

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 10:34:57

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	88 m ²
Site Reference	SAP VG 21-0282	Plot Reference	Plot 33
Address			

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

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

1a Target emission rate and dwelling emission rate			
Fuel for main heating system	Mains gas		
Target carbon dioxide emission rate	12.62 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	12.56 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	66.05 kWh _{PE} /m ²		
Dwelling primary energy	65.87 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	43.4 kWh/m ²		
Dwelling fabric energy efficiency	40.3 kWh/m ²		OK

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.19	Walls (1) (0.19)	OK
Party walls	0.2	N/A	N/A	N/A
Curtain walls	1.6	N/A	N/A	N/A
Floors	0.18	0.13	Ground Floor (0.13)	OK
Roofs	0.16	0.09	Roof (1) (0.09)	OK
Windows, doors, and roof windows	1.6	1.3	Front (1.3)	OK
Rooflights	2.2	N/A	N/A	N/A

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))			
Name	Net area [m ²]	U-Value [W/m ² K]	
Exposed wall: Walls (1)	117.98	0.19	
Ground floor: Ground Floor, Ground Floor	44.21	0.13	
Exposed roof: Roof (1)	44.21	0.09 (!)	

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
Front , Windows	10.2	East	0.7	1.3
Rear , Windows	7.14	West	0.7	1.3
Front Door, Door	2.14	East	N/A	1.3
Side, Windows	0.71	North	0.7	1.3

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

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	West	
Pitch	45°	
Overshading	None or very little	
Manufacturer		
MCS certificate		
Technology type: Photovoltaic system (2)		
Peak power	0.5 kWp	
Orientation	East	
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 33	Prop Type Ref	SAP VG 21-0282	
Property				

SAP Rating	93 A	DER	12.56	TER	12.62
Environmental	89 B	% DER < TER			0.48
CO ₂ Emissions (t/year)	1.06	DFEE	40.27	TFEE	43.44
Compliance Check	See BREL	% DFEE < TFEE			7.30
% DPER < TPER	0.27	DPER	65.87	TPER	66.05

Assessor Details	Miss Victoria Gartside	Assessor ID	AL30-0001
Client			

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

Orientation	East	
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	221.08	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements	Ground floor:	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	1st Storey:	27.58 m	44.21 m ²	2.38 m
	2nd Storey:	27.58 m	44.21 m ²	2.68 m
		32.20 m	60.31 m ²	2.28 m

8.0 Living Area	14.14	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	138.17	117.98	0.00	None	20.19	Enter Gross Area

9.2 Internal Walls	Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
	Studs	Plasterboard on timber frame	9.00	156.06

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	44.21	44.21	None	0.00	Enter Gross Area	0.00

10.2 Internal Ceilings	Description	Storey	Construction	Area (m ²)
	Internal Ceiling 1	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	72.89

11.0 Heat Loss Floors	Description	Type	Storey Index	Construction	U-Value (W/m ² K)	Shelter Code	Shelter Factor	Kappa (kJ/m ² K)	Area (m ²)
	Ground Floor	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.13	None	0.00	75.00	44.21

Summary for Input Data

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1		Plasterboard ceiling, carpeted chipboard floor	9.00	44.21

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	East	10.20	0
Rear	Windows	External Wall	West	7.14	0
Front Door	Door	External Wall	East	2.14	0
Side	Windows	External Wall	North	0.71	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	14.37	0.02	0.02 MFF-150-E2-02	No
E3 Sill	Independently assessed	11.54	0.02	0.02 E3-01	No
E4 Jamb	Independently assessed	30.00	0.02	0.02 E4-01 RCD	No
E5 Ground floor (normal)	Independently assessed	27.58	0.09	0.09 Manufacturer Declaration	No
E10 Eaves (insulation at ceiling level)	Independently assessed	17.44	0.06	0.06 E10-01	No
E16 Corner (normal)	Independently assessed	20.04	0.05	0.05 E16-01 RCD	No
E6 Intermediate floor within a dwelling	Independently assessed	27.58	0.00	0.00 E6-01 RCD	No
E12 Gable (insulation at ceiling level)	Independently assessed	10.14	0.06	0.06 E12-01 RCD	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

21.0 Fixed Cooling System

22.0 Pressure Testing

Designed AP₅₀ m³/(h.m²) @ 50 Pa

Property Tested?

