.9189 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.5900 (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	2492.7758	1.1300	2816.8367 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2738.5440	1.1300	3094.5548 (278)
Space and water heating			5911.3914 (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			4742.5349 (286)
Target Primary Energy Rate (TPER)			65.9200 (287)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 38			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	91 B	DER	12.42	TER	12.59		
Environmental	90 B	% DER < TER				1.35	
CO ₂ Emissions (t/year)	0.86	DFEE	34.00	TFEE	37.62		
Compliance Check	See BREL	% DFEE < TFEE				9.61	
% DPER < TPER	0.60	DPER	65.53	TPER	65.92		
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 (42a)
	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										Total = Sum(45)m =		992.0875
	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)									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)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			570.7403 (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)

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	Solar flux	g	FF			Access			Gains
			m2	Table 6a	Specific data	Specific data			factor			W
				W/m2	or Table 6b	or Table 6c			Table 6d			
North			6.0100	10.6334	0.7300	0.7000			0.7700			22.6308 (74)
East			1.4200	19.6403	0.7300	0.7000			0.7700			9.8762 (76)
South			4.5600	46.7521	0.7300	0.7000			0.7700			75.4953 (78)

Solar gains	108.0023	186.2104	262.8050	342.4540	401.3790	406.9596	388.7741	343.0847	289.8885	207.7659	129.7201	92.2227 (83)
Total gains	518.8596	609.2821	667.5110	736.0818	775.1017	768.5947	736.8787	690.4574	647.5808	575.6769	518.5672	493.8010 (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	0.9941	0.9865	0.9704	0.9191	0.8054	0.6165	0.4560	0.5046	0.7461	0.9406	0.9871	0.9954 (86)
MIT	19.7165	19.9309	20.2094	20.5725	20.8390	20.9679	20.9942	20.9905	20.9179	20.5722	20.0856	19.6849 (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	0.9923	0.9824	0.9614	0.8946	0.7521	0.5329	0.3573	0.4020	0.6671	0.9173	0.9825	0.9939 (89)
MIT 2	18.8359	19.0498	19.3244	19.6772	19.9085	20.0085	20.0213	20.0220	19.9764	19.6858	19.2134	18.8119 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.9939	19.2079	19.4832	19.8379	20.0755	20.1807	20.1959	20.1958	20.1453	19.8449	19.3700	18.9686 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.9939	19.2079	19.4832	19.8379	20.0755	20.1807	20.1959	20.1958	20.1453	19.8449	19.3700	18.9686 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9899	0.9782	0.9555	0.8896	0.7558	0.5470	0.3751	0.4204	0.6782	0.9124	0.9785	0.9919 (94)
Useful gains	513.6087	596.0249	637.7876	654.7989	585.8322	420.4098	276.3704	290.2566	439.1764	525.2599	507.4130	489.7960 (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	1170.7190	1136.8762	1028.8733	855.9215	653.8512	430.8380	277.6111	292.4331	468.7272	721.7201	962.4943	1164.2982 (97)
Space heating kWh	488.8901	363.4521	290.9678	144.8083	50.6061	0.0000	0.0000	0.0000	0.0000	146.1664	327.6586	501.8296 (98a)
Space heating requirement - total per year (kWh/year)	2314.3789											
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	488.8901	363.4521	290.9678	144.8083	50.6061	0.0000	0.0000	0.0000	0.0000	146.1664	327.6586	501.8296 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2314.3789											
Space heating per m2	(98c) / (4) = 32.1710 (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	0.8956	0.9454	0.9259	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	649.9435	540.0986	542.1069	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	855.9019	820.9845	768.8045	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	148.2901	208.9791	168.6630	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	37.0725	52.2448	42.1658	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	131.4830 (107)											
Energy for space heating	32.1710 (99)											
Energy for space cooling	1.8277 (108)											
Total	33.9986 (109)											
Fabric Energy Efficiency (DFEE)	34.0 (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 (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)
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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	65.1717	63.3841	61.4324	59.0030	56.8358	54.5836	54.1155	56.0633	58.0609	60.3739	62.8247	65.0802 (44)
Energy conte	103.2161	90.2581	94.4193	80.7722	76.5120	67.1169	65.4480	69.4180	71.5949	81.9268	89.5053	101.8999 (45)
Energy content (annual)										Total = Sum(45)m =		992.0875
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	87.7336	76.7194	80.2564	68.6563	65.0352	57.0494	55.6308	59.0053	60.8557	69.6378	76.0795	86.6149 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64d)
Output from w/h	87.7336	76.7194	80.2564	68.6563	65.0352	57.0494	55.6308	59.0053	60.8557	69.6378	76.0795	86.6149 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		843.2744 (64)
Electric shower(s)	50.1752	44.7065	48.8178	46.5863	47.4604	45.2726	46.7817	47.4604	46.5863	48.8178	47.8999	50.1752 (64a)

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

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

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	105.3508	116.6383	105.3508	108.8625	105.3508	108.8625	105.3508	105.3508	108.8625	105.3508	108.8625	105.3508 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.7819	203.8757	198.5993	187.3663	173.1867	159.8598	150.9567	148.8628	154.1393	165.3722	179.5519	192.8787 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915 (71)
Water heating gains (Table 5)	46.3403	45.1733	43.3717	40.0148	37.8009	35.5285	34.4128	35.7748	37.3062	39.8036	43.0484	45.9644 (72)
Total internal gains	410.8573	423.0717	404.7060	393.6278	373.7227	361.6351	348.1046	347.3727	357.6923	367.9109	388.8470	401.5782 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				6.0100	10.6334	0.6300	0.7000	0.7700	19.5307 (74)			
East				1.4200	19.6403	0.6300	0.7000	0.7700	8.5233 (76)			
South				4.5600	46.7521	0.6300	0.7000	0.7700	65.1535 (78)			
Solar gains	93.2075	160.7021	226.8043	295.5425	346.3956	351.2118	335.5174	296.0868	250.1778	179.3048	111.9503	79.5895 (83)
Total gains	504.0648	583.7739	631.5103	689.1703	720.1183	712.8468	683.6219	643.4595	607.8701	547.2158	500.7973	481.1677 (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	0.9949	0.9891	0.9776	0.9395	0.8487	0.6729	0.5060	0.5554	0.7912	0.9537	0.9893	0.9959 (86)
MIT	19.6109	19.8135	20.0888	20.4688	20.7730	20.9475	20.9894	20.9836	20.8820	20.4927	19.9957	19.5874 (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	0.9933	0.9858	0.9703	0.9194	0.7998	0.5845	0.3948	0.4416	0.7138	0.9341	0.9853	0.9947 (89)
MIT 2	18.6990	18.9022	19.1757	19.5521	19.8249	19.9651	19.9865	19.9868	19.9211	19.5830	19.0956	18.6850 (90)
Living area fraction	18.8626	19.0657	19.3396	19.7166	19.9951	20.1414	20.1664	20.1657	20.0935	19.7463	19.2571	18.8469 (92)
MIT	18.8626	19.0657	19.3396	19.7166	19.9951	20.1414	20.1664	20.1657	20.0935	19.7463	19.2571	18.8469 (93)
Temperature adjustment												0.0000
adjusted MIT	18.8626	19.0657	19.3396	19.7166	19.9951	20.1414	20.1664	20.1657	20.0935	19.7463	19.2571	18.8469 (93)

