

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 10:34:38

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

Dwelling Details			
Assessment Type	As designed	Total Floor Area	117 m ²
Site Reference	SAP VG 21-0282	Plot Reference	Plot 23
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	11.28 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	11.21 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	59.27 kWh _{PE} /m ²		
Dwelling primary energy	59.03 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	45.5 kWh/m ²		
Dwelling fabric energy efficiency	42.6 kWh/m ²		OK

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.19	Walls (1) (0.19)	OK
Party walls	0.2	N/A	N/A	N/A
Curtain walls	1.6	N/A	N/A	N/A
Floors	0.18	0.15	Exposed Floor (0.2)	OK
Roofs	0.16	0.09	Roof (1) (0.09)	OK
Windows, doors, and roof windows	1.6	1.3	Front (1.3)	OK
Rooflights	2.2	N/A	N/A	N/A

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))			
Name	Net area [m ²]	U-Value [W/m ² K]	
Exposed wall: Walls (1)	128.07	0.19	
Sheltered wall: Walls (2)	22.2	0.17	
Ground floor: Ground Floor, Ground Floor	48.75	0.13	
Upper floor: Exposed Floor, Exposed Floor	19.36	0.2	
Exposed roof: Roof (1)	68.11	0.09 (!)	

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
Front , Windows	8.23	West	0.7	1.3
Rear , Windows	9.54	East	0.7	1.3
Front Door, Door	2.14	West	N/A	1.3

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

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E4: Jamb	Calculated by person with suitable expertise	0.016 (!)	E4-01 RCD
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.092	Manufacturer Declaration
External wall	E10: Eaves (insulation at ceiling level)	Calculated by person with suitable expertise	0.058	E10-01
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.047	E16-01 RCD
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.001 (!)	E6-01 RCD
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.057	E12-01 RCD
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.088	E17-01 RCD
External wall	E20: Exposed floor (normal)	SAP table default	0.32	
External wall	E21: Exposed floor (inverted)	SAP table default	0.32	

3 Air permeability (better than typically expected values are flagged with a subsequent (!))

Maximum permitted air permeability at 50Pa	8 m ³ /hm ²	
Dwelling air permeability at 50Pa	4 m ³ /hm ² , Design value	OK
Air permeability test certificate reference		

4 Space heating

Main heating system 1: Boiler with radiators or underfloor heating - Mains gas		
Efficiency	88.5%	
Emitter type	Both radiators and underfloor	
Flow temperature		
System type	Combi boiler	
Manufacturer	Vaillant	
Model	ecoTEC sustain 28	
Commissioning		
Secondary heating system: N/A		
Fuel	N/A	
Efficiency	N/A	
Commissioning		

5 Hot water

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

6 Controls

Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		

7 Lighting

Minimum permitted light source efficacy	75 lm/W	
Lowest light source efficacy	85 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: N/A		
Maximum permitted specific fan power	N/A	
Specific fan power	N/A	N/A
Minimum permitted heat recovery efficiency	N/A	
Heat recovery efficiency	N/A	N/A
Manufacturer/Model		
Commissioning		
9 Local generation		
Technology type: Photovoltaic system (1)		
Peak power	2.43 kWp	
Orientation	East	
Pitch	30°	
Overshading	None or very little	
Manufacturer		
MCS certificate		
Technology type: Photovoltaic system (2)		
Peak power	2 kWp	
Orientation	West	
Pitch	30°	
Overshading	None or very little	
Manufacturer		
MCS certificate		
10 Heat networks		
N/A		
11 Supporting documentary evidence		
N/A		
12 Declarations		
a. Assessor Declaration		
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.		
Signed:	Assessor ID:	
Name:		
	Date:	
b. Client Declaration		
N/A		

Summary for Input Data



Property Reference	SAP VG 21-0282		Issued on Date	15/11/2024
Assessment Reference	Plot 23	Prop Type Ref	SAP VG 21-0282	
Property				

SAP Rating	95 A	DER	11.21	TER	11.28
Environmental	90 B	% DER < TER			0.62
CO ₂ Emissions (t/year)	1.26	DFEE	42.59	TFEE	45.53
Compliance Check	See BREL	% DFEE < TFEE			6.45
% DPER < TPER	0.40	DPER	59.03	TPER	59.27

Assessor Details	Miss Victoria Gartside	Assessor ID	AL30-0001
Client			

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

Orientation	West	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	House, Detached	
Which Floor	0	
2.0 Number of Storeys	2	
3.0 Date Built	2023	
3.0 Property Age Band	L	
4.0 Sheltered Sides	0	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	208.57	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	Unheated Space Floor Area	Average Storey Height
Ground floor:	33.90 m	48.75 m ²	19.36 m ²	2.62 m
1st Storey:	33.90 m	68.11 m ²		2.39 m
2nd Storey:	32.20 m	60.31 m ²		2.28 m

8.0 Living Area	12.79	m ²
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9.0 External Walls										
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area (m ²)	Shelter Res	Shelter	Openings	Area Calculation Type
External Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.19	110.00	147.98	128.07	0.00	None	19.91	Enter Gross Area
Garage Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.19	110.00	22.20	22.20	0.55	Garage Single 2 Inside	0.00	Enter Gross Area

9.2 Internal Walls										
Description	Construction								Kappa (kJ/m ² K)	Area (m ²)
Studs	Plasterboard on timber frame								9.00	207.84

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	68.11	68.11	None	0.00	Enter Gross Area	0.00

10.2 Internal Ceilings										
Description	Storey	Construction								Area (m ²)
Internal Ceiling 1	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor								48.75

Summary for Input Data

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.13	None	0.00	75.00	48.75
Exposed Floor	Exposed Floor - Timber	Lowest occupied	Timber exposed floor, insulation between joists	0.20	None	0.00	20.00	19.36

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1		Plasterboard ceiling, carpeted chipboard floor	9.00	48.75

12.0 Opening Types

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

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Front	Windows	External Wall	West	8.23	0
Rear	Windows	External Wall	East	9.54	0
Front Door	Door	External Wall	West	2.14	0

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	13.69	0.02	0.02 MFF-150-E2-02	No
E3 Sill	Independently assessed	10.86	0.02	0.02 E3-01	No
E4 Jamb	Independently assessed	31.20	0.02	0.02 E4-01 RCD	No
E5 Ground floor (normal)	Independently assessed	33.90	0.09	0.09 Manufacturer Declaration	No
E10 Eaves (insulation at ceiling level)	Independently assessed	14.80	0.06	0.06 E10-01	No
E16 Corner (normal)	Independently assessed	27.50	0.05	0.05 E16-01 RCD	No
E6 Intermediate floor within a dwelling	Independently assessed	24.65	0.00	0.00 E6-01 RCD	No
E12 Gable (insulation at ceiling level)	Independently assessed	19.10	0.06	0.06 E12-01 RCD	No
E17 Corner (inverted – internal area greater than external area)	Independently assessed	7.42	-0.09	-0.09 E17-01 RCD	No
E20 Exposed floor (normal)	Table K1 - Default	9.25	0.32	0.32	No
E21 Exposed floor (inverted)	Table K1 - Default	9.25	0.32	0.32	No

Y-value W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present

19.1 Mechanical extract ventilation - Decentralised

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

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys

Number of open flues

Number of chimneys/flues attached to closed fire

Number of flues attached to solid fuel boiler

Number of flues attached to other heater

Number of blocked chimneys

Number of intermittent extract fans

Number of passive vents

Number of flueless gas fires

Summary for Input Data

21.0 Fixed Cooling System	No									
22.0 Pressure Testing	Yes									
Designed AP ₅₀	4.00	m ² /(h.m ²) @ 50 Pa								
Property Tested?	Yes									
Test Method	Blower Door									
22.0 Lighting	No									
No Fixed Lighting	No									
	Name Lighting 1	Efficacy 85.00	Power 10.00	Capacity 850.00	Count 16					
24.0 Main Heating 1	Database									
Percentage of Heat	100.00 %									
Database Ref. No.	18119									
Fuel Type	Mains gas									
SAP Code	0									
In Winter	88.50									
In Summer	87.00									
Model Name	ecoTEC sustain 28									
Manufacturer	Vaillant									
System Type	Combi boiler									
Controls SAP Code	2110									
Delayed Start Stat	Yes									
Burner Control	Modulating									
HETAS approved System	No									
Flue Type	Balanced									
Fan Assisted Flue	Yes									
Is MHS Pumped	Pump in heated space									
Heating Pump Age	2013 or later									
Heat Emitter	Radiators and Underfloor									
Underfloor Heating	Yes - Pipes in thin screed									
Flow Temperature	Unknown									
Flow Temperature Value	45.00									
Boiler Interlock	Yes									
Combi boiler type	Standard Combi									
25.0 Main Heating 2	None									
26.0 Heat Networks	None									
	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									
27.0 Secondary Heating	None									
28.0 Water Heating	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
Immersion Heater	Single
Summer Immersion	No
Cold Water Source	From mains
Bath Count	1
Supplementary Immersion	No
Immersion Only Heating Hot Water	No

28.1 Showers

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

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	None		
Cylinder Stat	Yes		
Cylinder In Heated Space	Yes		
Independent Time Control	Yes		
Insulation Type	Measured Loss		
Insulation Thickness Type	Other		
Insulation Thickness	50		
Cylinder Volume	210.00	L	
Loss	2.10	kWh/day	
Pipes insulation	Fully insulated primary pipework		
In Airing Cupboard	No		

31.0 Thermal Store

None

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
2.43	East	30°	None Or Little	No	No	1.00		
2.00	West	30°	None Or Little	No	No	1.00		

34.0 Small-scale Hydro

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

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

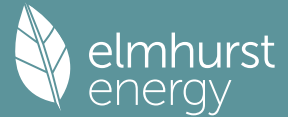
Lower cost measures

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 23			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	95 A		DER	11.21		TER	11.28
Environmental	90 B		% DER < TER				0.62
CO ₂ Emissions (t/year)	1.26		DFEE	42.59		TFEE	45.53
Compliance Check	See BREL		% DFEE < TFEE				6.45
% DPER < TPER	0.40		DPER	59.03		TPER	59.27
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	48.7500 (1b)	x 2.6200 (2b)	= 127.7250 (1b) - (3b)
First floor	68.1100 (1c)	x 2.3900 (2c)	= 162.7829 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	116.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 290.5079 (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	5 * 10 = 50.0000 (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) =	50.0000 / (5) = 0.1721 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3721 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3721 (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	0.4744	0.4651	0.4558	0.4093	0.4000	0.3535	0.3535	0.3442	0.3721	0.4000	0.4186	0.4372 (22b)
Effective ac	0.6125	0.6082	0.6039	0.5838	0.5800	0.5625	0.5625	0.5592	0.5692	0.5800	0.5876	0.5956 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.30)			17.7700	1.2357	21.9591		(27)
Door			2.1400	1.3000	2.7820		(26a)
Ground Floor			48.7500	0.1300	6.3375	75.0000	3656.2500 (28a)
Exposed Floor			19.3600	0.2000	3.8720	20.0000	387.2000 (28b)
External Wall	147.9800	19.9100	128.0700	0.1900	24.3333	110.0000	14087.7000 (29a)
Garage Wall	22.2000		22.2000	0.1700	3.7740	110.0000	2442.0000 (29a)
Plane Roof	68.1100		68.1100	0.0900	6.1299	9.0000	612.9900 (30)
Total net area of external elements Aum(A, m ²)			306.4000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	69.1878		(33)
Studs			207.8400			9.0000	1870.5600 (32c)
Internal Floor 1			48.7500			18.0000	877.5000 (32d)
Internal Ceiling 1			48.7500			9.0000	438.7500 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	24372.9500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							208.5654 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				13.6900	0.0240	0.3286	
E3 Sill				10.8600	0.0210	0.2281	

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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	48.1467	48.2906	48.4325	49.1102	49.2391	49.8482	49.8482	49.9626	49.6118	49.2391	48.9790	48.7100	
alpha	4.2098	4.2194	4.2288	4.2740	4.2826	4.3232	4.3232	4.3308	4.3075	4.2826	4.2653	4.2473	
util living area	0.9949	0.9890	0.9742	0.9251	0.8181	0.6446	0.4886	0.5470	0.7957	0.9577	0.9901	0.9958 (86)	
MIT	19.6592	19.8306	20.0981	20.4567	20.7296	20.8775	20.9163	20.9091	20.7996	20.4233	19.9827	19.6392 (87)	
Th 2	19.9174	19.9202	19.9230	19.9363	19.9388	19.9503	19.9503	19.9525	19.9459	19.9388	19.9337	19.9285 (88)	
util rest of house	0.9934	0.9859	0.9666	0.9029	0.7669	0.5573	0.3782	0.4327	0.7209	0.9407	0.9867	0.9947 (89)	
MIT 2	18.3488	18.5692	18.9096	19.3613	19.6743	19.8272	19.8541	19.8530	19.7603	19.3320	18.7746	18.3315 (90)	
Living area fraction									fLA = Living area / (4) =				0.1094 (91)
MIT	18.4922	18.7073	19.0397	19.4812	19.7898	19.9421	19.9704	19.9686	19.8740	19.4515	18.9068	18.4747 (92)	
Temperature adjustment												-0.1500	
adjusted MIT	18.3422	18.5573	18.8897	19.3312	19.6398	19.7921	19.8204	19.8186	19.7240	19.3015	18.7568	18.3247 (93)	