Test Method

Summary for Input Data

22.0 Lighting

No Fixed Lighting

No				
Name	Efficacy	Power	Capacity	Count
Lighting 1	85.00	10.00	850.00	22

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

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
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

Summary for Input Data

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

1.0 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	West	45°	None Or Little	No	No	1.00		
0.50	East	30°	None Or Little	No	No	1.00		

34.0 Small-scale Hydro

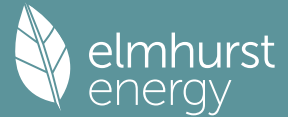
None	
Electricity Generated	0.00
Apportioned	0.00
Connected to dwelling's electricity meter	Yes
Electricity Generation	Annual

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



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Environmental	89 B	% DER < TER				0.48	
CO ₂ Emissions (t/year)	1.06	DFEE	40.27	TFEE	43.44		
Compliance Check	See BREL	% DFEE < TFEE				7.30	
% DPER < TPER	0.27	DPER	65.87	TPER	66.05		
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	44.2100 (1b)	x 2.3800 (2b)	= 105.2198 (1b) - (3b)
First floor	44.2100 (1c)	x 2.6800 (2c)	= 118.4828 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 223.7026 (5)

2. Ventilation rate

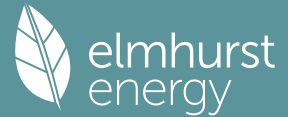
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	50.0000 / (5) = 0.2235 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.4235 (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) = 0.4235 (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	0.5400	0.5294	0.5188	0.4659	0.4553	0.4023	0.4023	0.3917	0.4235	0.4553	0.4764	0.4976 (22b)
Effective ac	0.6458	0.6401	0.6346	0.6085	0.6036	0.5809	0.5809	0.5767	0.5897	0.6036	0.6135	0.6238 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (U _w = 1.30)			18.0500	1.2357	22.3051		(27)
Door			2.1400	1.3000	2.7820		(26a)
Ground Floor			44.2100	0.1300	5.7473	75.0000	3315.7500 (28a)
External Wall	138.1700	20.1900	117.9800	0.1900	22.4162	110.0000	12977.8000 (29a)
Plane Roof	44.2100		44.2100	0.0900	3.9789	9.0000	397.8900 (30)
Total net area of external elements A _{um} (A, m ²)			226.5900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	57.2295		(33)
Studs			156.0600			9.0000	1404.5400 (32c)
Internal Floor 1			44.2100			18.0000	795.7800 (32d)
Internal Ceiling 1			72.8900			9.0000	656.0100 (32e)
Heat capacity C _m = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	19547.7700 (34)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							221.0786 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				14.3700	0.0240	0.3449	
E3 Sill				11.5400	0.0210	0.2423	
E4 Jamb				30.0000	0.0160	0.4800	
E5 Ground floor (normal)				27.5800	0.0920	2.5374	

Full SAP Calculation Printout



E10 Eaves (insulation at ceiling level)	17.4400	0.0580	1.0115										
E16 Corner (normal)	20.0400	0.0470	0.9419										
E6 Intermediate floor within a dwelling	27.5800	0.0010	0.0276										
E12 Gable (insulation at ceiling level)	10.1400	0.0570	0.5780										
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				6.1635 (36)									
Point Thermal bridges				0.0000									
Total fabric heat loss		(33) + (36) + (36a) =		63.3931 (37)									
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 47.6732	Feb 47.2553	Mar 46.8457	Apr 44.9216	May 44.5616	Jun 42.8858	Jul 42.8858	Aug 42.5755	Sep 43.5313	Oct 44.5616	Nov 45.2899	Dec 46.0512	(38)
Heat transfer coeff	111.0663	110.6484	110.2387	108.3147	107.9547	106.2789	106.2789	105.9686	106.9244	107.9547	108.6829	109.4443	(39)
Average = Sum(39)m / 12 =												108.3130	
HLP	Jan 1.2561	Feb 1.2514	Mar 1.2468	Apr 1.2250	May 1.2209	Jun 1.2020	Jul 1.2020	Aug 1.1985	Sep 1.2093	Oct 1.2209	Nov 1.2292	Dec 1.2378	(40)
HLP (average)												1.2250	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6035 (42)
Hot water usage for mixer showers													
67.8714	66.8514	65.3651	62.5213	60.4227	58.0823	56.7521	58.2271	59.8440	62.3569	65.2618	67.6113	(42a)	
Hot water usage for baths													
29.3101	28.8748	28.2619	27.1316	26.2853	25.3469	24.8400	25.4487	26.1115	27.1156	28.2691	29.2111	(42b)	
Hot water usage for other uses													
41.2921	39.7906	38.2891	36.7875	35.2860	33.7845	33.7845	35.2860	36.7875	38.2891	39.7906	41.2921	(42c)	
Average daily hot water use (litres/day)												127.2886	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.4737	135.5169	131.9160	126.4405	121.9940	117.2137	115.3765	118.9618	122.7430	127.7616	133.3215	138.1145	(44)
Energy content (annual)	219.3084	192.9742	202.7500	173.0907	164.2274	144.1279	139.5379	147.2996	151.3544	173.3712	189.9409	216.2540	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2114.2367	
32.8963	28.9461	30.4125	25.9636	24.6341	21.6192	20.9307	22.0949	22.7032	26.0057	28.4911	32.4381	(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	19.4030	17.4736	19.2357	18.3817	18.8466	18.0892	18.5973	18.6757	18.1622	18.9390	18.5519	19.3721	(61)
Total heat required for water heating calculated for each month													
238.7114	210.4478	221.9858	191.4724	183.0740	162.2171	158.1352	165.9752	169.5166	192.3102	208.4928	235.6261	(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	238.7114	210.4478	221.9858	191.4724	183.0740	162.2171	158.1352	165.9752	169.5166	192.3102	208.4928	235.6261	(64)
12Total per year (kWh/year)									Total per year (kWh/year) = Sum(64)m =			2337.9647	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)
Heat gains from water heating, kWh/month													
77.7708	68.5323	72.2233	62.1481	59.3173	52.4448	51.0457	53.6460	54.8659	62.3807	67.7933	76.7475	(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	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.7053	132.5309	119.7053	123.6955	119.7053	123.6955	119.7053	119.7053	123.6955	119.7053	123.6955	119.7053 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.1407	238.5911	232.4162	219.2705	202.6764	187.0803	176.6611	174.2107	180.3857	193.5314	210.1255	225.7216 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174 (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)	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388 (71)
Water heating gains (Table 5)	104.5306	101.9826	97.0744	86.3168	79.7275	72.8400	68.6098	72.1049	76.2026	83.8450	94.1574	103.1552 (72)
Total internal gains	525.4287	538.1567	514.2479	494.3348	467.1613	445.6679	427.0283	428.0730	442.3359	462.1338	493.0304	513.6342 (73)