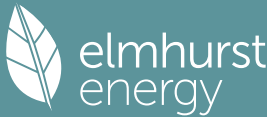
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9910	0.9819	0.9647	0.9133	0.8008	0.5986	0.4148	0.4619	0.7231	0.9285	0.9816	0.9927 (94)
Useful gains	499.5464	573.2336	609.2206	629.4135	576.6962	426.7149	283.5622	297.2099	439.5605	508.1076	491.5918	477.6597 (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	1213.8007	1176.7658	1063.0930	881.7138	674.1780	444.1811	285.8738	301.0665	482.9999	743.3581	993.9686	1204.9794 (97)
Space heating kWh	531.4052	405.5737	337.6811	181.6563	72.5265	0.0000	0.0000	0.0000	0.0000	175.0264	361.7113	541.1258 (98a)
Space heating requirement - total per year (kWh/year)												2606.7062
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	531.4052	405.5737	337.6811	181.6563	72.5265	0.0000	0.0000	0.0000	0.0000	175.0264	361.7113	541.1258 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2606.7062
Space heating per m ²										(98c) / (4) =		36.2344 (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	0.8502	0.9150	0.8905	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	640.6295	542.7660	541.0739	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	790.7420	758.7363	713.8719	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	108.0810	160.6819	128.5617	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	27.0202	40.1705	32.1404	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												99.3312 (107)
Energy for space heating												36.2344 (99)

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Energy for space cooling	1.3807 (108)
Total	37.6152 (109)
Fabric Energy Efficiency (TFEE)	37.6 (109)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 38			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	91 B		DER	12.42		TER	12.59
Environmental	90 B		% DER < TER				1.35
CO ₂ Emissions (t/year)	0.86		DFEE	34.00		TFEE	37.62
Compliance Check	See BREL		% DFEE < TFEE				9.61
% DPER < TPER	0.60		DPER	65.53		TPER	65.92
Assessor Details	Miss Victoria Gartside					Assessor ID	AL30-0001
Client							

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

1. Overall dwelling characteristics

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

2. Ventilation rate

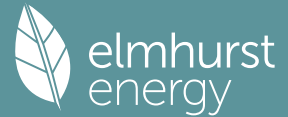
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1658 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3658 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3384 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4314	0.4230	0.4145	0.3722	0.3638	0.3215	0.3215	0.3130	0.3384	0.3638	0.3807	0.3976 (22b)
Effective ac	0.5931	0.5895	0.5859	0.5693	0.5662	0.5517	0.5517	0.5490	0.5572	0.5662	0.5725	0.5790 (25)