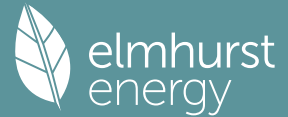
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9902	0.9803	0.9567	0.8872	0.7502	0.5431	0.3640	0.4173	0.7024	0.9267	0.9813	0.9920 (94)
Useful gains	726.2338	850.7006	952.5186	1025.6315	941.7616	677.8945	433.7293	456.7229	687.2332	763.6685	713.3383	692.0111 (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	1974.5758	1914.7263	1731.9275	1438.0321	1091.7067	705.1804	437.3830	463.2412	767.4802	1196.4322	1611.2966	1963.2014 (97)
Space heating kWh	928.7665	715.0253	579.8802	296.9285	111.5591	0.0000	0.0000	0.0000	0.0000	321.9762	646.5300	945.7656 (98a)
Space heating requirement - total per year (kWh/year)												4546.4314
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	928.7665	715.0253	579.8802	296.9285	111.5591	0.0000	0.0000	0.0000	0.0000	321.9762	646.5300	945.7656 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4546.4314
Space heating per m2										(98c) / (4) =		38.9049 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												88.5000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	928.7665	715.0253	579.8802	296.9285	111.5591	0.0000	0.0000	0.0000	0.0000	321.9762	646.5300	945.7656 (98)
Space heating efficiency (main heating system 1)	88.5000	88.5000	88.5000	88.5000	88.5000	0.0000	0.0000	0.0000	0.0000	88.5000	88.5000	88.5000 (210)
Space heating fuel (main heating system)	1049.4537	807.9381	655.2319	335.5124	126.0555	0.0000	0.0000	0.0000	0.0000	363.8149	730.5423	1068.6617 (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	252.2242	222.3377	234.4777	202.1370	193.1924	171.0971	166.7325	175.0510	178.8424	202.9926	220.1961	248.9507 (64)
Efficiency of water heater	88.1753	88.1395	88.0628	87.8863	87.5432	87.0000	87.0000	87.0000	87.0000	87.9139	88.1140	88.1832 (216)
Fuel for water heating, kWh/month	286.0485	252.2565	266.2619	229.9984	220.6825	196.6633	191.6466	201.2081	205.5660	230.8994	249.8989	282.3109 (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	30.4149	24.3999	21.9694	16.0958	12.4328	10.1577	11.3416	14.7423	19.1488	25.1242	28.3778	31.2602 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-45.1745	-68.1685	-104.7446	-121.7647	-131.4539	-122.2750	-120.2696	-113.2716	-99.5228	-79.8968	-50.7320	-38.1766 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-24.9817	-59.9410	-140.3300	-241.6984	-345.0408	-356.7338	-348.0083	-278.1023	-182.0197	-91.4181	-34.7193	-18.9914 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												5137.2107 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												87.0000
Water heating fuel used												2813.4409 (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)												245.4655 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-3217.4354 (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	5064.6816 (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	5137.2107	0.2100	1078.8142 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2813.4409	0.2100	590.8226 (264)
Space and water heating			1669.6368 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	245.4655	0.1443	35.4283 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1095.4506	0.1339	-146.6610
PV Unit electricity exported	-2121.9848	0.1227	-260.2739
Total			-406.9349 (269)
Total CO2, kg/year			1310.0595 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.2100 (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	5137.2107	1.1300	5805.0480 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2813.4409	1.1300	3179.1882 (278)
Space and water heating			8984.2363 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	245.4655	1.5338	376.5031 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1095.4506	1.4948	-1637.4537
PV Unit electricity exported	-2121.9848	0.4501	-955.0621
Total			-2592.5158 (283)
Total Primary energy kWh/year			6898.3244 (286)
Dwelling Primary energy Rate (DPER)			59.0300 (287)

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

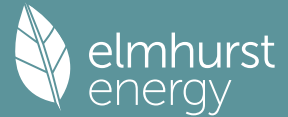
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	48.7500 (1b)	x 2.6200 (2b)	= 127.7250 (1b) - (3b)
First floor	68.1100 (1c)	x 2.3900 (2c)	= 162.7829 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	116.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	290.5079 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1377 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3877 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3877 (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	0.4943 0.4846 0.4749 0.4265 0.4168 0.3683 0.3683 0.3586 0.3877 0.4168 0.4362 0.4555 (22b)
Effective ac	0.6222 0.6174 0.6128 0.5909 0.5868 0.5678 0.5678 0.5643 0.5752 0.5868 0.5951 0.6038 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Semi-glazed door			2.1400	1.0000	2.1400			(26a)
TER Opening Type (Uw = 1.20)			17.7700	1.1450	20.3473			(27)
Ground Floor			48.7500	0.1300	6.3375			(28a)
Exposed Floor			19.3600	0.1300	2.5168			(28b)
External Wall	147.9800	19.9100	128.0700	0.1800	23.0526			(29a)
Garage Wall	22.2000		22.2000	0.1800	3.9960			(29a)
Plane Roof	68.1100		68.1100	0.1100	7.4921			(30)
Total net area of external elements Aum(A, m2)			306.4000					(31)
Fabric heat loss, W/K = Sum (A x U)					(26) ... (30) + (32) =	65.8823		(33)

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

208.5654 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	13.6900	0.0500	0.6845
E3 Sill	10.8600	0.0500	0.5430
E4 Jamb	31.2000	0.0500	1.5600
E5 Ground floor (normal)	33.9000	0.1600	5.4240
E10 Eaves (insulation at ceiling level)	14.8000	0.0600	0.8880
E16 Corner (normal)	27.5000	0.0900	2.4750
E6 Intermediate floor within a dwelling	24.6500	0.0000	0.0000
E12 Gable (insulation at ceiling level)	19.1000	0.0600	1.1460
E17 Corner (inverted - internal area greater than external area)	7.4200	-0.0900	-0.6678
E20 Exposed floor (normal)	9.2500	0.3200	2.9600
E21 Exposed floor (inverted)	9.2500	0.3200	2.9600

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

17.9727 (36)

Point Thermal Bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 83.8550 (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	59.6458	59.1910	58.7452	56.6514	56.2596	54.4360	54.4360	54.0983	55.1384	56.2596	57.0521	57.8807	(38)
Heat transfer coeff	143.5008	143.0460	142.6003	140.5064	140.1147	138.2910	138.2910	137.9533	138.9934	140.1147	140.9072	141.7357	(39)
Average = Sum(39)m / 12 =												140.5045	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2280	1.2241	1.2203	1.2023	1.1990	1.1834	1.1834	1.1805	1.1894	1.1990	1.2058	1.2129	(40)
HLP (average)												1.2023	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8503 (42)
Hot water usage for mixer showers	72.0103	70.9281	69.3512	66.3340	64.1074	61.6243	60.2129	61.7779	63.4934	66.1595	69.2415	71.7344	(42a)
Hot water usage for baths	31.0900	30.6283	29.9781	28.7792	27.8815	26.8861	26.3484	26.9941	27.6971	28.7622	29.9858	30.9849	(42b)
Hot water usage for other uses	43.8201	42.2267	40.6332	39.0398	37.4463	35.8528	35.8528	37.4463	39.0398	40.6332	42.2267	43.8201	(42c)
Average daily hot water use (litres/day)												135.0529	(43)
Daily hot water use	146.9205	143.7831	139.9625	134.1530	129.4352	124.3632	122.4141	126.2183	130.2303	135.5550	141.4540	146.5395	(44)
Energy conte	232.6861	204.7452	215.1171	183.6487	174.2446	152.9191	148.0493	156.2846	160.5870	183.9468	201.5271	229.4454	(45)
Energy content (annual)										Total = Sum(45)m =		2243.2009	
Distribution loss (46)m = 0.15 x (45)m	34.9029	30.7118	32.2676	27.5473	26.1367	22.9379	22.2074	23.4427	24.0880	27.5920	30.2291	34.4168	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	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	283.6450	250.7726	266.0760	232.9638	225.2035	202.2341	199.0082	207.2435	209.9020	234.9057	250.8422	280.4043	(62)
WWHRS	-32.9201	-29.1148	-30.4874	-25.2447	-23.5272	-20.1324	-18.8709	-20.0673	-20.8297	-24.5560	-27.8189	-32.3105	(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	250.7249	221.6578	235.5887	207.7190	201.6763	182.1018	180.1373	187.1762	189.0723	210.3497	223.0233	248.0938	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2537.3210	(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	90.1079	79.5846	84.2662	73.3920	70.6761	63.1744	61.9661	64.7044	65.7239	73.9020	79.3365	89.0303	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	142.5160	142.5160	142.5160	142.5160	142.5160	142.5160	142.5160	142.5160	142.5160	142.5160	142.5160	142.5160	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	149.4344	165.4452	149.4344	154.4155	149.4344	154.4155	149.4344	149.4344	154.4155	149.4344	154.4155	149.4344	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.0671	283.9837	276.6340	260.9873	241.2361	222.6728	210.2714	207.3548	214.7045	230.3512	250.1024	268.6657	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2516	37.2516	37.2516	37.2516	37.2516	37.2516	37.2516	37.2516	37.2516	37.2516	37.2516	37.2516	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	(71)
Water heating gains (Table 5)	121.1127	118.4295	113.2610	101.9333	94.9947	87.7422	83.2878	86.9682	91.2832	99.3307	110.1896	119.6644	(72)
Total internal gains	620.3690	636.6132	608.0841	586.0909	554.4200	530.5853	508.7484	509.5122	526.1581	547.8711	583.4623	606.5193	(73)

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6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
East					9.5400	19.6403	0.6300		0.7000		0.7700		57.2621 (76)	
West					8.2300	19.6403	0.6300		0.7000		0.7700		49.3991 (80)	
Solar gains	106.6612	208.6520	343.6201	501.1494	614.1774	628.7199	598.5670	514.1602	399.6444	247.5832	132.9940	87.7130 (83)		
Total gains	727.0302	845.2652	951.7042	1087.2403	1168.5974	1159.3052	1107.3153	1023.6724	925.8025	795.4543	716.4564	694.2323 (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	47.1793	47.3293	47.4772	48.1847	48.3195	48.9566	48.9566	49.0765	48.7092	48.3195	48.0477	47.7668
alpha	4.1453	4.1553	4.1651	4.2123	4.2213	4.2638	4.2638	4.2718	4.2473	4.2213	4.2032	4.1845
util living area	0.9950	0.9901	0.9783	0.9393	0.8498	0.6881	0.5294	0.5867	0.8234	0.9632	0.9907	0.9959 (86)
MIT	19.2623	19.4760	19.8175	20.2911	20.6761	20.9085	20.9766	20.9643	20.7940	20.2779	19.6970	19.2394 (87)
Th 2	19.8977	19.9008	19.9038	19.9181	19.9208	19.9333	19.9333	19.9356	19.9285	19.9208	19.9154	19.9097 (88)
util rest of house	0.9936	0.9873	0.9717	0.9202	0.8026	0.5991	0.4104	0.4657	0.7519	0.9479	0.9875	0.9947 (89)
MIT 2	17.8773	18.1517	18.5868	19.1843	19.6340	19.8755	19.9246	19.9209	19.7753	19.1807	18.4449	17.8561 (90)
Living area fraction									fLA =	Living area /	(4) =	0.1094 (91)
MIT	18.0289	18.2966	18.7215	19.3054	19.7480	19.9885	20.0397	20.0351	19.8868	19.3008	18.5819	18.0075 (92)
Temperature adjustment												0.0000
adjusted MIT	18.0289	18.2966	18.7215	19.3054	19.7480	19.9885	20.0397	20.0351	19.8868	19.3008	18.5819	18.0075 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9898	0.9811	0.9618	0.9064	0.7938	0.6041	0.4228	0.4777	0.7486	0.9358	0.9816	0.9915 (94)
Useful gains	719.6258	829.2823	915.3436	985.4605	927.6169	700.3673	468.2029	489.0448	693.0722	744.3703	703.2562	688.3455 (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	1970.1090	1916.3374	1742.7917	1462.0308	1127.6441	745.1863	475.6850	501.4681	804.3272	1219.1082	1617.8865	1957.0180 (97)
Space heating	930.3595	730.5010	615.6214	343.1307	148.8202	0.0000	0.0000	0.0000	0.0000	353.2050	658.5338	943.8924 (98a)
Space heating requirement - total per year (kWh/year)												4724.0640
Solar heating	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	930.3595	730.5010	615.6214	343.1307	148.8202	0.0000	0.0000	0.0000	0.0000	353.2050	658.5338	943.8924 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4724.0640
Space heating per m ²										(98c) / (4) =		40.4250 (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	930.3595	730.5010	615.6214	343.1307	148.8202	0.0000	0.0000	0.0000	0.0000	353.2050	658.5338	943.8924	(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)	1006.8826	790.5855	666.2569	371.3535	161.0608	0.0000	0.0000	0.0000	0.0000	382.2565	712.6989	1021.5285	(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	250.7249	221.6578	235.5887	207.7190	201.6763	182.1018	180.1373	187.1762	189.0723	210.3497	223.0233	248.0938	(64)
Efficiency of water heater	86.9238	86.7375	86.3407	85.4491	83.7396	80.3000	80.3000	80.3000	80.3000	85.4828	86.5548	86.9615	(216)
Fuel for water heating, kWh/month	288.4423	255.5502	272.8592	243.0910	240.8375	226.7768	224.3304	233.0961	235.4574	246.0725	257.6670	285.2914	(217)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	31.0495	24.9091	22.4279	16.4316	12.6922	10.3697	11.5783	15.0499	19.5483	25.6485	28.9699	31.9125	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-58.9114	-80.6990	-112.7154	-122.9861	-129.4820	-119.6735	-118.1044	-112.9565	-103.5086	-90.4027	-63.8876	-51.2057	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-40.8150	-84.8795	-166.9708	-248.3517	-326.1293	-326.9464	-323.1727	-274.7107	-202.7538	-120.6481	-54.2394	-32.3571	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

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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	(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	(235d)
Annual totals kWh/year										
Space heating fuel - main system 1									5112.6233	(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									3009.4719	(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)									250.5874	(232)
Energy saving/generation technologies (Appendices M ,N and Q)										
PV generation									-3366.5074	(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									5092.1752	(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	5112.6233	0.2100	1073.6509 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3009.4719	0.2100	631.9891 (264)
Space and water heating			1705.6400 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	250.5874	0.1443	36.1675 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1164.5328	0.1352	-157.4764
PV Unit electricity exported	-2201.9746	0.1262	-277.8447
Total			-435.3211 (269)
Total CO2, kg/year			1318.4157 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.2800 (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	5112.6233	1.1300	5777.2644 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3009.4719	1.1300	3400.7032 (278)
Space and water heating			9177.9676 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	250.5874	1.5338	384.3593 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1164.5328	1.4998	-1746.5804
PV Unit electricity exported	-2201.9746	0.4632	-1019.9084
Total			-2766.4888 (283)
Total Primary energy kWh/year			6925.9388 (286)
Target Primary Energy Rate (TPER)			59.2700 (287)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024
Assessment Reference	Plot 23		Prop Type Ref	SAP VG 21-0282		
Property						
SAP Rating	95 A	DER	11.21	TER	11.28	
Environmental	90 B	% DER < TER				0.62
CO ₂ Emissions (t/year)	1.26	DFEE	42.59	TFEE	45.53	
Compliance Check	See BREL	% DFEE < TFEE				6.45
% DPER < TPER	0.40	DPER	59.03	TPER	59.27	
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	48.7500 (1b)	x 2.6200 (2b)	= 127.7250 (1b) - (3b)
First floor	68.1100 (1c)	x 2.3900 (2c)	= 162.7829 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	116.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 290.5079 (5)

2. Ventilation rate

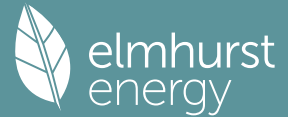
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1377 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3377 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3377 (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	0.4306	0.4221	0.4137	0.3715	0.3630	0.3208	0.3208	0.3124	0.3377	0.3630	0.3799	0.3968 (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	0.5927	0.5891	0.5856	0.5690	0.5659	0.5515	0.5515	0.5488	0.5570	0.5659	0.5722	0.5787 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.30)			17.7700	1.2357	21.9591		(27)
Door			2.1400	1.3000	2.7820		(26a)
Ground Floor			48.7500	0.1300	6.3375	75.0000	3656.2500 (28a)
Exposed Floor			19.3600	0.2000	3.8720	20.0000	387.2000 (28b)
External Wall	147.9800	19.9100	128.0700	0.1900	24.3333	110.0000	14087.7000 (29a)
Garage Wall	22.2000		22.2000	0.1700	3.7740	110.0000	2442.0000 (29a)
Plane Roof	68.1100		68.1100	0.0900	6.1299	9.0000	612.9900 (30)
Total net area of external elements Aum(A, m ²)			306.4000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	69.1878		(33)
Studs			207.8400			9.0000	1870.5600 (32c)
Internal Floor 1			48.7500			18.0000	877.5000 (32d)
Internal Ceiling 1			48.7500			9.0000	438.7500 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	24372.9500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							208.5654 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