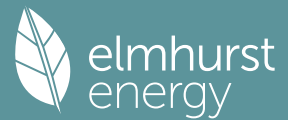
6. Solar gains

[Jan]												
				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	Gains W	
North				0.7100	10.6334	0.7300		0.7000		0.7700	2.6735 (74)	
East				10.2000	19.6403	0.7300		0.7000		0.7700	70.9417 (76)	
West				7.1400	19.6403	0.7300		0.7000		0.7700	49.6592 (80)	
Solar gains	123.2744	241.0302	397.2100	580.5905	713.2305	730.9985	695.5701	596.2525	462.3128	286.0220	153.6733	101.4051 (83)
Total gains	648.7032	779.1869	911.4580	1074.9253	1180.3918	1176.6664	1122.5984	1024.3255	904.6486	748.1557	646.7037	615.0392 (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)		

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	48.8891	49.0738	49.2561	50.1311	50.2983	51.0914	51.0914	51.2410	50.7829	50.2983	49.9613	49.6137
alpha	4.2593	4.2716	4.2837	4.3421	4.3532	4.4061	4.4061	4.4161	4.3855	4.3532	4.3308	4.3076
util living area	0.9926	0.9833	0.9592	0.8836	0.7421	0.5551	0.4114	0.4663	0.7232	0.9357	0.9853	0.9940 (86)
MIT	19.7408	19.9318	20.2168	20.5731	20.8027	20.9030	20.9241	20.9203	20.8469	20.5119	20.0681	19.7212 (87)
Th 2	19.8754	19.8791	19.8828	19.9001	19.9033	19.9184	19.9184	19.9212	19.9126	19.9033	19.8967	19.8899 (88)
util rest of house	0.9904	0.9785	0.9473	0.8521	0.6819	0.4703	0.3128	0.3616	0.6392	0.9108	0.9803	0.9923 (89)
MIT 2	18.4148	18.6598	19.0194	19.4601	19.7101	19.8133	19.8265	19.8279	19.7673	19.4033	18.8484	18.4009 (90)
Living area fraction	18.6269	18.8632	19.2109	19.6381	19.8848	19.9876	20.0020	20.0026	19.9399	19.5805	19.0434	0.1599 (91)
MIT	18.4769	18.7132	19.0609	19.4881	19.7348	19.8376	19.8520	19.8526	19.7899	19.4305	18.8934	18.6121 (92)
Temperature adjustment												-0.1500
adjusted MIT												18.4621 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9864	0.9716	0.9360	0.8381	0.6718	0.4637	0.3067	0.3547	0.6287	0.8969	0.9737	0.9890 (94)
Useful gains	639.8880	757.0668	853.1208	900.9383	792.9375	545.6123	344.2863	363.3599	568.7347	671.0040	629.7004	608.2446 (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	1574.5737	1528.4134	1384.6928	1146.8450	867.3955	556.6450	345.6206	365.8634	608.3916	953.2990	1281.7443	1560.9011 (97)
Space heating kWh	695.4061	518.3449	395.4896	177.0528	55.3968	0.0000	0.0000	0.0000	0.0000	210.0275	469.4716	708.7764 (98a)
Space heating requirement - total per year (kWh/year)												3229.9658
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	695.4061	518.3449	395.4896	177.0528	55.3968	0.0000	0.0000	0.0000	0.0000	210.0275	469.4716	708.7764 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3229.9658
Space heating per m2										(98c) / (4) =		36.5298 (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	695.4061	518.3449	395.4896	177.0528	55.3968	0.0000	0.0000	0.0000	0.0000	210.0275	469.4716	708.7764 (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)	785.7696	585.7005	446.8809	200.0597	62.5952	0.0000	0.0000	0.0000	0.0000	237.3192	530.4764	800.8773 (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	238.7114	210.4478	221.9858	191.4724	183.0740	162.2171	158.1352	165.9752	169.5166	192.3102	208.4928	235.6261 (64)
Efficiency of water heater (217)m	88.1118	88.0616	87.9548	87.7143	87.3439	87.0000	87.0000	87.0000	87.0000	87.7766	88.0332	88.1209 (216)