3. Heat losses and heat loss parameter

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

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E5 Ground floor (normal)						16.9700			0.0920			1.5612	
E6 Intermediate floor within a dwelling						16.9700			0.0010			0.0170	
E16 Corner (normal)						10.0600			0.0460			0.4628	
E18 Party wall between dwellings						10.0600			0.0400			0.4024	
P1 Party wall - Ground floor						8.2300			0.0690			0.5679	
P2 Party wall - Intermediate floor within a dwelling						16.4600			0.0000			0.0000	
P4 Party wall - Roof (insulation at ceiling level)						8.2300			0.1010			0.8312	
E10 Eaves (insulation at ceiling level)						8.7400			0.0600			0.5244	
E12 Gable (insulation at ceiling level)						8.2300			0.0560			0.4609	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												5.6461	(36)
Point Thermal bridges												0.0000	
Total fabric heat loss									(33) + (36) + (36a) =			44.2637	(37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	35.4099	35.1941	34.9826	33.9892	33.8034	32.9382	32.9382	32.7779	33.2714	33.8034	34.1794	34.5725	(38)
Average = Sum(39)m / 12 =	79.6737	79.4579	79.2464	78.2530	78.0671	77.2019	77.2019	77.0417	77.5352	78.0671	78.4431	78.8362	(39)
												78.2521	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1075	1.1045	1.1016	1.0878	1.0852	1.0731	1.0731	1.0709	1.0778	1.0852	1.0904	1.0959	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
												1.0877	
												31	
4. Water heating energy requirements (kWh/year)													
Assumed occupancy												2.2923	(42)
Hot water usage for mixer showers													
	62.6538	61.7122	60.3402	57.7150	55.7777	53.6172	52.3892	53.7509	55.2435	57.5632	60.2448	62.4137	(42a)
Hot water usage for baths													
	27.0664	26.6644	26.0984	25.0546	24.2731	23.4065	22.9384	23.5005	24.1126	25.0399	26.1051	26.9749	(42b)
Hot water usage for other uses													
	38.1053	36.7197	35.3340	33.9484	32.5627	31.1771	31.1771	32.5627	33.9484	35.3340	36.7197	38.1053	(42c)
Average daily hot water use (litres/day)												117.5007	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	127.8255	125.0963	121.7725	116.7180	112.6135	108.2008	106.5048	109.8142	113.3045	117.9371	123.0695	127.4939	(44)
Energy conte	202.4443	178.1355	187.1599	159.7811	151.5995	133.0456	128.8083	135.9729	139.7158	160.0395	175.3350	199.6247	(45)
Energy content (annual)													
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)
												1959.0085	(64)
12Total per year (kWh/year)												1959	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)
Heat gains from water heating, kWh/month													
	67.4846	59.3861	62.4008	53.2806	50.5586	44.3767	42.9655	45.3509	46.5944	53.3648	58.4561	66.5453	(65)
5. Internal gains (see Table 5 and 5a)													
Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	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)
Appliances gains (calculated in Appendix L, equation L13 or L13a), 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)
Cooking gains (calculated in Appendix L, equation L15 or L15a), 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)
Pumps, fans	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)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Water heating gains (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)
Total internal gains	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)
	458.2220	469.2705	448.2064	430.6139	406.8768	387.7409	371.4411	372.5534	385.1004	402.8342	429.9876	448.0564	(73)
6. Solar gains													
[Jan]				Area	Solar flux	g	FF	Access	Gains				
				m2	Table 6a	Specific data	Specific data	factor	W				
					W/m2	or Table 6b	or Table 6c	Table 6d					
North				6.0100	10.6334	0.7300	0.7000	0.7700	22.6308				(74)
East				1.4200	19.6403	0.7300	0.7000	0.7700	9.8762				(76)
South				4.5600	46.7521	0.7300	0.7000	0.7700	75.4953				(78)
Solar gains	108.0023	186.2104	262.8050	342.4540	401.3790	406.9596	388.7741	343.0847	289.8885	207.7659	129.7201	92.2227	(83)
Total gains	566.2243	655.4810	711.0114	773.0678	808.2558	794.7005	760.2152	715.6381	674.9890	610.6001	559.7077	540.2791	(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	0.9915	0.9818	0.9625	0.9056	0.7861	0.5992	0.4426	0.4880	0.7251	0.9276	0.9823	0.9931 (86)
MIT	19.7883	19.9979	20.2671	20.6097	20.8565	20.9717	20.9949	20.9918	20.9279	20.6115	20.1456	19.7560 (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	0.9889	0.9765	0.9515	0.8784	0.7311	0.5169	0.3465	0.3882	0.6455	0.9006	0.9762	0.9911 (89)
MIT 2	18.5989	18.8655	19.2036	19.6245	19.8952	20.0068	20.0212	20.0217	19.9718	19.6375	19.0631	18.5647 (90)
Living area fraction									fLA = Living area / (4) =			0.1795 (91)
MIT	18.8123	19.0687	19.3945	19.8013	20.0677	20.1799	20.1959	20.1958	20.1433	19.8123	19.2574	18.7785 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.6623	18.9187	19.2445	19.6513	19.9177	20.0299	20.0459	20.0458	19.9933	19.6623	19.1074	18.6285 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9841	0.9688	0.9407	0.8667	0.7253	0.5175	0.3488	0.3904	0.6432	0.8887	0.9685	0.9869 (94)
Useful gains	557.2024	635.0140	668.8372	670.0059	586.2143	411.2551	265.1772	279.3841	434.1505	542.6232	542.0724	533.2193 (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	1144.2978	1113.8960	1009.9517	841.3212	641.5307	419.2003	266.0300	280.8788	456.9407	707.4679	941.8958	1137.4900 (97)
Space heating kWh	436.7990	321.8088	253.7892	123.3470	41.1554	0.0000	0.0000	0.0000	0.0000	122.6444	287.8728	449.5773 (98a)
Space heating requirement - total per year (kWh/year)												2036.9941
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	436.7990	321.8088	253.7892	123.3470	41.1554	0.0000	0.0000	0.0000	0.0000	122.6444	287.8728	449.5773 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2036.9941
Space heating per m2										(98c) / (4) =		28.3152 (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	436.7990	321.8088	253.7892	123.3470	41.1554	0.0000	0.0000	0.0000	0.0000	122.6444	287.8728	449.5773 (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)	492.4454	362.8058	286.1208	139.0609	46.3985	0.0000	0.0000	0.0000	0.0000	138.2688	324.5466	506.8516 (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	84.3874	83.8776	83.0154	81.3010	78.7235	76.4000	76.4000	76.4000	76.4000	81.2795	83.5944	76.4000 (216)
Fuel for water heating, kWh/month	240.7131	213.1197	226.2720	197.2849	193.3430	174.8713	169.3134	178.7074	183.6011	197.6465	210.4970	237.0287 (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	-21.5075	-31.7262	-47.7724	-56.3257	-62.9605	-59.5830	-58.8137	-54.3787	-46.9494	-37.3675	-24.1235	-18.4278 (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	-8.5444	-18.4218	-37.6353	-58.1375	-78.4491	-79.4452	-78.3773	-65.4857	-46.9284	-26.7400	-11.5224	-6.7205 (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												2296.4984 (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												2422.3981 (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												-1036.3436 (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	3941.6052 (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	2296.4984	0.2100	482.2647 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2422.3981	0.2100	508.7036 (264)
Space and water heating			990.9683 (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	-519.9360	0.1336	-69.4814
PV Unit electricity exported	-516.4076	0.1251	-64.6215
Total			-134.1029 (269)
Total CO2, kg/year			893.7714 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.4200 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2296.4984	1.1300	2595.0432 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2422.3981	1.1300	2737.3099 (278)
Space and water heating			5332.3530 (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	-519.9360	1.4938	-776.6993
PV Unit electricity exported	-516.4076	0.4593	-237.1859
Total			-1013.8852 (283)
Total Primary energy kWh/year			4714.0022 (286)
Dwelling Primary energy Rate (DPER)			65.5300 (287)

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

1. Overall dwelling characteristics

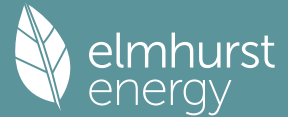
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	35.9700 (1b)	x 2.4000 (2b)	= 86.3280 (1b) - (3b)
First floor	35.9700 (1c)	x 2.6300 (2c)	= 94.6011 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.9400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	180.9291 (5)

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)													2286 (64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month													
80.0525	70.7369	74.9704	65.4560	63.1466	56.5664	55.5685	57.9507	58.7843	65.9529	70.6277	79.1149	79.1149	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	114.6143	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
105.3508	116.6383	105.3508	108.8625	105.3508	108.8625	105.3508	105.3508	108.8625	105.3508	108.8625	105.3508	105.3508	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
201.7819	203.8757	198.5993	187.3663	173.1867	159.8598	150.9567	148.8628	154.1393	165.3722	179.5519	192.8787	192.8787	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	34.4614	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	(71)
Water heating gains (Table 5)													
107.5974	105.2632	100.7666	90.9111	84.8744	78.5645	74.6888	77.8907	81.6448	88.6463	98.0940	106.3373	106.3373	(72)
Total internal gains													