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E2 Other lintels (including other steel lintels)	13.6900	0.0240	0.3286
E3 Sill	10.8600	0.0210	0.2281
E4 Jamb	31.2000	0.0160	0.4992
E5 Ground floor (normal)	33.9000	0.0920	3.1188
E10 Eaves (insulation at ceiling level)	14.8000	0.0580	0.8584
E16 Corner (normal)	27.5000	0.0470	1.2925
E6 Intermediate floor within a dwelling	24.6500	0.0010	0.0246
E12 Gable (insulation at ceiling level)	19.1000	0.0570	1.0887
E17 Corner (inverted - internal area greater than external area)	7.4200	-0.0880	-0.6530
E20 Exposed floor (normal)	9.2500	0.3200	2.9600
E21 Exposed floor (inverted)	9.2500	0.3200	2.9600
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			12.7059 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	81.8937 (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	56.8196	56.4746	56.1364	54.5478	54.2506	52.8670	52.8670	52.6107	53.3999	54.2506	54.8518	55.4804 (38)
Average = Sum(39)m / 12 =	138.7134	138.3683	138.0301	136.4415	136.1443	134.7607	134.7607	134.5045	135.2936	136.1443	136.7456	137.3742 (39)
												136.4401
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1870	1.1841	1.1812	1.1676	1.1650	1.1532	1.1532	1.1510	1.1577	1.1650	1.1702	1.1755 (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												2.8503 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	31.0900	30.6283	29.9781	28.7792	27.8815	26.8861	26.3484	26.9941	27.6971	28.7622	29.9858	30.9849 (42b)
Hot water usage for other uses	43.8201	42.2267	40.6332	39.0398	37.4463	35.8528	35.8528	37.4463	39.0398	40.6332	42.2267	43.8201 (42c)
Average daily hot water use (litres/day)												68.6618 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	74.9101	72.8550	70.6113	67.8189	65.3278	62.7389	62.2012	64.4404	66.7368	69.3954	72.2124	74.8050 (44)
Energy content (annual)	118.6394	103.7445	108.5269	92.8407	87.9437	77.1448	75.2270	79.7906	82.2932	94.1689	102.8799	117.1266 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	100.8434	88.1828	92.2479	78.9146	74.7522	65.5731	63.9430	67.8220	69.9492	80.0436	87.4479	99.5576 (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	100.8434	88.1828	92.2479	78.9146	74.7522	65.5731	63.9430	67.8220	69.9492	80.0436	87.4479	99.5576 (64)
12Total per year (kWh/year)												969.2773 (64)
Electric shower(s)	57.6683	51.3829	56.1082	53.5433	54.5480	52.0335	53.7680	54.5480	53.5433	56.1082	55.0531	57.6683 (64a)
Heat gains from water heating, kWh/month	39.6279	34.8914	37.0890	33.1145	32.3251	29.4017	29.4277	30.5925	30.8731	34.0379	35.6252	39.3065 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												655.9731 (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	142.5160	142.5160	142.5160	142.5160	142.5160	142.5160	142.5160	142.5160	142.5160	142.5160	142.5160	142.5160 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	149.4344	165.4452	149.4344	154.4155	149.4344	154.4155	149.4344	149.4344	154.4155	149.4344	154.4155	149.4344 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.0671	283.9837	276.6340	260.9873	241.2361	222.6728	210.2714	207.3548	214.7045	230.3512	250.1024	268.6657 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2516	37.2516	37.2516	37.2516	37.2516	37.2516	37.2516	37.2516	37.2516	37.2516	37.2516	37.2516 (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)	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128 (71)
Water heating gains (Table 5)	53.2633	51.9218	49.8508	45.9923	43.4477	40.8356	39.5534	41.1190	42.8794	45.7499	49.4795	52.8313 (72)
Total internal gains	549.5196	567.1055	541.6740	527.1499	499.8730	483.6788	465.0140	463.6630	477.7542	491.2903	519.7522	536.6861 (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							
East	9.5400	19.6403	0.7300	0.7000	0.7700	66.3514 (76)						
West	8.2300	19.6403	0.7300	0.7000	0.7700	57.2402 (80)						
Solar gains	123.5916	241.7713	398.1630	580.6970	711.6659	728.5167	693.5776	595.7729	463.0800	286.8821	154.1042	101.6357 (83)
Total gains	673.1112	808.8768	939.8369	1107.8469	1211.5389	1212.1955	1158.5916	1059.4359	940.8342	778.1724	673.8564	638.3218 (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	48.8076	48.9293	49.0492	49.6203	49.7286	50.2392	50.2392	50.3349	50.0413	49.7286	49.5099	49.2834	
alpha	4.2538	4.2620	4.2699	4.3080	4.3152	4.3493	4.3493	4.3557	4.3361	4.3152	4.3007	4.2856	
util living area	0.9963	0.9915	0.9786	0.9329	0.8293	0.6558	0.4978	0.5593	0.8094	0.9645	0.9925	0.9971 (86)	
MIT	19.2759	19.5056	19.8655	20.3507	20.7249	20.9287	20.9829	20.9724	20.8187	20.2998	19.7050	19.2450 (87)	
Th 2	19.9304	19.9328	19.9351	19.9460	19.9481	19.9576	19.9576	19.9594	19.9540	19.9481	19.9439	19.9396 (88)	
util rest of house	0.9952	0.9890	0.9721	0.9126	0.7798	0.5686	0.3865	0.4440	0.7368	0.9498	0.9899	0.9962 (89)	
MIT 2	18.3610	18.5911	18.9484	19.4242	19.7606	19.9231	19.9527	19.9506	19.8498	19.3866	18.7989	18.3370 (90)	
Living area fraction									fLA = Living area / (4) =				0.1094 (91)
MIT	18.4611	18.6912	19.0488	19.5256	19.8661	20.0332	20.0655	20.0624	19.9559	19.4866	18.8981	18.4364 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.4611	18.6912	19.0488	19.5256	19.8661	20.0332	20.0655	20.0624	19.9559	19.4866	18.8981	18.4364 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9931	0.9850	0.9650	0.9026	0.7754	0.5754	0.3984	0.4560	0.7370	0.9412	0.9862	0.9944 (94)
Useful gains	668.4462	796.7290	906.9325	999.9675	939.4545	697.4820	461.6116	483.0699	693.3543	732.4438	664.5802	634.7680 (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	1964.3391	1908.2619	1732.1116	1449.7766	1111.7740	732.1812	467.0114	492.6102	792.2631	1209.8547	1613.3347	1955.7091 (97)
Space heating kWh	964.1443	746.9501	613.9333	323.8625	128.2057	0.0000	0.0000	0.0000	0.0000	355.1937	683.1033	982.7802 (98a)
Space heating requirement - total per year (kWh/year)												4798.1731
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	964.1443	746.9501	613.9333	323.8625	128.2057	0.0000	0.0000	0.0000	0.0000	355.1937	683.1033	982.7802 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4798.1731
Space heating per m2										(98c) / (4) =		41.0592 (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	1266.7506	997.2292	1022.2340	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8379	0.9009	0.8658	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1061.4158	898.4515	885.0740	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1349.7297	1290.1530	1177.2843	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	207.5860	291.4259	217.4045	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	51.8965	72.8565	54.3511	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												179.1041 (107)
Energy for space heating												41.0592 (99)
Energy for space cooling												1.5326 (108)
Total												42.5918 (109)
Fabric Energy Efficiency (DFEE)												42.6 (109)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	48.7500 (1b)	x 2.6200 (2b)	= 127.7250 (1b) - (3b)
First floor	68.1100 (1c)	x 2.3900 (2c)	= 162.7829 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	116.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 290.5079 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

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Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 40.0000 / (5) = 0.1377 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 5.0000 (17)
Infiltration rate 0.3877 (18)
Number of sides sheltered 0 (19)
Shelter factor (20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3877 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	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	0.4943	0.4846	0.4749	0.4265	0.4168	0.3683	0.3683	0.3586	0.3877	0.4168	0.4362	0.4555	(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	0.6222	0.6174	0.6128	0.5909	0.5868	0.5678	0.5678	0.5643	0.5752	0.5868	0.5951	0.6038	(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	
TER Semi-glazed door			2.1400	1.0000	2.1400			(26a)
TER Opening Type (Uw = 1.20)			17.7700	1.1450	20.3473			(27)
Ground Floor			48.7500	0.1300	6.3375			(28a)
Exposed Floor			19.3600	0.1300	2.5168			(28b)
External Wall	147.9800	19.9100	128.0700	0.1800	23.0526			(29a)
Garage Wall	22.2000		22.2000	0.1800	3.9960			(29a)
Plane Roof	68.1100		68.1100	0.1100	7.4921			(30)
Total net area of external elements Aum(A, m ²)			306.4000					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 65.8823			(33)

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

208.5654 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	13.6900	0.0500	0.6845	
E3 Sill	10.8600	0.0500	0.5430	
E4 Jamb	31.2000	0.0500	1.5600	
E5 Ground floor (normal)	33.9000	0.1600	5.4240	
E10 Eaves (insulation at ceiling level)	14.8000	0.0600	0.8880	
E16 Corner (normal)	27.5000	0.0900	2.4750	
E6 Intermediate floor within a dwelling	24.6500	0.0000	0.0000	
E12 Gable (insulation at ceiling level)	19.1000	0.0600	1.1460	
E17 Corner (inverted - internal area greater than external area)	7.4200	-0.0900	-0.6678	
E20 Exposed floor (normal)	9.2500	0.3200	2.9600	
E21 Exposed floor (inverted)	9.2500	0.3200	2.9600	

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

17.9727 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 83.8550 (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	
	59.6458	59.1910	58.7452	56.6514	56.2596	54.4360	54.4360	54.0983	55.1384	56.2596	57.0521	57.8807	(38)
Heat transfer coeff	143.5008	143.0460	142.6003	140.5064	140.1147	138.2910	138.2910	137.9533	138.9934	140.1147	140.9072	141.7357	(39)
Average = Sum(39)m / 12 =													140.5045

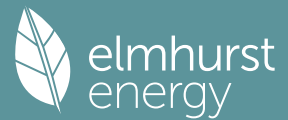
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	1.2280	1.2241	1.2203	1.2023	1.1990	1.1834	1.1834	1.1805	1.1894	1.1990	1.2058	1.2129	(40)
HLP (average)													1.2023
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8503 (42)
Hot water usage for mixer showers													0.0000 (42a)
Hot water usage for baths	31.0900	30.6283	29.9781	28.7792	27.8815	26.8861	26.3484	26.9941	27.6971	28.7622	29.9858	30.9849	(42b)
Hot water usage for other uses	43.8201	42.2267	40.6332	39.0398	37.4463	35.8528	35.8528	37.4463	39.0398	40.6332	42.2267	43.8201	(42c)
Average daily hot water use (litres/day)													68.6618 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	74.9101	72.8550	70.6113	67.8189	65.3278	62.7389	62.2012	64.4404	66.7368	69.3954	72.2124	74.8050	(44)
Energy conte	118.6394	103.7445	108.5269	92.8407	87.9437	77.1448	75.2270	79.7906	82.2932	94.1689	102.8799	117.1266	(45)
Energy content (annual)										Total = Sum(45)m =			1140.3263
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	100.8434	88.1828	92.2479	78.9146	74.7522	65.5731	63.9430	67.8220	69.9492	80.0436	87.4479	99.5576	(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	100.8434	88.1828	92.2479	78.9146	74.7522	65.5731	63.9430	67.8220	69.9492	80.0436	87.4479	99.5576	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =			969.2773 (64)
Electric shower(s)	57.6683	51.3829	56.1082	53.5433	54.5480	52.0335	53.7680	54.5480	53.5433	56.1082	55.0531	57.6683	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													655.9731 (64a)

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Heat gains from water heating, kWh/month
39.6279 34.8914 37.0890 33.1145 32.3251 29.4017 29.4277 30.5925 30.8731 34.0379 35.6252 39.3065 (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	142.5160	142.5160	142.5160	142.5160	142.5160	142.5160	142.5160	142.5160	142.5160	142.5160	142.5160	142.5160	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	149.4344	165.4452	149.4344	154.4155	149.4344	154.4155	149.4344	149.4344	154.4155	149.4344	154.4155	149.4344	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.0671	283.9837	276.6340	260.9873	241.2361	222.6728	210.2714	207.3548	214.7045	230.3512	250.1024	268.6657	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2516	37.2516	37.2516	37.2516	37.2516	37.2516	37.2516	37.2516	37.2516	37.2516	37.2516	37.2516	(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)	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	(71)
Water heating gains (Table 5)	53.2633	51.9218	49.8508	45.9923	43.4477	40.8356	39.5534	41.1190	42.8794	45.7499	49.4795	52.8313	(72)
Total internal gains	549.5196	567.1055	541.6740	527.1499	499.8730	483.6788	465.0140	463.6630	477.7542	491.2903	519.7522	536.6861	(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				
East				9.5400	19.6403		0.6300		0.7000		0.7700		57.2621 (76)		
West				8.2300	19.6403		0.6300		0.7000		0.7700		49.3991 (80)		
Solar gains				106.6612	208.6520	343.6201	501.1494	614.1774	628.7199	598.5670	514.1602	399.6444	247.5832	132.9940	87.7130 (83)
Total gains				656.1809	775.7575	885.2941	1028.2994	1114.0504	1112.3987	1063.5809	977.8231	877.3986	738.8735	652.7462	624.3991 (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	47.1793	47.3293	47.4772	48.1847	48.3195	48.9566	48.9566	49.0765	48.7092	48.3195	48.0477	47.7668		
alpha	4.1453	4.1553	4.1651	4.2123	4.2213	4.2638	4.2638	4.2718	4.2473	4.2213	4.2032	4.1845		
util living area	0.9966	0.9928	0.9831	0.9487	0.8660	0.7080	0.5482	0.6090	0.8436	0.9711	0.9934	0.9973	(86)	
MIT	19.1902	19.4066	19.7544	20.2435	20.6466	20.8978	20.9734	20.9589	20.7708	20.2271	19.6329	19.1679	(87)	
Th 2	19.8977	19.9008	19.9038	19.9181	19.9208	19.9333	19.9333	19.9356	19.9285	19.9208	19.9154	19.9097	(88)	
util rest of house	0.9956	0.9906	0.9778	0.9320	0.8217	0.6193	0.4264	0.4857	0.7758	0.9587	0.9911	0.9965	(89)	
MIT 2	18.2515	18.4691	18.8160	19.3024	19.6738	19.8823	19.9255	19.9221	19.7930	19.2963	18.7062	18.2381	(90)	
Living area fraction									fLA = Living area / (4) =			0.1094	(91)	
MIT	18.3542	18.5717	18.9187	19.4054	19.7802	19.9934	20.0402	20.0356	19.9000	19.3982	18.8076	18.3398	(92)	
Temperature adjustment												0.0000		
adjusted MIT	18.3542	18.5717	18.9187	19.4054	19.7802	19.9934	20.0402	20.0356	19.9000	19.3982	18.8076	18.3398	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9936	0.9869	0.9713	0.9220	0.8149	0.6247	0.4392	0.4981	0.7737	0.9504	0.9876	0.9948	(94)
Useful gains	651.9537	765.6336	859.9287	948.0629	907.8821	694.9512	467.1039	487.0125	678.8260	702.2320	644.6725	621.1250	(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	2016.7890	1955.6829	1770.9041	1476.0701	1132.1604	745.8602	475.7424	501.5459	806.1643	1232.7571	1649.6902	2004.1200	(97)
Space heating kWh	1015.4375	799.7131	677.7657	380.1652	166.8630	0.0000	0.0000	0.0000	0.0000	394.7107	723.6127	1028.9483	(98a)
Space heating requirement - total per year (kWh/year)												5187.2162	
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	1015.4375	799.7131	677.7657	380.1652	166.8630	0.0000	0.0000	0.0000	0.0000	394.7107	723.6127	1028.9483	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5187.2162	
Space heating per m2										(98c) / (4) =		44.3883	(99)