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

6. Solar gains

[Jan]	Area m2		Solar flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
North	6.0100		10.6334		0.6300		0.7000		0.7700		19.5307 (74)	
East	1.4200		19.6403		0.6300		0.7000		0.7700		8.5233 (76)	
South	4.5600		46.7521		0.6300		0.7000		0.7700		65.1535 (78)	
Solar gains	93.2075	160.7021	226.8043	295.5425	346.3956	351.2118	335.5174	296.0868	250.1778	179.3048	111.9503	79.5895 (83)
Total gains	568.3218	646.8638	691.9053	743.0666	770.1917	755.8828	723.8979	685.5754	652.2086	599.0585	558.8429	544.5406 (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	0.9916	0.9836	0.9684	0.9227	0.8214	0.6425	0.4798	0.5245	0.7580	0.9369	0.9833	0.9931 (86)
MIT	19.7077	19.9054	20.1711	20.5286	20.8067	20.9570	20.9916	20.9872	20.9031	20.5545	20.0804	19.6837 (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	0.9891	0.9788	0.9587	0.8986	0.7687	0.5552	0.3734	0.4155	0.6778	0.9121	0.9774	0.9910 (89)
MIT 2	18.4668	18.7191	19.0551	19.5013	19.8144	19.9644	19.9864	19.9869	19.9195	19.5424	18.9537	18.4450 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.6895	18.9320	19.2554	19.6857	19.9924	20.1425	20.1668	20.1664	20.0960	19.7241	19.1559	18.6673 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.6895	18.9320	19.2554	19.6857	19.9924	20.1425	20.1668	20.1664	20.0960	19.7241	19.1559	18.6673 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9848	0.9723	0.9501	0.8905	0.7697	0.5691	0.3924	0.4349	0.6875	0.9045	0.9711	0.9873 (94)
Useful gains	559.6672	628.9579	657.3988	661.7262	592.7789	430.1945	284.0917	298.1551	448.3662	541.8313	542.6808	537.6005 (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	1199.3666	1165.6600	1056.1209	879.1898	673.9655	444.2698	285.9045	301.1229	483.2039	741.5548	985.6957	1190.1998 (97)
Space heating kWh	475.9364	360.6638	296.6492	156.5738	60.4028	0.0000	0.0000	0.0000	0.0000	148.5943	318.9707	485.5339 (98a)
Space heating requirement - total per year (kWh/year)	2303.3248											
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	475.9364	360.6638	296.6492	156.5738	60.4028	0.0000	0.0000	0.0000	0.0000	148.5943	318.9707	485.5339 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2303.3248											
Space heating per m2	(98c) / (4) = 32.0173 (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	475.9364	360.6638	296.6492	156.5738	60.4028	0.0000	0.0000	0.0000	0.0000	148.5943	318.9707	485.5339 (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)	515.0826	390.3288	321.0489	169.4522	65.3710	0.0000	0.0000	0.0000	0.0000	160.8163	345.2064	525.4695 (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	85.9474	85.6405	85.1054	84.0018	82.2827	80.3000	80.3000	80.3000	80.3000	83.8642	85.3716	86.0057 (216)
Fuel for water heating, kWh/month	261.5094	232.1694	248.6244	222.7708	221.2957	205.2853	203.4225	211.0484	212.8363	226.1191	234.7921	258.6705 (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													2492.7758	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													80.3000	
Water heating fuel used													2738.5440	(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													3716.0758	(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	2492.7758	0.2100	523.4829 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2738.5440	0.2100	575.0942 (264)
Space and water heating			1098.5772 (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			905.9189 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.5900 (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	2492.7758	1.1300	2816.8367 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2738.5440	1.1300	3094.5548 (278)
Space and water heating			5911.3914 (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			4742.5349 (286)
Target Primary Energy Rate (TPER)			65.9200 (287)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 38			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	91 B	DER	12.42	TER	12.59		
Environmental	90 B	% DER < TER				1.35	
CO ₂ Emissions (t/year)	0.86	DFEE	34.00	TFEE	37.62		
Compliance Check	See BREL	% DFEE < TFEE				9.61	
% DPER < TPER	0.60	DPER	65.53	TPER	65.92		
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)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1658 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3658 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3384 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4314	0.4230	0.4145	0.3722	0.3638	0.3215	0.3215	0.3130	0.3384	0.3638	0.3807	0.3976 (22b)
Effective ac	0.5931	0.5895	0.5859	0.5693	0.5662	0.5517	0.5517	0.5490	0.5572	0.5662	0.5725	0.5790 (25)

3. Heat losses and heat loss parameter

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

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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 (36a) = 5.6461 (36)
 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)

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

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2923 (42)											
Hot water usage for mixer showers	62.6538	61.7122	60.3402	57.7150	55.7777	53.6172	52.3892	53.7509	55.2435	57.5632	60.2448	62.4137 (42a)
Hot water usage for baths	27.0664	26.6644	26.0984	25.0546	24.2731	23.4065	22.9384	23.5005	24.1126	25.0399	26.1051	26.9749 (42b)
Hot water usage for other uses	38.1053	36.7197	35.3340	33.9484	32.5627	31.1771	31.1771	32.5627	33.9484	35.3340	36.7197	38.1053 (42c)
Average daily hot water use (litres/day)	117.5007 (43)											
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	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 content (annual)	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)
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)
Heat gains from water heating, kWh/month	67.4846	59.3861	62.4008	53.2806	50.5586	44.3767	42.9655	45.3509	46.5944	53.3648	58.4561	66.5453 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.4974	21.7583	17.6951	13.3963	10.0139	8.4542	9.1350	11.8740	15.9373	20.2361	23.6185	25.1782 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	301.1670	304.2921	296.4168	279.6512	258.4875	238.5967	225.3085	222.1833	230.0586	246.8243	267.9879	287.8787 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915 (71)
Water heating gains (Table 5)	90.7051	88.3722	83.8721	74.0008	67.9550	61.6343	57.7494	60.9555	64.7144	71.7269	81.1890	89.4426 (72)
Total internal gains	516.2611	514.3144	497.8757	466.9400	436.3482	405.5769	389.0846	391.9045	407.6020	438.6789	472.6871	502.3912 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c				Access factor Table 6d	Gains W
North					6.0100	10.6334	0.7300	0.7000				0.7700	22.6308 (74)
East					1.4200	19.6403	0.7300	0.7000				0.7700	9.8762 (76)
South					4.5600	46.7521	0.7300	0.7000				0.7700	75.4953 (78)
Solar gains	108.0023	186.2104	262.8050	342.4540	401.3790	406.9596	388.7741	343.0847	289.8885	207.7659	129.7201	92.2227	(83)
Total gains	624.2634	700.5248	760.6807	809.3940	837.7273	812.5366	777.8587	734.9893	697.4906	646.4449	602.4072	594.6140	(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	0.9872	0.9763	0.9521	0.8915	0.7690	0.5879	0.4330	0.4759	0.7083	0.9129	0.9762	0.9897 (86)	
MIT	19.8747	20.0616	20.3300	20.6438	20.8706	20.9740	20.9954	20.9927	20.9351	20.6492	20.2061	19.8380 (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	0.9835	0.9697	0.9386	0.8619	0.7129	0.5064	0.3388	0.3782	0.6284	0.8823	0.9684	0.9867 (89)	
MIT 2	18.7080	18.9447	19.2795	19.6621	19.9078	20.0082	20.0213	20.0220	19.9770	19.6790	19.1381	18.6685 (90)	
Living area fraction									fLA = Living area / (4) =				0.1795 (91)
MIT	18.9174	19.1452	19.4680	19.8382	20.0806	20.1815	20.1961	20.1962	20.1490	19.8531	19.3297	18.8784 (92)	
Temperature adjustment												-0.1500	
adjusted MIT	18.7674	18.9952	19.3180	19.6882	19.9306	20.0315	20.0461	20.0462	19.9990	19.7031	19.1797	18.7284 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9772	0.9608	0.9271	0.8506	0.7078	0.5071	0.3410	0.3804	0.6266	0.8706	0.9594	0.9812 (94)
Useful gains	610.0124	673.0711	705.2064	688.4349	592.9019	412.0540	265.2785	279.5837	437.0452	562.8090	577.9691	583.4438 (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	1152.6698	1119.9715	1015.7821	844.2123	642.5397	419.3203	266.0472	280.9116	457.3770	710.6559	947.5728	1145.3633 (97)
Space heating kWh	403.7371	300.3171	231.0683	112.1597	36.9305	0.0000	0.0000	0.0000	0.0000	109.9981	266.1147	418.0681 (98a)
Space heating requirement - total per year (kWh/year)												1878.3936
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	403.7371	300.3171	231.0683	112.1597	36.9305	0.0000	0.0000	0.0000	0.0000	109.9981	266.1147	418.0681 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1878.3936
Space heating per m2										(98c) / (4) =		26.1106 (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	403.7371	300.3171	231.0683	112.1597	36.9305	0.0000	0.0000	0.0000	0.0000	109.9981	266.1147	418.0681 (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)	455.1714	338.5762	260.5054	126.4484	41.6353	0.0000	0.0000	0.0000	0.0000	124.0114	300.0165	471.3282 (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	84.1645	83.6735	82.7278	81.0236	78.5262	76.4000	76.4000	76.4000	76.4000	80.9630	83.3582	84.3036 (217)	
Fuel for water heating, kWh/month	241.3507	213.6395	227.0586	197.9604	193.8288	174.8713	169.3134	178.7074	183.6011	198.4191	211.0933	237.5997 (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	-21.5075	-31.7262	-47.7724	-56.3257	-62.9605	-59.5830	-58.8137	-54.3787	-46.9494	-37.3675	-24.1235	-18.4278 (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	-8.5444	-18.4218	-37.6353	-58.1375	-78.4491	-79.4452	-78.3773	-65.4857	-46.9284	-26.7400	-11.5224	-6.7205 (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													2117.6928 (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													2427.4432 (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													-1036.3436 (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	3767.8448 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2117.6928	3.6400	77.0840 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2427.4432	3.6400	88.3589 (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	-519.9360	16.4900	-85.7374
PV Unit electricity exported	-516.4076	5.5900	-28.8672
Total			-114.6046 (252)
Total energy cost			185.5561 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.5712 (257)
SAP value		90.7403
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	2117.6928	0.2100	444.7155 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2427.4432	0.2100	509.7631 (264)
Space and water heating			954.4786 (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	-519.9360	0.1336	-69.4814
PV Unit electricity exported	-516.4076	0.1251	-64.6215
Total			-134.1029 (269)
Total CO2, kg/year			857.2818 (272)
CO2 emissions per m2			11.9200 (273)
EI value			90.1765
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)

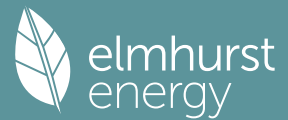
(38)m	Jan 35.4099	Feb 35.1941	Mar 34.9826	Apr 33.9892	May 33.8034	Jun 32.9382	Jul 32.9382	Aug 32.7779	Sep 33.2714	Oct 33.8034	Nov 34.1794	Dec 34.5725	(38)
Heat transfer coeff	79.6737	79.4579	79.2464	78.2530	78.0671	77.2019	77.2019	77.0417	77.5352	78.0671	78.4431	78.8362	(39)
Average = Sum(39)m / 12 =												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 m ²		Solar flux Table 6a W/m ²		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
North	6.0100		10.6334		0.7300		0.7000		0.7700		22.6308 (74)	
East	1.4200		19.6403		0.7300		0.7000		0.7700		9.8762 (76)	
South	4.5600		46.7521		0.7300		0.7000		0.7700		75.4953 (78)	
Solar gains	108.0023	186.2104	262.8050	342.4540	401.3790	406.9596	388.7741	343.0847	289.8885	207.7659	129.7201	92.2227 (83)
Total gains	624.2634	700.5248	760.6807	809.3940	837.7273	812.5366	777.8587	734.9893	697.4906	646.4449	602.4072	594.6140 (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	0.9872	0.9763	0.9521	0.8915	0.7690	0.5879	0.4330	0.4759	0.7083	0.9129	0.9762	0.9897 (86)
MIT	19.8747	20.0616	20.3300	20.6438	20.8706	20.9740	20.9954	20.9927	20.9351	20.6492	20.2061	19.8380 (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	0.9835	0.9697	0.9386	0.8619	0.7129	0.5064	0.3388	0.3782	0.6284	0.8823	0.9684	0.9867 (89)
MIT 2	18.7080	18.9447	19.2795	19.6621	19.9078	20.0082	20.0213	20.0220	19.9770	19.6790	19.1381	18.6685 (90)
Living area fraction	18.9174	19.1452	19.4680	19.8382	20.0806	20.1815	20.1961	20.1962	20.1490	19.8531	19.3297	18.8784 (92)
MIT	18.9174	19.1452	19.4680	19.8382	20.0806	20.1815	20.1961	20.1962	20.1490	19.8531	19.3297	18.8784 (92)
Temperature adjustment	18.7674	18.9952	19.3180	19.6882	19.9306	20.0315	20.0461	20.0462	19.9990	19.7031	19.1797	-0.1500
adjusted MIT	18.7674	18.9952	19.3180	19.6882	19.9306	20.0315	20.0461	20.0462	19.9990	19.7031	19.1797	18.7284 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9772	0.9608	0.9271	0.8506	0.7078	0.5071	0.3410	0.3804	0.6266	0.8706	0.9594	0.9812 (94)
Useful gains	610.0124	673.0711	705.2064	688.4349	592.9019	412.0540	265.2785	279.5837	437.0452	562.8090	577.9691	583.4438 (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	1152.6698	1119.9715	1015.7821	844.2123	642.5397	419.3203	266.0472	280.9116	457.3770	710.6559	947.5728	1145.3633 (97)
Space heating kWh	403.7371	300.3171	231.0683	112.1597	36.9305	0.0000	0.0000	0.0000	0.0000	109.9981	266.1147	418.0681 (98a)
Space heating requirement - total per year (kWh/year)												1878.3936
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	403.7371	300.3171	231.0683	112.1597	36.9305	0.0000	0.0000	0.0000	0.0000	109.9981	266.1147	418.0681 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1878.3936
Space heating per m ²										(98c) / (4) =		26.1106 (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	403.7371	300.3171	231.0683	112.1597	36.9305	0.0000	0.0000	0.0000	0.0000	109.9981	266.1147	418.0681 (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)	455.1714	338.5762	260.5054	126.4484	41.6353	0.0000	0.0000	0.0000	0.0000	124.0114	300.0165	471.3282 (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	84.1645	83.6735	82.7278	81.0236	78.5262	76.4000	76.4000	76.4000	76.4000	80.9630	83.3582	84.3036	(217)
Fuel for water heating, kWh/month	241.3507	213.6395	227.0586	197.9604	193.8288	174.8713	169.3134	178.7074	183.6011	198.4191	211.0933	237.5997	(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	-21.5075	-31.7262	-47.7724	-56.3257	-62.9605	-59.5830	-58.8137	-54.3787	-46.9494	-37.3675	-24.1235	-18.4278	(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	-8.5444	-18.4218	-37.6353	-58.1375	-78.4491	-79.4452	-78.3773	-65.4857	-46.9284	-26.7400	-11.5224	-6.7205	(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												2117.6928	(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												2427.4432	(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												-1036.3436	(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												3767.8448	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2117.6928	5.6000	118.5908	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2427.4432	5.6000	135.9368	(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	-519.9360	26.0600	-135.4953	
PV Unit electricity exported	-516.4076	5.8100	-30.0033	
Total			-165.4986	(252)
Total energy cost			255.5381	(255)