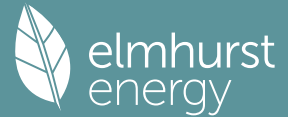
8c. Space cooling requirement

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	1299.9354	1023.3534	1048.4449	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7880	0.8626	0.8228	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1024.4108	882.7780	862.6726	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1233.0841	1179.1016	1081.8928	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	150.2447	220.4647	163.0998	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fc = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	37.5612	55.1162	40.7750	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												133.4523	(107)
Energy for space heating												44.3883	(99)
Energy for space cooling												1.1420	(108)
Total												45.5303	(109)

Fabric Energy Efficiency (TFEE)

45.5 (109)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024		
Assessment Reference	Plot 23			Prop Type Ref	SAP VG 21-0282			
Property								
SAP Rating	95 A		DER	11.21		TER	11.28	
Environmental	90 B		% DER < TER				0.62	
CO ₂ Emissions (t/year)	1.26		DFEE	42.59		TFEE	45.53	
Compliance Check	See BREL		% DFEE < TFEE				6.45	
% DPER < TPER	0.40		DPER	59.03		TPER	59.27	
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	48.7500 (1b)	x 2.6200 (2b)	= 127.7250 (1b) - (3b)
First floor	68.1100 (1c)	x 2.3900 (2c)	= 162.7829 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	116.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 290.5079 (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	5 * 10 = 50.0000 (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) =	50.0000 / (5) = 0.1721 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3721 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3721 (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	0.4744	0.4651	0.4558	0.4093	0.4000	0.3535	0.3535	0.3442	0.3721	0.4000	0.4186	0.4372 (22b)
Effective ac	0.6125	0.6082	0.6039	0.5838	0.5800	0.5625	0.5625	0.5592	0.5692	0.5800	0.5876	0.5956 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.30)			17.7700	1.2357	21.9591		(27)
Door			2.1400	1.3000	2.7820		(26a)
Ground Floor			48.7500	0.1300	6.3375	75.0000	3656.2500 (28a)
Exposed Floor			19.3600	0.2000	3.8720	20.0000	387.2000 (28b)
External Wall	147.9800	19.9100	128.0700	0.1900	24.3333	110.0000	14087.7000 (29a)
Garage Wall	22.2000		22.2000	0.1700	3.7740	110.0000	2442.0000 (29a)
Plane Roof	68.1100		68.1100	0.0900	6.1299	9.0000	612.9900 (30)
Total net area of external elements Aum(A, m ²)			306.4000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	69.1878		(33)
Studs			207.8400			9.0000	1870.5600 (32c)
Internal Floor 1			48.7500			18.0000	877.5000 (32d)
Internal Ceiling 1			48.7500			9.0000	438.7500 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	24372.9500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							208.5654 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				13.6900	0.0240	0.3286	
E3 Sill				10.8600	0.0210	0.2281	

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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	48.1467	48.2906	48.4325	49.1102	49.2391	49.8482	49.8482	49.9626	49.6118	49.2391	48.9790	48.7100	
alpha	4.2098	4.2194	4.2288	4.2740	4.2826	4.3232	4.3232	4.3308	4.3075	4.2826	4.2653	4.2473	
util living area	0.9949	0.9890	0.9742	0.9251	0.8181	0.6446	0.4886	0.5470	0.7957	0.9577	0.9901	0.9958 (86)	
MIT	19.6592	19.8306	20.0981	20.4567	20.7296	20.8775	20.9163	20.9091	20.7996	20.4233	19.9827	19.6392 (87)	
Th 2	19.9174	19.9202	19.9230	19.9363	19.9388	19.9503	19.9503	19.9525	19.9459	19.9388	19.9337	19.9285 (88)	
util rest of house	0.9934	0.9859	0.9666	0.9029	0.7669	0.5573	0.3782	0.4327	0.7209	0.9407	0.9867	0.9947 (89)	
MIT 2	18.3488	18.5692	18.9096	19.3613	19.6743	19.8272	19.8541	19.8530	19.7603	19.3320	18.7746	18.3315 (90)	
Living area fraction									fLA = Living area / (4) =				0.1094 (91)
MIT	18.4922	18.7073	19.0397	19.4812	19.7898	19.9421	19.9704	19.9686	19.8740	19.4515	18.9068	18.4747 (92)	
Temperature adjustment												-0.1500	
adjusted MIT	18.3422	18.5573	18.8897	19.3312	19.6398	19.7921	19.8204	19.8186	19.7240	19.3015	18.7568	18.3247 (93)	

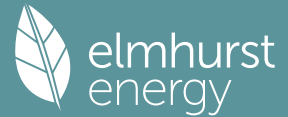
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9902	0.9803	0.9567	0.8872	0.7502	0.5431	0.3640	0.4173	0.7024	0.9267	0.9813	0.9920 (94)
Useful gains	726.2338	850.7006	952.5186	1025.6315	941.7616	677.8945	433.7293	456.7229	687.2332	763.6685	713.3383	692.0111 (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	1974.5758	1914.7263	1731.9275	1438.0321	1091.7067	705.1804	437.3830	463.2412	767.4802	1196.4322	1611.2966	1963.2014 (97)
Space heating kWh	928.7665	715.0253	579.8802	296.9285	111.5591	0.0000	0.0000	0.0000	0.0000	321.9762	646.5300	945.7656 (98a)
Space heating requirement - total per year (kWh/year)												4546.4314
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	928.7665	715.0253	579.8802	296.9285	111.5591	0.0000	0.0000	0.0000	0.0000	321.9762	646.5300	945.7656 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4546.4314
Space heating per m2										(98c) / (4) =		38.9049 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												88.5000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	928.7665	715.0253	579.8802	296.9285	111.5591	0.0000	0.0000	0.0000	0.0000	321.9762	646.5300	945.7656 (98)
Space heating efficiency (main heating system 1)	88.5000	88.5000	88.5000	88.5000	88.5000	0.0000	0.0000	0.0000	0.0000	88.5000	88.5000	88.5000 (210)
Space heating fuel (main heating system)	1049.4537	807.9381	655.2319	335.5124	126.0555	0.0000	0.0000	0.0000	0.0000	363.8149	730.5423	1068.6617 (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	252.2242	222.3377	234.4777	202.1370	193.1924	171.0971	166.7325	175.0510	178.8424	202.9926	220.1961	248.9507 (64)
Efficiency of water heater (217)m	88.1753	88.1395	88.0628	87.8863	87.5432	87.0000	87.0000	87.0000	87.0000	87.9139	88.1140	88.1832 (217)
Fuel for water heating, kWh/month	286.0485	252.2565	266.2619	229.9984	220.6825	196.6633	191.6466	201.2081	205.5660	230.8994	249.8989	282.3109 (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	30.4149	24.3999	21.9694	16.0958	12.4328	10.1577	11.3416	14.7423	19.1488	25.1242	28.3778	31.2602 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-45.1745	-68.1685	-104.7446	-121.7647	-131.4539	-122.2750	-120.2696	-113.2716	-99.5228	-79.8968	-50.7320	-38.1766 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-24.9817	-59.9410	-140.3300	-241.6984	-345.0408	-356.7338	-348.0083	-278.1023	-182.0197	-91.4181	-34.7193	-18.9914 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												5137.2107 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												87.0000
Water heating fuel used												2813.4409 (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)												245.4655 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-3217.4354 (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	5064.6816 (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	5137.2107	0.2100	1078.8142 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2813.4409	0.2100	590.8226 (264)
Space and water heating			1669.6368 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	245.4655	0.1443	35.4283 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1095.4506	0.1339	-146.6610
PV Unit electricity exported	-2121.9848	0.1227	-260.2739
Total			-406.9349 (269)
Total CO2, kg/year			1310.0595 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.2100 (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	5137.2107	1.1300	5805.0480 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2813.4409	1.1300	3179.1882 (278)
Space and water heating			8984.2363 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	245.4655	1.5338	376.5031 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1095.4506	1.4948	-1637.4537
PV Unit electricity exported	-2121.9848	0.4501	-955.0621
Total			-2592.5158 (283)
Total Primary energy kWh/year			6898.3244 (286)
Dwelling Primary energy Rate (DPER)			59.0300 (287)

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

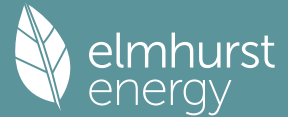
1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	48.7500 (1b)	x 2.6200 (2b)	= 127.7250 (1b) - (3b)
First floor	68.1100 (1c)	x 2.3900 (2c)	= 162.7829 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	116.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	290.5079 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1377 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3877 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3877 (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	0.4943 0.4846 0.4749 0.4265 0.4168 0.3683 0.3683 0.3586 0.3877 0.4168 0.4362 0.4555 (22b)
Effective ac	0.6222 0.6174 0.6128 0.5909 0.5868 0.5678 0.5678 0.5643 0.5752 0.5868 0.5951 0.6038 (25)

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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	
TER Semi-glazed door			2.1400	1.0000	2.1400			(26a)
TER Opening Type (Uw = 1.20)			17.7700	1.1450	20.3473			(27)
Ground Floor			48.7500	0.1300	6.3375			(28a)
Exposed Floor			19.3600	0.1300	2.5168			(28b)
External Wall	147.9800	19.9100	128.0700	0.1800	23.0526			(29a)
Garage Wall	22.2000		22.2000	0.1800	3.9960			(29a)
Plane Roof	68.1100		68.1100	0.1100	7.4921			(30)
Total net area of external elements Aum(A, m ²)			306.4000					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	65.8823		(33)

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

208.5654 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	13.6900	0.0500	0.6845
E3 Sill	10.8600	0.0500	0.5430
E4 Jamb	31.2000	0.0500	1.5600
E5 Ground floor (normal)	33.9000	0.1600	5.4240
E10 Eaves (insulation at ceiling level)	14.8000	0.0600	0.8880
E16 Corner (normal)	27.5000	0.0900	2.4750
E6 Intermediate floor within a dwelling	24.6500	0.0000	0.0000
E12 Gable (insulation at ceiling level)	19.1000	0.0600	1.1460
E17 Corner (inverted - internal area greater than external area)	7.4200	-0.0900	-0.6678
E20 Exposed floor (normal)	9.2500	0.3200	2.9600
E21 Exposed floor (inverted)	9.2500	0.3200	2.9600

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

17.9727 (36)

Point Thermal Bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 83.8550 (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	59.6458	59.1910	58.7452	56.6514	56.2596	54.4360	54.4360	54.0983	55.1384	56.2596	57.0521	57.8807	(38)
Heat transfer coeff	143.5008	143.0460	142.6003	140.5064	140.1147	138.2910	138.2910	137.9533	138.9934	140.1147	140.9072	141.7357	(39)
Average = Sum(39)m / 12 =												140.5045	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2280	1.2241	1.2203	1.2023	1.1990	1.1834	1.1834	1.1805	1.1894	1.1990	1.2058	1.2129	(40)
HLP (average)												1.2023	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8503 (42)
Hot water usage for mixer showers	72.0103	70.9281	69.3512	66.3340	64.1074	61.6243	60.2129	61.7779	63.4934	66.1595	69.2415	71.7344	(42a)
Hot water usage for baths	31.0900	30.6283	29.9781	28.7792	27.8815	26.8861	26.3484	26.9941	27.6971	28.7622	29.9858	30.9849	(42b)
Hot water usage for other uses	43.8201	42.2267	40.6332	39.0398	37.4463	35.8528	35.8528	37.4463	39.0398	40.6332	42.2267	43.8201	(42c)
Average daily hot water use (litres/day)												135.0529	(43)
Daily hot water use	146.9205	143.7831	139.9625	134.1530	129.4352	124.3632	122.4141	126.2183	130.2303	135.5550	141.4540	146.5395	(44)
Energy conte	232.6861	204.7452	215.1171	183.6487	174.2446	152.9191	148.0493	156.2846	160.5870	183.9468	201.5271	229.4454	(45)
Energy content (annual)										Total = Sum(45)m =		2243.2009	
Distribution loss (46)m = 0.15 x (45)m	34.9029	30.7118	32.2676	27.5473	26.1367	22.9379	22.2074	23.4427	24.0880	27.5920	30.2291	34.4168	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	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	283.6450	250.7726	266.0760	232.9638	225.2035	202.2341	199.0082	207.2435	209.9020	234.9057	250.8422	280.4043	(62)
WWHRS	-32.9201	-29.1148	-30.4874	-25.2447	-23.5272	-20.1324	-18.8709	-20.0673	-20.8297	-24.5560	-27.8189	-32.3105	(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	250.7249	221.6578	235.5887	207.7190	201.6763	182.1018	180.1373	187.1762	189.0723	210.3497	223.0233	248.0938	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2537.3210	(64)
Electric shower(s)												2537	(64)
Heat gains from water heating, kWh/month	90.1079	79.5846	84.2662	73.3920	70.6761	63.1744	61.9661	64.7044	65.7239	73.9020	79.3365	89.0303	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	142.5160	142.5160	142.5160	142.5160	142.5160	142.5160	142.5160	142.5160	142.5160	142.5160	142.5160	142.5160	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	149.4344	165.4452	149.4344	154.4155	149.4344	154.4155	149.4344	149.4344	154.4155	149.4344	154.4155	149.4344	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.0671	283.9837	276.6340	260.9873	241.2361	222.6728	210.2714	207.3548	214.7045	230.3512	250.1024	268.6657	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2516	37.2516	37.2516	37.2516	37.2516	37.2516	37.2516	37.2516	37.2516	37.2516	37.2516	37.2516	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	(71)
Water heating gains (Table 5)	121.1127	118.4295	113.2610	101.9333	94.9947	87.7422	83.2878	86.9682	91.2832	99.3307	110.1896	119.6644	(72)
Total internal gains	620.3690	636.6132	608.0841	586.0909	554.4200	530.5853	508.7484	509.5122	526.1581	547.8711	583.4623	606.5193	(73)