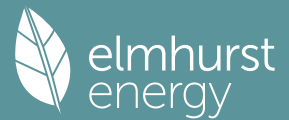
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2117.6928	0.2100	444.7155	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2427.4432	0.2100	509.7631	(264)
Space and water heating			954.4786	(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	-519.9360	0.1336	-69.4814	
PV Unit electricity exported	-516.4076	0.1251	-64.6215	
Total			-134.1029	(269)
Total CO2, kg/year			857.2818	(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	2117.6928	1.1300	2392.9929	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2427.4432	1.1300	2743.0108	(278)
Space and water heating			5136.0038	(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	-519.9360	1.4938	-776.6993	
PV Unit electricity exported	-516.4076	0.4593	-237.1859	
Total			-1013.8852	(283)
Total Primary energy kWh/year			4517.6529	(286)

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SAP 10 EPC IMPROVEMENTS

Plot 38

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 (16.8%)

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	£354	£354	£0
Space heating	£240	£240	£0
Water heating	£136	£136	£0
Lighting	£45	£45	£0
Generated (PV)	-£165	-£165	£0
Total cost of fuels	£257	£257	£0
Total cost of uses	£256	£256	£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

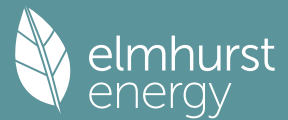
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	35.9700 (1b)	x 2.4000 (2b)	= 86.3280 (1b) - (3b)
First floor	35.9700 (1c)	x 2.6300 (2c)	= 94.6011 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.9400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	180.9291 (5)

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)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month													
67.4846	59.3861	62.4008	53.2806	50.5586	44.3767	42.9655	45.3509	46.5944	53.3648	58.4561	66.5453	66.5453	(65)

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

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

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Losses e.g. evaporation (negative values) (Table 5)	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915 (71)
Water heating gains (Table 5)	90.7051	88.3722	83.8721	74.0008	67.9550	61.6343	57.7494	60.9555	64.7144	71.7269	81.1890	89.4426 (72)
Total internal gains	516.2611	514.3144	497.8757	466.9400	436.3482	405.5769	389.0846	391.9045	407.6020	438.6789	472.6871	502.3912 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d			Gains W	
North				6.0100	10.6334	0.7300	0.7000	0.7700			22.6308 (74)	
East				1.4200	19.6403	0.7300	0.7000	0.7700			9.8762 (76)	
South				4.5600	46.7521	0.7300	0.7000	0.7700			75.4953 (78)	
Solar gains	108.0023	186.2104	262.8050	342.4540	401.3790	406.9596	388.7741	343.0847	289.8885	207.7659	129.7201	92.2227 (83)
Total gains	624.2634	700.5248	760.6807	809.3940	837.7273	812.5366	777.8587	734.9893	697.4906	646.4449	602.4072	594.6140 (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	0.9872	0.9763	0.9521	0.8915	0.7690	0.5879	0.4330	0.4759	0.7083	0.9129	0.9762	0.9897 (86)
MIT	19.8747	20.0616	20.3300	20.6438	20.8706	20.9740	20.9954	20.9927	20.9351	20.6492	20.2061	19.8380 (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	0.9835	0.9697	0.9386	0.8619	0.7129	0.5064	0.3388	0.3782	0.6284	0.8823	0.9684	0.9867 (89)
MIT 2	18.7080	18.9447	19.2795	19.6621	19.9078	20.0082	20.0213	20.0220	19.9770	19.6790	19.1381	18.6685 (90)
Living area fraction	18.9174	19.1452	19.4680	19.8382	20.0806	20.1815	20.1961	20.1962	20.1490	19.8531	19.3297	18.8784 (92)
MIT	18.9174	19.1452	19.4680	19.8382	20.0806	20.1815	20.1961	20.1962	20.1490	19.8531	19.3297	18.8784 (92)
Temperature adjustment	18.7674	18.9952	19.3180	19.6882	19.9306	20.0315	20.0461	20.0462	19.9990	19.7031	19.1797	-0.1500
adjusted MIT	18.7674	18.9952	19.3180	19.6882	19.9306	20.0315	20.0461	20.0462	19.9990	19.7031	19.1797	18.7284 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	610.0124	673.0711	705.2064	688.4349	592.9019	412.0540	265.2785	279.5837	437.0452	562.8090	577.9691	583.4438 (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	1152.6698	1119.9715	1015.7821	844.2123	642.5397	419.3203	266.0472	280.9116	457.3770	710.6559	947.5728	1145.3633 (97)
Space heating kWh	403.7371	300.3171	231.0683	112.1597	36.9305	0.0000	0.0000	0.0000	0.0000	109.9981	266.1147	418.0681 (98a)
Space heating requirement - total per year (kWh/year)												1878.3936
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	403.7371	300.3171	231.0683	112.1597	36.9305	0.0000	0.0000	0.0000	0.0000	109.9981	266.1147	418.0681 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1878.3936
Space heating per m ²										(98c) / (4) =		26.1106 (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	403.7371	300.3171	231.0683	112.1597	36.9305	0.0000	0.0000	0.0000	0.0000	109.9981	266.1147	418.0681 (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)	455.1714	338.5762	260.5054	126.4484	41.6353	0.0000	0.0000	0.0000	0.0000	124.0114	300.0165	471.3282 (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	84.1645	83.6735	82.7278	81.0236	78.5262	76.4000	76.4000	76.4000	76.4000	80.9630	83.3582	76.4000 (216)
Fuel for water heating, kWh/month	241.3507	213.6395	227.0586	197.9604	193.8288	174.8713	169.3134	178.7074	183.6011	198.4191	211.0933	237.5997 (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	-21.5075	-31.7262	-47.7724	-56.3257	-62.9605	-59.5830	-58.8137	-54.3787	-46.9494	-37.3675	-24.1235	-18.4278 (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	-8.5444	-18.4218	-37.6353	-58.1375	-78.4491	-79.4452	-78.3773	-65.4857	-46.9284	-26.7400	-11.5224	-6.7205	(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												2117.6928	(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												2427.4432	(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												-1036.3436	(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												3767.8448	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2117.6928	3.6400	77.0840 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2427.4432	3.6400	88.3589 (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	-519.9360	16.4900	-85.7374
PV Unit electricity exported	-516.4076	5.5900	-28.8672
Total			-114.6046 (252)
Total energy cost			185.5561 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.5712 (257)
SAP value		90.7403
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	2117.6928	0.2100	444.7155 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2427.4432	0.2100	509.7631 (264)
Space and water heating			954.4786 (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	-519.9360	0.1336	-69.4814
PV Unit electricity exported	-516.4076	0.1251	-64.6215
Total			-134.1029 (269)
Total CO2, kg/year			857.2818 (272)
CO2 emissions per m2			11.9200 (273)
EI value			90.1765
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) (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)