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6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	Gains W	
East					9.5400	19.6403	0.6300		0.7000		0.7700	57.2621 (76)	
West					8.2300	19.6403	0.6300		0.7000		0.7700	49.3991 (80)	
Solar gains	106.6612	208.6520	343.6201	501.1494	614.1774	628.7199	598.5670	514.1602	399.6444	247.5832	132.9940	87.7130 (83)	
Total gains	727.0302	845.2652	951.7042	1087.2403	1168.5974	1159.3052	1107.3153	1023.6724	925.8025	795.4543	716.4564	694.2323 (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	47.1793	47.3293	47.4772	48.1847	48.3195	48.9566	48.9566	49.0765	48.7092	48.3195	48.0477	47.7668
alpha	4.1453	4.1553	4.1651	4.2123	4.2213	4.2638	4.2638	4.2718	4.2473	4.2213	4.2032	4.1845
util living area	0.9950	0.9901	0.9783	0.9393	0.8498	0.6881	0.5294	0.5867	0.8234	0.9632	0.9907	0.9959 (86)
MIT	19.2623	19.4760	19.8175	20.2911	20.6761	20.9085	20.9766	20.9643	20.7940	20.2779	19.6970	19.2394 (87)
Th 2	19.8977	19.9008	19.9038	19.9181	19.9208	19.9333	19.9333	19.9356	19.9285	19.9208	19.9154	19.9097 (88)
util rest of house	0.9936	0.9873	0.9717	0.9202	0.8026	0.5991	0.4104	0.4657	0.7519	0.9479	0.9875	0.9947 (89)
MIT 2	17.8773	18.1517	18.5868	19.1843	19.6340	19.8755	19.9246	19.9209	19.7753	19.1807	18.4449	17.8561 (90)
Living area fraction									fLA =	Living area /	(4) =	0.1094 (91)
MIT	18.0289	18.2966	18.7215	19.3054	19.7480	19.9885	20.0397	20.0351	19.8868	19.3008	18.5819	18.0075 (92)
Temperature adjustment												0.0000
adjusted MIT	18.0289	18.2966	18.7215	19.3054	19.7480	19.9885	20.0397	20.0351	19.8868	19.3008	18.5819	18.0075 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9898	0.9811	0.9618	0.9064	0.7938	0.6041	0.4228	0.4777	0.7486	0.9358	0.9816	0.9915 (94)
Useful gains	719.6258	829.2823	915.3436	985.4605	927.6169	700.3673	468.2029	489.0448	693.0722	744.3703	703.2562	688.3455 (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	1970.1090	1916.3374	1742.7917	1462.0308	1127.6441	745.1863	475.6850	501.4681	804.3272	1219.1082	1617.8865	1957.0180 (97)
Space heating	930.3595	730.5010	615.6214	343.1307	148.8202	0.0000	0.0000	0.0000	0.0000	353.2050	658.5338	943.8924 (98a)
Space heating requirement - total per year (kWh/year)												4724.0640
Solar heating	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	930.3595	730.5010	615.6214	343.1307	148.8202	0.0000	0.0000	0.0000	0.0000	353.2050	658.5338	943.8924 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4724.0640
Space heating per m ²										(98c) / (4) =		40.4250 (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	930.3595	730.5010	615.6214	343.1307	148.8202	0.0000	0.0000	0.0000	0.0000	353.2050	658.5338	943.8924	(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)	1006.8826	790.5855	666.2569	371.3535	161.0608	0.0000	0.0000	0.0000	0.0000	382.2565	712.6989	1021.5285	(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	250.7249	221.6578	235.5887	207.7190	201.6763	182.1018	180.1373	187.1762	189.0723	210.3497	223.0233	248.0938	(64)
Efficiency of water heater	86.9238	86.7375	86.3407	85.4491	83.7396	80.3000	80.3000	80.3000	80.3000	85.4828	86.5548	86.9615	(216)
Fuel for water heating, kWh/month	288.4423	255.5502	272.8592	243.0910	240.8375	226.7768	224.3304	233.0961	235.4574	246.0725	257.6670	285.2914	(217)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	31.0495	24.9091	22.4279	16.4316	12.6922	10.3697	11.5783	15.0499	19.5483	25.6485	28.9699	31.9125	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-58.9114	-80.6990	-112.7154	-122.9861	-129.4820	-119.6735	-118.1044	-112.9565	-103.5086	-90.4027	-63.8876	-51.2057	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-40.8150	-84.8795	-166.9708	-248.3517	-326.1293	-326.9464	-323.1727	-274.7107	-202.7538	-120.6481	-54.2394	-32.3571	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

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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	(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	(235d)
Annual totals kWh/year										
Space heating fuel - main system 1									5112.6233	(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									3009.4719	(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)									250.5874	(232)
Energy saving/generation technologies (Appendices M ,N and Q)										
PV generation									-3366.5074	(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									5092.1752	(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	5112.6233	0.2100	1073.6509 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3009.4719	0.2100	631.9891 (264)
Space and water heating			1705.6400 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	250.5874	0.1443	36.1675 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1164.5328	0.1352	-157.4764
PV Unit electricity exported	-2201.9746	0.1262	-277.8447
Total			-435.3211 (269)
Total CO2, kg/year			1318.4157 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.2800 (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	5112.6233	1.1300	5777.2644 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3009.4719	1.1300	3400.7032 (278)
Space and water heating			9177.9676 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	250.5874	1.5338	384.3593 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1164.5328	1.4998	-1746.5804
PV Unit electricity exported	-2201.9746	0.4632	-1019.9084
Total			-2766.4888 (283)
Total Primary energy kWh/year			6925.9388 (286)
Target Primary Energy Rate (TPER)			59.2700 (287)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024
Assessment Reference	Plot 23		Prop Type Ref	SAP VG 21-0282		
Property						
SAP Rating	95 A	DER	11.21	TER	11.28	
Environmental	90 B	% DER < TER				0.62
CO ₂ Emissions (t/year)	1.26	DFEE	42.59	TFEE	45.53	
Compliance Check	See BREL	% DFEE < TFEE				6.45
% DPER < TPER	0.40	DPER	59.03	TPER	59.27	
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	48.7500 (1b)	x 2.6200 (2b)	= 127.7250 (1b) - (3b)
First floor	68.1100 (1c)	x 2.3900 (2c)	= 162.7829 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	116.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 290.5079 (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	5 * 10 = 50.0000 (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) =	50.0000 / (5) = 0.1721 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3721 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3721 (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	0.4744	0.4651	0.4558	0.4093	0.4000	0.3535	0.3535	0.3442	0.3721	0.4000	0.4186	0.4372 (22b)
Effective ac	0.6125	0.6082	0.6039	0.5838	0.5800	0.5625	0.5625	0.5592	0.5692	0.5800	0.5876	0.5956 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.30)			17.7700	1.2357	21.9591		(27)
Door			2.1400	1.3000	2.7820		(26a)
Ground Floor			48.7500	0.1300	6.3375	75.0000	3656.2500 (28a)
Exposed Floor			19.3600	0.2000	3.8720	20.0000	387.2000 (28b)
External Wall	147.9800	19.9100	128.0700	0.1900	24.3333	110.0000	14087.7000 (29a)
Garage Wall	22.2000		22.2000	0.1700	3.7740	110.0000	2442.0000 (29a)
Plane Roof	68.1100		68.1100	0.0900	6.1299	9.0000	612.9900 (30)
Total net area of external elements Aum(A, m ²)			306.4000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	69.1878		(33)
Studs			207.8400			9.0000	1870.5600 (32c)
Internal Floor 1			48.7500			18.0000	877.5000 (32d)
Internal Ceiling 1			48.7500			9.0000	438.7500 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	24372.9500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							208.5654 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				13.6900	0.0240	0.3286	
E3 Sill				10.8600	0.0210	0.2281	

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 58.7235	Feb 58.3046	Mar 57.8939	Apr 55.9649	May 55.6040	Jun 53.9239	Jul 53.9239	Aug 53.6128	Sep 54.5711	Oct 55.6040	Nov 56.3341	Dec 57.0974 (38)
Heat transfer coeff	140.6173	140.1983	139.7876	137.8586	137.4977	135.8177	135.8177	135.5066	136.4648	137.4977	138.2278	138.9911 (39)
Average = Sum(39)m / 12 =												137.8569
HLP	Jan 1.2033	Feb 1.1997	Mar 1.1962	Apr 1.1797	May 1.1766	Jun 1.1622	Jul 1.1622	Aug 1.1596	Sep 1.1678	Oct 1.1766	Nov 1.1828	Dec 1.1894 (40)
HLP (average)												1.1797
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

Assumed occupancy													2.8503 (42)
Hot water usage for mixer showers	72.0103	70.9281	69.3512	66.3340	64.1074	61.6243	60.2129	61.7779	63.4934	66.1595	69.2415	71.7344 (42a)	
Hot water usage for baths	31.0900	30.6283	29.9781	28.7792	27.8815	26.8861	26.3484	26.9941	27.6971	28.7622	29.9858	30.9849 (42b)	
Hot water usage for other uses	43.8201	42.2267	40.6332	39.0398	37.4463	35.8528	35.8528	37.4463	39.0398	40.6332	42.2267	43.8201 (42c)	
Average daily hot water use (litres/day)												135.0529 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	146.9205	143.7831	139.9625	134.1530	129.4352	124.3632	122.4141	126.2183	130.2303	135.5550	141.4540	146.5395 (44)	
Distribution loss (46)m = 0.15 x (45)m	232.6861	204.7452	215.1171	183.6487	174.2446	152.9191	148.0493	156.2846	160.5870	183.9468	201.5271	229.4454 (45)	
Total = Sum(45)m =												2243.2009	
Water storage loss:	34.9029	30.7118	32.2676	27.5473	26.1367	22.9379	22.2074	23.4427	24.0880	27.5920	30.2291	34.4168 (46)	
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)	
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)	
Combi loss	19.5381	17.5925	19.3606	18.4884	18.9478	18.1780	18.6832	18.7664	18.2554	19.0458	18.6689	19.5053 (61)	
Total heat required for water heating calculated for each month	252.2242	222.3377	234.4777	202.1370	193.1924	171.0971	166.7325	175.0510	178.8424	202.9926	220.1961	248.9507 (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	252.2242	222.3377	234.4777	202.1370	193.1924	171.0971	166.7325	175.0510	178.8424	202.9926	220.1961	248.9507 (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	82.2526	72.4759	76.3666	65.6853	62.6733	55.3901	53.8972	56.6562	57.9590	65.9238	71.6750	81.1669 (65)	

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	171.0192	171.0192	171.0192	171.0192	171.0192	171.0192	171.0192	171.0192	171.0192	171.0192	171.0192	171.0192 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.7482	30.8630	25.0995	19.0019	14.2042	11.9918	12.9575	16.8427	22.6062	28.7038	33.5015	35.7139 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	419.5031	423.8563	412.8865	389.5332	360.0539	332.3475	313.8379	309.4848	320.4545	343.8078	373.2871	400.9936 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.9522	54.9522	54.9522	54.9522	54.9522	54.9522	54.9522	54.9522	54.9522	54.9522	54.9522	54.9522 (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)	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128 (71)
Water heating gains (Table 5)	110.5546	107.8511	102.6433	91.2295	84.2383	76.9307	72.4425	76.1508	80.4986	88.6072	99.5486	109.0953 (72)
Total internal gains	679.7646	677.5290	655.5879	614.7234	573.4550	533.2286	511.1965	514.4369	535.5180	576.0774	621.2959	660.7615 (73)

[Jan]						Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East						9.5400	19.6403	0.7300	0.7000	0.7700	66.3514 (76)	
West						8.2300	19.6403	0.7300	0.7000	0.7700	57.2402 (80)	
Solar gains	123.5916	241.7713	398.1630	580.6970	711.6659	728.5167	693.5776	595.7729	463.0800	286.8821	154.1042	101.6357 (83)
Total gains	803.3562	919.3003	1053.7509	1195.4203	1285.1209	1261.7453	1204.7741	1110.2098	998.5980	862.9595	775.4001	762.3972 (84)

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Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	48.1467	48.2906	48.4325	49.1102	49.2391	49.8482	49.8482	49.9626	49.6118	49.2391	48.9790	48.7100
alpha	4.2098	4.2194	4.2288	4.2740	4.2826	4.3232	4.3232	4.3308	4.3075	4.2826	4.2653	4.2473
util living area	0.9928	0.9865	0.9688	0.9176	0.8087	0.6393	0.4837	0.5403	0.7870	0.9510	0.9875	0.9942 (86)
MIT	19.7124	19.8687	20.1380	20.4782	20.7393	20.8791	20.9167	20.9100	20.8054	20.4481	20.0188	19.6889 (87)
Th 2	19.9174	19.9202	19.9230	19.9363	19.9388	19.9503	19.9503	19.9525	19.9459	19.9388	19.9337	19.9285 (88)
util rest of house	0.9908	0.9827	0.9598	0.8938	0.7564	0.5522	0.3742	0.4269	0.7112	0.9319	0.9833	0.9925 (89)
MIT 2	18.4165	18.6173	18.9590	19.3861	19.6837	19.8282	19.8543	19.8534	19.7651	19.3613	18.8202	18.3949 (90)
Living area fraction									fLA = Living area / (4) =			0.1094 (91)
MIT	18.5583	18.7543	19.0880	19.5057	19.7992	19.9432	19.9706	19.9690	19.8790	19.4803	18.9513	18.5365 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.4083	18.6043	18.9380	19.3557	19.6492	19.7932	19.8206	19.8190	19.7290	19.3303	18.8013	18.3865 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9866	0.9762	0.9489	0.8777	0.7400	0.5381	0.3602	0.4117	0.6929	0.9171	0.9769	0.9891 (94)
Useful gains	792.6258	897.4578	999.8805	1049.2471	950.9315	678.9722	433.9069	457.1122	691.9726	791.4244	757.4836	754.0781 (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	1983.8703	1921.3151	1738.6805	1441.4020	1093.0018	705.3343	437.4119	463.3025	768.1597	1200.3915	1617.4513	1971.7959 (97)
Space heating kWh	886.2859	688.0321	549.6672	282.3515	105.7003	0.0000	0.0000	0.0000	0.0000	304.2715	619.1768	905.9821 (98a)
Space heating requirement - total per year (kWh/year)												4341.4674
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	886.2859	688.0321	549.6672	282.3515	105.7003	0.0000	0.0000	0.0000	0.0000	304.2715	619.1768	905.9821 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4341.4674
Space heating per m2										(98c) / (4) =		37.1510 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												88.5000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	886.2859	688.0321	549.6672	282.3515	105.7003	0.0000	0.0000	0.0000	0.0000	304.2715	619.1768	905.9821 (98)
Space heating efficiency (main heating system 1)	88.5000	88.5000	88.5000	88.5000	88.5000	0.0000	0.0000	0.0000	0.0000	88.5000	88.5000	88.5000 (210)
Space heating fuel (main heating system)	1001.4530	777.4374	621.0929	319.0413	119.4354	0.0000	0.0000	0.0000	0.0000	343.8096	699.6348	1023.7085 (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	252.2242	222.3377	234.4777	202.1370	193.1924	171.0971	166.7325	175.0510	178.8424	202.9926	220.1961	248.9507 (64)
Efficiency of water heater (217)m	88.1632	88.1289	88.0461	87.8679	87.5246	87.0000	87.0000	87.0000	87.0000	87.8936	88.1015	87.0000 (216)
Fuel for water heating, kWh/month	286.0877	252.2870	266.3126	230.0464	220.7293	196.6633	191.6466	201.2081	205.5660	230.9527	249.9345	282.3457 (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	30.4149	24.3999	21.9694	16.0958	12.4328	10.1577	11.3416	14.7423	19.1488	25.1242	28.3778	31.2602 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-45.1745	-68.1685	-104.7446	-121.7647	-131.4539	-122.2750	-120.2696	-113.2716	-99.5228	-79.8968	-50.7320	-38.1766 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-24.9817	-59.9410	-140.3300	-241.6984	-345.0408	-356.7338	-348.0083	-278.1023	-182.0197	-91.4181	-34.7193	-18.9914 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												4905.6129 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												87.0000
Water heating fuel used												2813.7797 (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)												245.4655 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-3217.4354 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)

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Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4833.4226 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4905.6129	3.6400	178.5643 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2813.7797	3.6400	102.4216 (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	245.4655	16.4900	40.4773 (250)
Additional standing charges			92.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1095.4506	16.4900	-180.6398
PV Unit electricity exported	-2121.9848	5.5900	-118.6190
Total			-299.2588 (252)
Total energy cost			128.3858 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	0.2855 (257)
SAP value	95.3713
SAP rating (Section 12)	95 (258)
SAP band	A

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4905.6129	0.2100	1030.1787 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2813.7797	0.2100	590.8937 (264)
Space and water heating			1621.0724 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	245.4655	0.1443	35.4283 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1095.4506	0.1339	-146.6610
PV Unit electricity exported	-2121.9848	0.1227	-260.2739
Total			-406.9349 (269)
Total CO2, kg/year			1261.4951 (272)
CO2 emissions per m2			10.7900 (273)
EI value			89.5564
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	48.7500 (1b)	x 2.6200 (2b)	= 127.7250 (1b) - (3b)
First floor	68.1100 (1c)	x 2.3900 (2c)	= 162.7829 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	116.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 290.5079 (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	5 * 10 = 50.0000 (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	50.0000 / (5) = 0.1721 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3721 (18)
Number of sides sheltered	0 (19)

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Shelter factor
Infiltration rate adjusted to include shelter factor

$$(20) = 1 - [0.075 \times (19)] = 1.0000 \quad (20)$$
$$(21) = (18) \times (20) = 0.3721 \quad (21)$$

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4744	0.4651	0.4558	0.4093	0.4000	0.3535	0.3535	0.3442	0.3721	0.4000	0.4186	0.4372	(22b)
Effective ac	0.6125	0.6082	0.6039	0.5838	0.5800	0.5625	0.5625	0.5592	0.5692	0.5800	0.5876	0.5956	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Windows (Uw = 1.30)			17.7700	1.2357	21.9591			(27)
Door			2.1400	1.3000	2.7820			(26a)
Ground Floor			48.7500	0.1300	6.3375	75.0000	3656.2500	(28a)
Exposed Floor			19.3600	0.2000	3.8720	20.0000	387.2000	(28b)
External Wall	147.9800	19.9100	128.0700	0.1900	24.3333	110.0000	14087.7000	(29a)
Garage Wall	22.2000		22.2000	0.1700	3.7740	110.0000	2442.0000	(29a)
Plane Roof	68.1100		68.1100	0.0900	6.1299	9.0000	612.9900	(30)
Total net area of external elements Aum(A, m2)			306.4000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	69.1878			(33)
Studs			207.8400			9.0000	1870.5600	(32c)
Internal Floor 1			48.7500			18.0000	877.5000	(32d)
Internal Ceiling 1			48.7500			9.0000	438.7500	(32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
(28)...(30) + (32) + (32a)...(32e) = 24372.9500 (34)

List of Thermal Bridges
Total fabric heat loss
(33) + (36) + (36a) = 81.8937 (37)

	Length	Psi-value	Total	
K1 Element	13.6900	0.0240	0.3286	
E2 Other lintels (including other steel lintels)	10.8600	0.0210	0.2281	
E3 Sill	31.2000	0.0160	0.4992	
E4 Jamb	33.9000	0.0920	3.1188	
E5 Ground floor (normal)	14.8000	0.0580	0.8584	
E10 Eaves (insulation at ceiling level)	27.5000	0.0470	1.2925	
E16 Corner (normal)	24.6500	0.0010	0.0246	
E6 Intermediate floor within a dwelling	19.1000	0.0570	1.0887	
E12 Gable (insulation at ceiling level)	7.4200	-0.0880	-0.6530	
E17 Corner (inverted - internal area greater than external area)	9.2500	0.3200	2.9600	
E20 Exposed floor (normal)	9.2500	0.3200	2.9600	
E21 Exposed floor (inverted)				

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Point Thermal bridges
Total fabric heat loss
(33) + (36) + (36a) = 81.8937 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	58.7235	58.3046	57.8939	55.9649	55.6040	53.9239	53.9239	53.6128	54.5711	55.6040	56.3341	57.0974	(38)
Heat transfer coeff	140.6173	140.1983	139.7876	137.8586	137.4977	135.8177	135.8177	135.5066	136.4648	137.4977	138.2278	138.9911	(39)
Average = Sum(39)m / 12 =												137.8569	

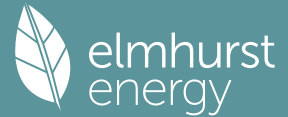
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2033	1.1997	1.1962	1.1797	1.1766	1.1622	1.1622	1.1596	1.1678	1.1766	1.1828	1.1894	(40)
HLP (average)												1.1797	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8503 (42)
Hot water usage for mixer showers													
72.0103	70.9281	69.3512	66.3340	64.1074	61.6243	60.2129	61.7779	63.4934	66.1595	69.2415	71.7344	(42a)	
Hot water usage for baths													
31.0900	30.6283	29.9781	28.7792	27.8815	26.8861	26.3484	26.9941	27.6971	28.7622	29.9858	30.9849	(42b)	
Hot water usage for other uses													
43.8201	42.2267	40.6332	39.0398	37.4463	35.8528	35.8528	37.4463	39.0398	40.6332	42.2267	43.8201	(42c)	
Average daily hot water use (litres/day)												135.0529 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	146.9205	143.7831	139.9625	134.1530	129.4352	124.3632	122.4141	126.2183	130.2303	135.5550	141.4540	146.5395	(44)
Energy conte	232.6861	204.7452	215.1171	183.6487	174.2446	152.9191	148.0493	156.2846	160.5870	183.9468	201.5271	229.4454	(45)
Energy content (annual)										Total = Sum(45)m =		2243.2009	
Distribution loss (46)m = 0.15 x (45)m													
34.9029	30.7118	32.2676		27.5473	26.1367	22.9379	22.2074	23.4427	24.0880	27.5920	30.2291	34.4168	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	19.5381	17.5925	19.3606	18.4884	18.9478	18.1780	18.6832	18.7664	18.2554	19.0458	18.6689	19.5053	(61)
Total heat required for water heating calculated for each month													
252.2242	222.3377	234.4777	202.1370	193.1924	171.0971	166.7325	175.0510	178.8424	202.9926	220.1961	248.9507	(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	252.2242	222.3377	234.4777	202.1370	193.1924	171.0971	166.7325	175.0510	178.8424	202.9926	220.1961	248.9507	(64)
	Total per year (kWh/year) = Sum(64)m =											2468.2315 (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													
82.2526	72.4759	76.3666	65.6853	62.6733	55.3901	53.8972	56.6562	57.9590	65.9238	71.6750	81.1669	(65)	

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

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Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	171.0192	171.0192	171.0192	171.0192	171.0192	171.0192	171.0192	171.0192	171.0192	171.0192	171.0192	171.0192 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.7482	30.8630	25.0995	19.0019	14.2042	11.9918	12.9575	16.8427	22.6062	28.7038	33.5015	35.7139 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	419.5031	423.8563	412.8865	389.5332	360.0539	332.3475	313.8379	309.4848	320.4545	343.8078	373.2871	400.9936 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.9522	54.9522	54.9522	54.9522	54.9522	54.9522	54.9522	54.9522	54.9522	54.9522	54.9522	54.9522 (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)	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128 (71)
Water heating gains (Table 5)	110.5546	107.8511	102.6433	91.2295	84.2383	76.9307	72.4425	76.1508	80.4986	88.6072	99.5486	109.0953 (72)
Total internal gains	679.7646	677.5290	655.5879	614.7234	573.4550	533.2286	511.1965	514.4369	535.5180	576.0774	621.2959	660.7615 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
East					9.5400	19.6403	0.7300	0.7000	0.7700		66.3514 (76)	
West					8.2300	19.6403	0.7300	0.7000	0.7700		57.2402 (80)	
Solar gains	123.5916	241.7713	398.1630	580.6970	711.6659	728.5167	693.5776	595.7729	463.0800	286.8821	154.1042	101.6357 (83)
Total gains	803.3562	919.3003	1053.7509	1195.4203	1285.1209	1261.7453	1204.7741	1110.2098	998.5980	862.9595	775.4001	762.3972 (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	48.1467	48.2906	48.4325	49.1102	49.2391	49.8482	49.8482	49.9626	49.6118	49.2391	48.9790	48.7100
alpha	4.2098	4.2194	4.2288	4.2740	4.2826	4.3232	4.3232	4.3308	4.3075	4.2826	4.2653	4.2473
util living area	0.9928	0.9865	0.9688	0.9176	0.8087	0.6393	0.4837	0.5403	0.7870	0.9510	0.9875	0.9942 (86)
MIT	19.7124	19.8687	20.1380	20.4782	20.7393	20.8791	20.9167	20.9100	20.8054	20.4481	20.0188	19.6889 (87)
Th 2	19.9174	19.9202	19.9230	19.9363	19.9388	19.9503	19.9503	19.9525	19.9459	19.9388	19.9337	19.9285 (88)
util rest of house	0.9908	0.9827	0.9598	0.8938	0.7564	0.5522	0.3742	0.4269	0.7112	0.9319	0.9833	0.9925 (89)
MIT 2	18.4165	18.6173	18.9590	19.3861	19.6837	19.8282	19.8543	19.8534	19.7651	19.3613	18.8202	18.3949 (90)
Living area fraction									fLA = Living area / (4) =			0.1094 (91)
MIT	18.5583	18.7543	19.0880	19.5057	19.7992	19.9432	19.9706	19.9690	19.8790	19.4803	18.9513	18.5365 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.4083	18.6043	18.9380	19.3557	19.6492	19.7932	19.8206	19.8190	19.7290	19.3303	18.8013	18.3865 (93)

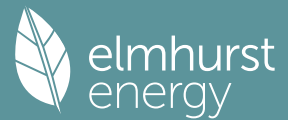
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9866	0.9762	0.9489	0.8777	0.7400	0.5381	0.3602	0.4117	0.6929	0.9171	0.9769	0.9891 (94)
Useful gains	792.6258	897.4578	999.8805	1049.2471	950.9315	678.9722	433.9069	457.1122	691.9726	791.4244	757.4836	754.0781 (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	1983.8703	1921.3151	1738.6805	1441.4020	1093.0018	705.3343	437.4119	463.3025	768.1597	1200.3915	1617.4513	1971.7959 (97)
Space heating kWh	886.2859	688.0321	549.6672	282.3515	105.7003	0.0000	0.0000	0.0000	0.0000	304.2715	619.1768	905.9821 (98a)
Space heating requirement - total per year (kWh/year)												4341.4674
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	886.2859	688.0321	549.6672	282.3515	105.7003	0.0000	0.0000	0.0000	0.0000	304.2715	619.1768	905.9821 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4341.4674
Space heating per m ²										(98c) / (4) =		37.1510 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												88.5000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	886.2859	688.0321	549.6672	282.3515	105.7003	0.0000	0.0000	0.0000	0.0000	304.2715	619.1768	905.9821 (98)
Space heating efficiency (main heating system 1)	88.5000	88.5000	88.5000	88.5000	88.5000	0.0000	0.0000	0.0000	0.0000	88.5000	88.5000	88.5000 (210)
Space heating fuel (main heating system)	1001.4530	777.4374	621.0929	319.0413	119.4354	0.0000	0.0000	0.0000	0.0000	343.8096	699.6348	1023.7085 (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	252.2242	222.3377	234.4777	202.1370	193.1924	171.0971	166.7325	175.0510	178.8424	202.9926	220.1961	248.9507 (64)
Efficiency of water heater	88.1632	88.1289	88.0461	87.8679	87.5246	87.0000	87.0000	87.0000	87.0000	87.8936	88.1015	87.0000 (216)
Fuel for water heating, kWh/month												88.1723 (217)

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	286.0877	252.2870	266.3126	230.0464	220.7293	196.6633	191.6466	201.2081	205.5660	230.9527	249.9345	282.3457	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	30.4149	24.3999	21.9694	16.0958	12.4328	10.1577	11.3416	14.7423	19.1488	25.1242	28.3778	31.2602	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-45.1745	-68.1685	-104.7446	-121.7647	-131.4539	-122.2750	-120.2696	-113.2716	-99.5228	-79.8968	-50.7320	-38.1766	(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	-24.9817	-59.9410	-140.3300	-241.6984	-345.0408	-356.7338	-348.0083	-278.1023	-182.0197	-91.4181	-34.7193	-18.9914	(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												4905.6129	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.0000	
Water heating fuel used												2813.7797	(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)												245.4655	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3217.4354	(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												4833.4226	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4905.6129	5.6000	274.7143	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2813.7797	5.6000	157.5717	(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	245.4655	26.0600	63.9683	(250)
Additional standing charges			99.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1095.4506	26.0600	-285.4744	
PV Unit electricity exported	-2121.9848	5.8100	-123.2873	
Total			-408.7617	(252)
Total energy cost			208.9041	(255)

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

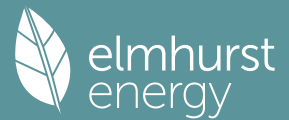
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4905.6129	0.2100	1030.1787	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2813.7797	0.2100	590.8937	(264)
Space and water heating			1621.0724	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	245.4655	0.1443	35.4283	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1095.4506	0.1339	-146.6610	
PV Unit electricity exported	-2121.9848	0.1227	-260.2739	
Total			-406.9349	(269)
Total CO2, kg/year			1261.4951	(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	4905.6129	1.1300	5543.3425	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2813.7797	1.1300	3179.5710	(278)
Space and water heating			8722.9135	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	245.4655	1.5338	376.5031	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1095.4506	1.4948	-1637.4537	
PV Unit electricity exported	-2121.9848	0.4501	-955.0621	
Total			-2592.5158	(283)
Total Primary energy kWh/year			6637.0017	(286)

SAP 10 EPC IMPROVEMENTS

Full SAP Calculation Printout



Plot 23

Current energy efficiency rating: A 95
Current environmental impact rating: B 90

N Solar water heating SAP increase too small
U Solar photovoltaic panels Already installed
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Measures omitted - SAP change or cost saving too small:
N Solar water heating + 0.5 -£ 21 -136 kg (10.8%)