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		(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 (38)
Heat transfer coeff	79.6737	79.4579	79.2464	78.2530	78.0671	77.2019	77.2019	77.0417	77.5352	78.0671	78.4431	78.8362 (39)
Average = Sum(39)m / 12 =												78.2521

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

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2923 (42)

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

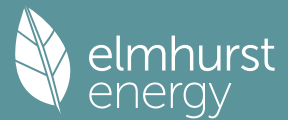
Hot water usage for baths 27.0664 26.6644 26.0984 25.0546 24.2731 23.4065 22.9384 23.5005 24.1126 25.0399 26.1051 26.9749 (42b)

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

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

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

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Energy content (annual)												Total = Sum(45)m =	1951.6620
Distribution loss (46)m = 0.15 x (45)m													
	30.3666	26.7203	28.0740	23.9672	22.7399	19.9568	19.3212	20.3959	20.9574	24.0059	26.3003	29.9437 (46)	
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)	
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)	
Combi loss	0.6873	0.6242	0.6807	0.6134	0.6069	0.5561	0.5472	0.5596	0.5555	0.6066	0.6286	0.6804 (61)	
Total heat required for water heating calculated for each month													
	203.1316	178.7597	187.8406	160.3946	152.2064	133.6017	129.3554	136.5325	140.2712	160.6461	175.9637	200.3051 (62)	
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)	
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
Output from w/h	203.1316	178.7597	187.8406	160.3946	152.2064	133.6017	129.3554	136.5325	140.2712	160.6461	175.9637	200.3051 (64)	
	Total per year (kWh/year) = Sum(64)m =											1959.0085 (64)	
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000 (64a)	
Heat gains from water heating, kWh/month													
	67.4846	59.3861	62.4008	53.2806	50.5586	44.3767	42.9655	45.3509	46.5944	53.3648	58.4561	66.5453 (65)	

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	137.5372	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.4974	21.7583	17.6951	13.3963	10.0139	8.4542	9.1350	11.8740	15.9373	20.2361	23.6185	25.1782	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	301.1670	304.2921	296.4168	279.6512	258.4875	238.5967	225.3085	222.1833	230.0586	246.8243	267.9879	287.8787	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	51.0460	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	-91.6915	(71)
Water heating gains (Table 5)	90.7051	88.3722	83.8721	74.0008	67.9550	61.6343	57.7494	60.9555	64.7144	71.7269	81.1890	89.4426	(72)
Total internal gains	516.2611	514.3144	497.8757	466.9400	436.3482	405.5769	389.0846	391.9045	407.6020	438.6789	472.6871	502.3912	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

North	6.0100	10.6334	0.7300	0.7000	0.7700	22.6308 (74)
East	1.4200	19.6403	0.7300	0.7000	0.7700	9.8762 (76)
South	4.5600	46.7521	0.7300	0.7000	0.7700	75.4953 (78)