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

Potential energy efficiency rating: A 95
Potential environmental impact rating: B 90

Fuel prices for cost data on this page from database revision number 554 TEST (31 Oct 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, East Pennines):

	Current	Potential	Saving
Electricity	£86	£86	£0
Mains gas	£531	£531	£0
Space heating	£396	£396	£0
Water heating	£158	£158	£0
Lighting	£64	£64	£0
Generated (PV)	-£409	-£409	£0
Total cost of fuels	£208	£208	£0
Total cost of uses	£209	£209	£0
Delivered energy	41 kWh/m²	41 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.3 tonnes	1.3 tonnes	0.0 tonnes
CO2 emissions per m²	11 kg/m²	11 kg/m²	0 kg/m²
Primary energy	57 kWh/m²	57 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	48.7500 (1b)	x 2.6200 (2b)	= 127.7250 (1b) - (3b)
First floor	68.1100 (1c)	x 2.3900 (2c)	= 162.7829 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	116.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 290.5079 (5)

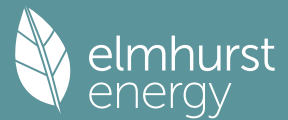
2. Ventilation rate

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	5 * 10 =	50.0000 (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) =	50.0000 / (5) =	0.1721 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	(17)
Infiltration rate	0.3721	(18)
Number of sides sheltered	0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3721 (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	0.4744	0.4651	0.4558	0.4093	0.4000	0.3535	0.3535	0.3442	0.3721	0.4000	0.4186	0.4372 (22b)
Effective ac	0.6125	0.6082	0.6039	0.5838	0.5800	0.5625	0.5625	0.5592	0.5692	0.5800	0.5876	0.5956 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Windows (Uw = 1.30)			17.7700	1.2357	21.9591			(27)
Door			2.1400	1.3000	2.7820			(26a)
Ground Floor			48.7500	0.1300	6.3375	75.0000	3656.2500	(28a)
Exposed Floor			19.3600	0.2000	3.8720	20.0000	387.2000	(28b)
External Wall	147.9800	19.9100	128.0700	0.1900	24.3333	110.0000	14087.7000	(29a)
Garage Wall	22.2000		22.2000	0.1700	3.7740	110.0000	2442.0000	(29a)
Plane Roof	68.1100		68.1100	0.0900	6.1299	9.0000	612.9900	(30)
Total net area of external elements Aum(A, m2)			306.4000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	69.1878			(33)
Studs			207.8400			9.0000	1870.5600	(32c)
Internal Floor 1			48.7500			18.0000	877.5000	(32d)
Internal Ceiling 1			48.7500			9.0000	438.7500	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 24372.9500 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5654 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	13.6900	0.0240	0.3286
E3 Sill	10.8600	0.0210	0.2281
E4 Jamb	31.2000	0.0160	0.4992
E5 Ground floor (normal)	33.9000	0.0920	3.1188
E10 Eaves (insulation at ceiling level)	14.8000	0.0580	0.8584
E16 Corner (normal)	27.5000	0.0470	1.2925
E6 Intermediate floor within a dwelling	24.6500	0.0010	0.0246
E12 Gable (insulation at ceiling level)	19.1000	0.0570	1.0887
E17 Corner (inverted - internal area greater than external area)	7.4200	-0.0880	-0.6530
E20 Exposed floor (normal)	9.2500	0.3200	2.9600
E21 Exposed floor (inverted)	9.2500	0.3200	2.9600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.7059 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 81.8937 (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	58.7235	58.3046	57.8939	55.9649	55.6040	53.9239	53.9239	53.6128	54.5711	55.6040	56.3341	57.0974
Heat transfer coeff	140.6173	140.1983	139.7876	137.8586	137.4977	135.8177	135.8177	135.5066	136.4648	137.4977	138.2278	138.9911
Average = Sum(39)m / 12 =												137.8569

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2033	1.1997	1.1962	1.1797	1.1766	1.1622	1.1622	1.1596	1.1678	1.1766	1.1828	1.1894
HLP (average)												1.1797
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

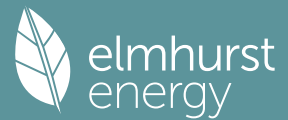
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8503 (42)
Hot water usage for mixer showers													
72.0103	70.9281	69.3512	66.3340	64.1074	61.6243	60.2129	61.7779	63.4934	66.1595	69.2415	71.7344	71.7344	(42a)
Hot water usage for baths													
31.0900	30.6283	29.9781	28.7792	27.8815	26.8861	26.3484	26.9941	27.6971	28.7622	29.9858	30.9849	30.9849	(42b)
Hot water usage for other uses													
43.8201	42.2267	40.6332	39.0398	37.4463	35.8528	35.8528	37.4463	39.0398	40.6332	42.2267	43.8201	43.8201	(42c)
Average daily hot water use (litres/day)													135.0529 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	146.9205	143.7831	139.9625	134.1530	129.4352	124.3632	122.4141	126.2183	130.2303	135.5550	141.4540	146.5395	(44)
Energy conte	232.6861	204.7452	215.1171	183.6487	174.2446	152.9191	148.0493	156.2846	160.5870	183.9468	201.5271	229.4454	(45)
Energy content (annual)										Total =	Sum(45)m =	2243.2009	
Distribution loss (46)m = 0.15 x (45)m													
34.9029	30.7118	32.2676	27.5473	26.1367	22.9379	22.2074	23.4427	24.0880	27.5920	30.2291	34.4168	34.4168	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	19.5381	17.5925	19.3606	18.4884	18.9478	18.1780	18.6832	18.7664	18.2554	19.0458	18.6689	19.5053	(61)
Total heat required for water heating calculated for each month	252.2242	222.3377	234.4777	202.1370	193.1924	171.0971	166.7325	175.0510	178.8424	202.9926	220.1961	248.9507	(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	252.2242	222.3377	234.4777	202.1370	193.1924	171.0971	166.7325	175.0510	178.8424	202.9926	220.1961	248.9507	(64)
								Total per year (kWh/year) =	Sum(64)m =			2468.2315	(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	82.2526	72.4759	76.3666	65.6853	62.6733	55.3901	53.8972	56.6562	57.9590	65.9238	71.6750	81.1669	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	171.0192	171.0192	171.0192	171.0192	171.0192	171.0192	171.0192	171.0192	171.0192	171.0192	171.0192	171.0192	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
34.7482	30.8630	25.0995	19.0019	14.2042	11.9918	12.9575	16.8427	22.6062	28.7038	33.5015	35.7139	35.7139	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
419.5031	423.8563	412.8865	389.5332	360.0539	332.3475	313.8379	309.4848	320.4545	343.8078	373.2871	400.9936	400.9936	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
54.9522	54.9522	54.9522	54.9522	54.9522	54.9522	54.9522	54.9522	54.9522	54.9522	54.9522	54.9522	54.9522	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	(71)

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Water heating gains (Table 5)	110.5546	107.8511	102.6433	91.2295	84.2383	76.9307	72.4425	76.1508	80.4986	88.6072	99.5486	109.0953 (72)
Total internal gains	679.7646	677.5290	655.5879	614.7234	573.4550	533.2286	511.1965	514.4369	535.5180	576.0774	621.2959	660.7615 (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	
East	9.5400		19.6403		0.7300		0.7000		0.7700		66.3514 (76)	
West	8.2300		19.6403		0.7300		0.7000		0.7700		57.2402 (80)	
Solar gains	123.5916	241.7713	398.1630	580.6970	711.6659	728.5167	693.5776	595.7729	463.0800	286.8821	154.1042	101.6357 (83)
Total gains	803.3562	919.3003	1053.7509	1195.4203	1285.1209	1261.7453	1204.7741	1110.2098	998.5980	862.9595	775.4001	762.3972 (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	48.1467	48.2906	48.4325	49.1102	49.2391	49.8482	49.8482	49.9626	49.6118	49.2391	48.9790	48.7100	
alpha	4.2098	4.2194	4.2288	4.2740	4.2826	4.3232	4.3232	4.3308	4.3075	4.2826	4.2653	4.2473	
util living area	0.9928	0.9865	0.9688	0.9176	0.8087	0.6393	0.4837	0.5403	0.7870	0.9510	0.9875	0.9942 (86)	
MIT	19.7124	19.8687	20.1380	20.4782	20.7393	20.8791	20.9167	20.9100	20.8054	20.4481	20.0188	19.6889 (87)	
Th 2	19.9174	19.9202	19.9230	19.9363	19.9388	19.9503	19.9503	19.9525	19.9459	19.9388	19.9337	19.9285 (88)	
util rest of house	0.9908	0.9827	0.9598	0.8938	0.7564	0.5522	0.3742	0.4269	0.7112	0.9319	0.9833	0.9925 (89)	
MIT 2	18.4165	18.6173	18.9590	19.3861	19.6837	19.8282	19.8543	19.8534	19.7651	19.3613	18.8202	18.3949 (90)	
Living area fraction	fLA = Living area / (4) =												0.1094 (91)
MIT	18.5583	18.7543	19.0880	19.5057	19.7992	19.9432	19.9706	19.9690	19.8790	19.4803	18.9513	18.5365 (92)	
Temperature adjustment													-0.1500
adjusted MIT	18.4083	18.6043	18.9380	19.3557	19.6492	19.7932	19.8206	19.8190	19.7290	19.3303	18.8013	18.3865 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9866	0.9762	0.9489	0.8777	0.7400	0.5381	0.3602	0.4117	0.6929	0.9171	0.9769	0.9891 (94)
Useful gains	792.6258	897.4578	999.8805	1049.2471	950.9315	678.9722	433.9069	457.1122	691.9726	791.4244	757.4836	754.0781 (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	1983.8703	1921.3151	1738.6805	1441.4020	1093.0018	705.3343	437.4119	463.3025	768.1597	1200.3915	1617.4513	1971.7959 (97)
Space heating kWh	886.2859	688.0321	549.6672	282.3515	105.7003	0.0000	0.0000	0.0000	0.0000	304.2715	619.1768	905.9821 (98a)
Space heating requirement - total per year (kWh/year)	4341.4674											
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	886.2859	688.0321	549.6672	282.3515	105.7003	0.0000	0.0000	0.0000	0.0000	304.2715	619.1768	905.9821 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	4341.4674											
Space heating per m ²	(98c) / (4) = 37.1510 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												88.5000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	886.2859	688.0321	549.6672	282.3515	105.7003	0.0000	0.0000	0.0000	0.0000	304.2715	619.1768	905.9821 (98)
Space heating efficiency (main heating system 1)	88.5000	88.5000	88.5000	88.5000	88.5000	0.0000	0.0000	0.0000	0.0000	88.5000	88.5000	88.5000 (210)
Space heating fuel (main heating system)	1001.4530	777.4374	621.0929	319.0413	119.4354	0.0000	0.0000	0.0000	0.0000	343.8096	699.6348	1023.7085 (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	252.2242	222.3377	234.4777	202.1370	193.1924	171.0971	166.7325	175.0510	178.8424	202.9926	220.1961	248.9507 (64)
Efficiency of water heater	88.1632	88.1289	88.0461	87.8679	87.5246	87.0000	87.0000	87.0000	87.0000	87.8936	88.1015	88.1723 (217)
Fuel for water heating, kWh/month	286.0877	252.2870	266.3126	230.0464	220.7293	196.6633	191.6466	201.2081	205.5660	230.9527	249.9345	282.3457 (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	30.4149	24.3999	21.9694	16.0958	12.4348	10.1577	11.3416	14.7423	19.1488	25.1242	28.3778	31.2602 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-45.1745	-68.1685	-104.7446	-121.7647	-131.4539	-122.2750	-120.2696	-113.2716	-99.5228	-79.8968	-50.7320	-38.1766 (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)

Full SAP Calculation Printout



Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-24.9817	-59.9410	-140.3300	-241.6984	-345.0408	-356.7338	-348.0083	-278.1023	-182.0197	-91.4181	-34.7193	-18.9914	(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												4905.6129	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.0000	
Water heating fuel used												2813.7797	(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)												245.4655	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3217.4354	(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												4833.4226	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4905.6129	3.6400	178.5643 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2813.7797	3.6400	102.4216 (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	245.4655	16.4900	40.4773 (250)
Additional standing charges			92.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1095.4506	16.4900	-180.6398
PV Unit electricity exported	-2121.9848	5.5900	-118.6190
Total			-299.2588 (252)
Total energy cost			128.3858 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.2855 (257)
SAP value		95.3713
SAP rating (Section 12)		95 (258)
SAP band		A

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4905.6129	0.2100	1030.1787 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2813.7797	0.2100	590.8937 (264)
Space and water heating			1621.0724 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	245.4655	0.1443	35.4283 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1095.4506	0.1339	-146.6610
PV Unit electricity exported	-2121.9848	0.1227	-260.2739
Total			-406.9349 (269)
Total CO2, kg/year			1261.4951 (272)
CO2 emissions per m2			10.7900 (273)
EI value			89.5564
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	48.7500 (1b)	x 2.6200 (2b)	= 127.7250 (1b) - (3b)
First floor	68.1100 (1c)	x 2.3900 (2c)	= 162.7829 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	116.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	290.5079 (5)