Solar gains	108.0023	186.2104	262.8050	342.4540	401.3790	406.9596	388.7741	343.0847	289.8885	207.7659	129.7201	92.2227	(83)
Total gains	624.2634	700.5248	760.6807	809.3940	837.7273	812.5366	777.8587	734.9893	697.4906	646.4449	602.4072	594.6140	(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	0.9872	0.9763	0.9521	0.8915	0.7690	0.5879	0.4330	0.4759	0.7083	0.9129	0.9762	0.9897 (86)
MIT	19.8747	20.0616	20.3300	20.6438	20.8706	20.9740	20.9954	20.9927	20.9351	20.6492	20.2061	19.8380 (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	0.9835	0.9697	0.9386	0.8619	0.7129	0.5064	0.3388	0.3782	0.6284	0.8823	0.9684	0.9867 (89)
MIT 2	18.7080	18.9447	19.2795	19.6621	19.9078	20.0082	20.0213	20.0220	19.9770	19.6790	19.1381	18.6685 (90)
Living area fraction	18.9174	19.1452	19.4680	19.8382	20.0806	20.1815	20.1961	20.1962	20.1490	19.8531	19.3297	18.8784 (91)
MIT	18.9174	19.1452	19.4680	19.8382	20.0806	20.1815	20.1961	20.1962	20.1490	19.8531	19.3297	18.8784 (92)
Temperature adjustment	18.7674	18.9952	19.3180	19.6882	19.9306	20.0315	20.0461	20.0462	19.9990	19.7031	19.1797	-0.1500
adjusted MIT	18.7674	18.9952	19.3180	19.6882	19.9306	20.0315	20.0461	20.0462	19.9990	19.7031	19.1797	18.7284 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	610.0124	673.0711	705.2064	688.4349	592.9019	412.0540	265.2785	279.5837	437.0452	562.8090	577.9691	583.4438	(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	1152.6698	1119.9715	1015.7821	844.2123	642.5397	419.3203	266.0472	280.9116	457.3770	710.6559	947.5728	1145.3633	(97)
Space heating kWh	403.7371	300.3171	231.0683	112.1597	36.9305	0.0000	0.0000	0.0000	0.0000	109.9981	266.1147	418.0681	(98a)
Space heating requirement - total per year (kWh/year)												1878.3936	
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	403.7371	300.3171	231.0683	112.1597	36.9305	0.0000	0.0000	0.0000	0.0000	109.9981	266.1147	418.0681	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1878.3936	
Space heating per m ²												26.1106	(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	403.7371	300.3171	231.0683	112.1597	36.9305	0.0000	0.0000	0.0000	0.0000	109.9981	266.1147	418.0681 (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)	455.1714	338.5762	260.5054	126.4484	41.6353	0.0000	0.0000	0.0000	0.0000	124.0114	300.0165	471.3282 (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	84.1645	83.6735	82.7278	81.0236	78.5262	76.4000	76.4000	76.4000	76.4000	80.9630	83.3582	76.4000 (216)
Fuel for water heating, kWh/month	241.3507	213.6395	227.0586	197.9604	193.8288	174.8713	169.3134	178.7074	183.6011	198.4191	211.0933	237.5997 (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	-21.5075	-31.7262	-47.7724	-56.3257	-62.9605	-59.5830	-58.8137	-54.3787	-46.9494	-37.3675	-24.1235	-18.4278 (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	-8.5444	-18.4218	-37.6353	-58.1375	-78.4491	-79.4452	-78.3773	-65.4857	-46.9284	-26.7400	-11.5224	-6.7205 (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												2117.6928 (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												2427.4432 (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												-1036.3436 (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												3767.8448 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2117.6928	5.6000	118.5908 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2427.4432	5.6000	135.9368 (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	-519.9360	26.0600	-135.4953
PV Unit electricity exported	-516.4076	5.8100	-30.0033
Total			-165.4986 (252)
Total energy cost			255.5381 (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	2117.6928	0.2100	444.7155 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2427.4432	0.2100	509.7631 (264)
Space and water heating			954.4786 (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	-519.9360	0.1336	-69.4814
PV Unit electricity exported	-516.4076	0.1251	-64.6215
Total			-134.1029 (269)
Total CO2, kg/year			857.2818 (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	2117.6928	1.1300	2392.9929 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2427.4432	1.1300	2743.0108 (278)
Space and water heating			5136.0038 (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	-519.9360	1.4938	-776.6993
PV Unit electricity exported	-516.4076	0.4593	-237.1859
Total			-1013.8852 (283)
Total Primary energy kWh/year			4517.6529 (286)

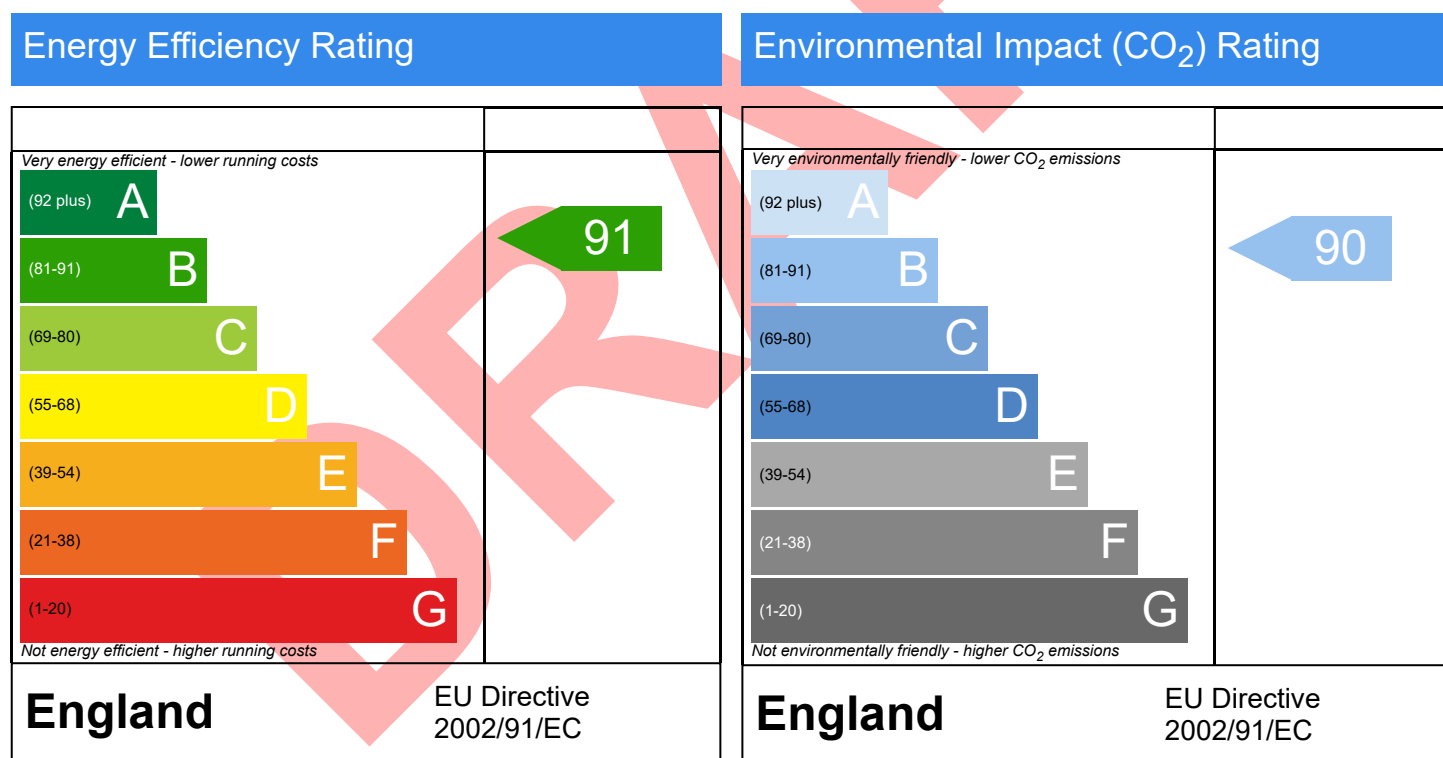
Predicted Energy Assessment



Dwelling type: House, End-Terrace
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.