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2. Ventilation rate

											m3 per hour	
Number of open chimneys											0 * 80 =	0.0000 (6a)
Number of open flues											0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire											0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler											0 * 20 =	0.0000 (6d)
Number of flues attached to other heater											0 * 35 =	0.0000 (6e)
Number of blocked chimneys											0 * 20 =	0.0000 (6f)
Number of intermittent extract fans											5 * 10 =	50.0000 (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) =										50.0000 / (5) =	0.1721 (8)
Pressure test											Yes	
Pressure Test Method											Blower Door	
Measured/design AP50											4.0000 (17)	
Infiltration rate											0.3721 (18)	
Number of sides sheltered											0 (19)	
Shelter factor											(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.3721 (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	0.4744	0.4651	0.4558	0.4093	0.4000	0.3535	0.3535	0.3442	0.3721	0.4000	0.4186	0.4372 (22b)
Effective ac	0.6125	0.6082	0.6039	0.5838	0.5800	0.5625	0.5625	0.5592	0.5692	0.5800	0.5876	0.5956 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Windows (Uw = 1.30)			17.7700	1.2357	21.9591			(27)					
Door			2.1400	1.3000	2.7820			(26a)					
Ground Floor			48.7500	0.1300	6.3375	75.0000	3656.2500	(28a)					
Exposed Floor			19.3600	0.2000	3.8720	20.0000	387.2000	(28b)					
External Wall	147.9800	19.9100	128.0700	0.1900	24.3333	110.0000	14087.7000	(29a)					
Garage Wall	22.2000		22.2000	0.1700	3.7740	110.0000	2442.0000	(29a)					
Plane Roof	68.1100		68.1100	0.0900	6.1299	9.0000	612.9900	(30)					
Total net area of external elements Aum(A, m2)			306.4000					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	69.1878			(33)					
Studs			207.8400			9.0000	1870.5600	(32c)					
Internal Floor 1			48.7500			18.0000	877.5000	(32d)					
Internal Ceiling 1			48.7500			9.0000	438.7500	(32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		24372.9500	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							208.5654	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
E2 Other lintels (including other steel lintels)				13.6900	0.0240	0.3286							
E3 Sill				10.8600	0.0210	0.2281							
E4 Jamb				31.2000	0.0160	0.4992							
E5 Ground floor (normal)				33.9000	0.0920	3.1188							
E10 Eaves (insulation at ceiling level)				14.8000	0.0580	0.8584							
E16 Corner (normal)				27.5000	0.0470	1.2925							
E6 Intermediate floor within a dwelling				24.6500	0.0010	0.0246							
E12 Gable (insulation at ceiling level)				19.1000	0.0570	1.0887							
E17 Corner (inverted - internal area greater than external area)				7.4200	-0.0880	-0.6530							
E20 Exposed floor (normal)				9.2500	0.3200	2.9600							
E21 Exposed floor (inverted)				9.2500	0.3200	2.9600							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.7059	(36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	81.8937	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 58.7235	Feb 58.3046	Mar 57.8939	Apr 55.9649	May 55.6040	Jun 53.9239	Jul 53.9239	Aug 53.6128	Sep 54.5711	Oct 55.6040	Nov 56.3341	Dec 57.0974	(38)
Heat transfer coeff	140.6173	140.1983	139.7876	137.8586	137.4977	135.8177	135.8177	135.5066	136.4648	137.4977	138.2278	138.9911	(39)
Average = Sum(39)m / 12 =												137.8569	
HLP	Jan 1.2033	Feb 1.1997	Mar 1.1962	Apr 1.1797	May 1.1766	Jun 1.1622	Jul 1.1622	Aug 1.1596	Sep 1.1678	Oct 1.1766	Nov 1.1828	Dec 1.1894	(40)
HLP (average)												1.1797	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8503 (42)
Hot water usage for mixer showers												
72.0103	70.9281	69.3512	66.3340	64.1074	61.6243	60.2129	61.7779	63.4934	66.1595	69.2415	71.7344 (42a)	
Hot water usage for baths												
31.0900	30.6283	29.9781	28.7792	27.8815	26.8861	26.3484	26.9941	27.6971	28.7622	29.9858	30.9849 (42b)	
Hot water usage for other uses												
43.8201	42.2267	40.6332	39.0398	37.4463	35.8528	35.8528	37.4463	39.0398	40.6332	42.2267	43.8201 (42c)	
Average daily hot water use (litres/day)												135.0529 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	146.9205	143.7831	139.9625	134.1530	129.4352	124.3632	122.4141	126.2183	130.2303	135.5550	141.4540	146.5395 (44)
Energy content	232.6861	204.7452	215.1171	183.6487	174.2446	152.9191	148.0493	156.2846	160.5870	183.9468	201.5271	229.4454 (45)
Energy content (annual)	Total = Sum(45)m =											2243.2009
Distribution loss (46)m = 0.15 x (45)m												
	34.9029	30.7118	32.2676	27.5473	26.1367	22.9379	22.2074	23.4427	24.0880	27.5920	30.2291	34.4168 (46)

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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 (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 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	19.5381	17.5925	19.3606	18.4884	18.9478	18.1780	18.6832	18.7664	18.2554	19.0458	18.6689 (61)
Total heat required for water heating calculated for each month											
	252.2242	222.3377	234.4777	202.1370	193.1924	171.0971	166.7325	175.0510	178.8424	202.9926	220.1961 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h											
	252.2242	222.3377	234.4777	202.1370	193.1924	171.0971	166.7325	175.0510	178.8424	202.9926	220.1961 (64)
Total per year (kWh/year) = Sum(64)m =										2468.2315	(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 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =										0.0000	(64a)
Heat gains from water heating, kWh/month											
	82.2526	72.4759	76.3666	65.6853	62.6733	55.3901	53.8972	56.6562	57.9590	65.9238	71.6750 (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	171.0192	171.0192	171.0192	171.0192	171.0192	171.0192	171.0192	171.0192	171.0192	171.0192	171.0192	171.0192 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	34.7482	30.8630	25.0995	19.0019	14.2042	11.9918	12.9575	16.8427	22.6062	28.7038	33.5015	35.7139 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	419.5031	423.8563	412.8865	389.5332	360.0539	332.3475	313.8379	309.4848	320.4545	343.8078	373.2871	400.9936 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.9522	54.9522	54.9522	54.9522	54.9522	54.9522	54.9522	54.9522	54.9522	54.9522	54.9522	54.9522 (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)	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128	-114.0128 (71)
Water heating gains (Table 5)	110.5546	107.8511	102.6433	91.2295	84.2383	76.9307	72.4425	76.1508	80.4986	88.6072	99.5486	109.0953 (72)
Total internal gains	679.7646	677.5290	655.5879	614.7234	573.4550	533.2286	511.1965	514.4369	535.5180	576.0774	621.2959	660.7615 (73)

6. Solar gains

[Jan]		Area	Solar flux									
		m2	Table 6a	g								
			W/m2	Specific data	or Table 6b	Specific data	or Table 6c		Access			
									factor			
									Table 6d			
East		9.5400	19.6403	0.7300		0.7000			0.7700		66.3514	(76)
West		8.2300	19.6403	0.7300		0.7000			0.7700		57.2402	(80)
Solar gains												
	123.5916	241.7713	398.1630	580.6970	711.6659	728.5167	693.5776	595.7729	463.0800	286.8821	154.1042	101.6357 (83)
Total gains												
	803.3562	919.3003	1053.7509	1195.4203	1285.1209	1261.7453	1204.7741	1110.2098	998.5980	862.9595	775.4001	762.3972 (84)

7. Mean internal temperature (heating season)

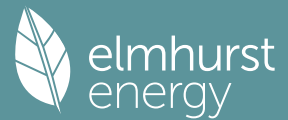
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	48.1467	48.2906	48.4325	49.1102	49.2391	49.8482	49.8482	49.9626	49.6118	49.2391	48.9790	48.7100
alpha	4.2098	4.2194	4.2288	4.2740	4.2826	4.3232	4.3232	4.3308	4.3075	4.2826	4.2653	4.2473
util living area												
	0.9928	0.9865	0.9688	0.9176	0.8087	0.6393	0.4837	0.5403	0.7870	0.9510	0.9875	0.9942 (86)
MIT	19.7124	19.8687	20.1380	20.4782	20.7393	20.8791	20.9167	20.9100	20.8054	20.4481	20.0188	19.6889 (87)
Th 2	19.9174	19.9202	19.9230	19.9363	19.9388	19.9503	19.9503	19.9525	19.9459	19.9388	19.9337	19.9285 (88)
util rest of house												
	0.9908	0.9827	0.9598	0.8938	0.7564	0.5522	0.3742	0.4269	0.7112	0.9319	0.9833	0.9925 (89)
MIT 2	18.4165	18.6173	18.9590	19.3861	19.6837	19.8282	19.8543	19.8534	19.7651	19.3613	18.8202	18.3949 (90)
Living area fraction												
	18.5583	18.7543	19.0880	19.5057	19.7992	19.9432	19.9706	19.9690	19.8790	19.4803	18.9513	18.5365 (92)
MIT												
	18.5583	18.7543	19.0880	19.5057	19.7992	19.9432	19.9706	19.9690	19.8790	19.4803	18.9513	18.5365 (92)
Temperature adjustment												
	18.4083	18.6043	18.9380	19.3557	19.6492	19.7932	19.8206	19.8190	19.7290	19.3303	18.8013	-0.1500 (93)
adjusted MIT												
	18.4083	18.6043	18.9380	19.3557	19.6492	19.7932	19.8206	19.8190	19.7290	19.3303	18.8013	18.3865 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9866	0.9762	0.9489	0.8777	0.7400	0.5381	0.3602	0.4117	0.6929	0.9171	0.9769	0.9891 (94)
Useful gains	792.6258	897.4578	999.8805	1049.2471	950.9315	678.9722	433.9069	457.1122	691.9726	791.4244	757.4836	754.0781 (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												
	1983.8703	1921.3151	1738.6805	1441.4020	1093.0018	705.3343	437.4119	463.3025	768.1597	1200.3915	1617.4513	1971.7959 (97)
Space heating kWh												
	886.2859	688.0321	549.6672	282.3515	105.7003	0.0000	0.0000	0.0000	0.0000	304.2715	619.1768	905.9821 (98a)
Space heating requirement - total per year (kWh/year)												4341.4674
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												
	886.2859	688.0321	549.6672	282.3515	105.7003	0.0000	0.0000	0.0000	0.0000	304.2715	619.1768	905.9821 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4341.4674
Space heating per m2										(98c) / (4) =		37.1510 (99)

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

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Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												88.5000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	886.2859	688.0321	549.6672	282.3515	105.7003	0.0000	0.0000	0.0000	0.0000	304.2715	619.1768	905.9821	(98)
Space heating efficiency (main heating system 1)	88.5000	88.5000	88.5000	88.5000	88.5000	0.0000	0.0000	0.0000	0.0000	88.5000	88.5000	88.5000	(210)
Space heating fuel (main heating system)	1001.4530	777.4374	621.0929	319.0413	119.4354	0.0000	0.0000	0.0000	0.0000	343.8096	699.6348	1023.7085	(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	252.2242	222.3377	234.4777	202.1370	193.1924	171.0971	166.7325	175.0510	178.8424	202.9926	220.1961	248.9507	(64)
Efficiency of water heater	88.1632	88.1289	88.0461	87.8679	87.5246	87.0000	87.0000	87.0000	87.0000	87.8936	88.1015	88.1723	(216)
Fuel for water heating, kWh/month	286.0877	252.2870	266.3126	230.0464	220.7293	196.6633	191.6466	201.2081	205.5660	230.9527	249.9345	282.3457	(217)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	30.4149	24.3999	21.9694	16.0958	12.4328	10.1577	11.3416	14.7423	19.1488	25.1242	28.3778	31.2602	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-45.1745	-68.1685	-104.7446	-121.7647	-131.4539	-122.2750	-120.2696	-113.2716	-99.5228	-79.8968	-50.7320	-38.1766	(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	-24.9817	-59.9410	-140.3300	-241.6984	-345.0408	-356.7338	-348.0083	-278.1023	-182.0197	-91.4181	-34.7193	-18.9914	(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												4905.6129	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.0000	
Water heating fuel used												2813.7797	(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)												245.4655	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3217.4354	(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												4833.4226	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4905.6129	5.6000	274.7143	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2813.7797	5.6000	157.5717	(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	245.4655	26.0600	63.9683	(250)
Additional standing charges			99.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1095.4506	26.0600	-285.4744	
PV Unit electricity exported	-2121.9848	5.8100	-123.2873	
Total			-408.7617	(252)
Total energy cost			208.9041	(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	4905.6129	0.2100	1030.1787	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2813.7797	0.2100	590.8937	(264)
Space and water heating			1621.0724	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	245.4655	0.1443	35.4283	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1095.4506	0.1339	-146.6610	
PV Unit electricity exported	-2121.9848	0.1227	-260.2739	
Total			-406.9349	(269)
Total CO2, kg/year			1261.4951	(272)

Full SAP Calculation Printout



----- 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	4905.6129	1.1300	5543.3425	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2813.7797	1.1300	3179.5710	(278)
Space and water heating			8722.9135	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	245.4655	1.5338	376.5031	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1095.4506	1.4948	-1637.4537	
PV Unit electricity exported	-2121.9848	0.4501	-955.0621	
Total			-2592.5158	(283)
Total Primary energy kWh/year			6637.0017	(286)

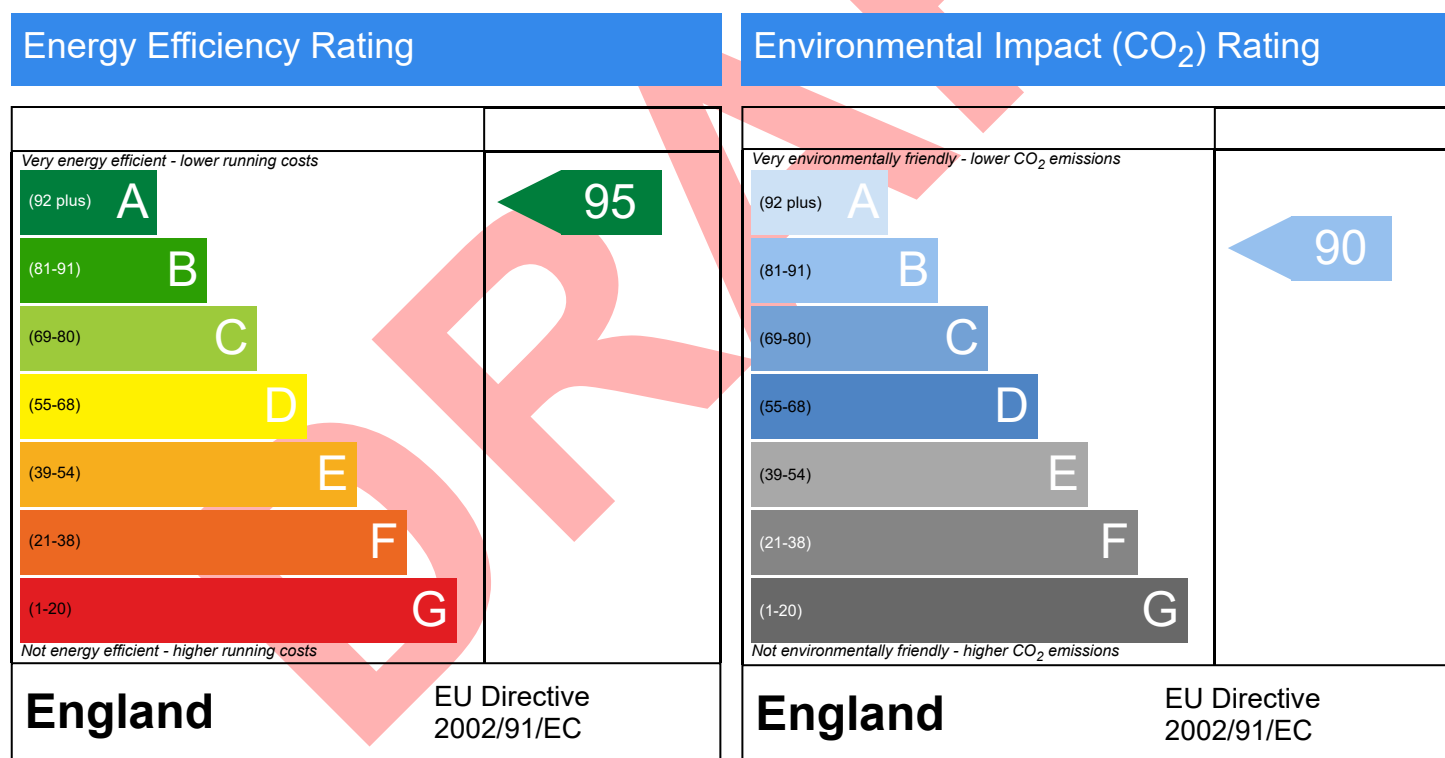
Predicted Energy Assessment



Dwelling type: House, Detached
Date of assessment: 15/11/2024
Produced by: Victoria Gartside
Total floor area: 136.22 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.