Fuel for water heating, kWh/month	270.9188	238.9781	252.3861	218.2911	209.6014	186.4564	181.7646	190.7761	194.8467	219.0905	236.8342	267.3895 (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	24.3640	19.5457	17.5988	12.8936	9.9594	8.1369	9.0853	11.8094	15.3392	20.1259	22.7322	25.0412 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-30.9425	-47.5571	-74.7039	-89.3512	-98.9541	-93.0596	-91.5220	-84.8716	-72.7612	-56.5888	-35.0525	-26.0817 (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)	-14.4775	-34.6718	-80.7865	-138.7408	-197.9528	-204.5537	-199.7829	-159.9391	-105.0395	-52.8880	-20.1311	-11.0221 (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												3649.6788 (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												2667.3335 (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)												196.6316 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2021.4319 (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)

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Energy used
Total delivered energy for all uses

0.0000 (237)
4578.2121 (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	3649.6788	0.2100	766.4326 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2667.3335	0.2100	560.1400 (264)
Space and water heating			1326.5726 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	196.6316	0.1443	28.3800 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-801.4461	0.1333	-106.8705
PV Unit electricity exported	-1219.9857	0.1227	-149.6896
Total			-256.5601 (269)
Total CO2, kg/year			1110.3218 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.5600 (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	3649.6788	1.1300	4124.1371 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2667.3335	1.1300	3014.0869 (278)
Space and water heating			7138.2240 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	196.6316	1.5338	301.6001 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-801.4461	1.4928	-1196.3719
PV Unit electricity exported	-1219.9857	0.4502	-549.2798
Total			-1745.6516 (283)
Total Primary energy kWh/year			5824.2733 (286)
Dwelling Primary energy Rate (DPER)			65.8700 (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	44.2100 (1b)	x 2.3800 (2b)	= 105.2198 (1b) - (3b)
First floor	44.2100 (1c)	x 2.6800 (2c)	= 118.4828 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 223.7026 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1341 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3841 (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) = 0.3841 (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	0.4897 0.4801 0.4705 0.4225 0.4129 0.3649 0.3649 0.3553 0.3841 0.4129 0.4321 0.4513 (22b)
Effective ac	0.6199 0.6153 0.6107 0.5893 0.5852 0.5666 0.5666 0.5631 0.5738 0.5852 0.5934 0.6018 (25)

3. Heat losses and heat loss parameter

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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)			18.0500	1.1450	20.6679			(27)
Ground Floor			44.2100	0.1300	5.7473			(28a)
External Wall	138.1700	20.1900	117.9800	0.1800	21.2364			(29a)
Plane Roof	44.2100		44.2100	0.1100	4.8631			(30)
Total net area of external elements Aum(A, m2)			226.5900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	54.6547			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								221.0786 (35)
List of Thermal Bridges								
K1 Element				Length	Psi-value		Total	
E2 Other lintels (including other steel lintels)				14.3700	0.0500		0.7185	
E3 Sill				11.5400	0.0500		0.5770	
E4 Jamb				30.0000	0.0500		1.5000	
E5 Ground floor (normal)				27.5800	0.1600		4.4128	
E10 Eaves (insulation at ceiling level)				17.4400	0.0600		1.0464	
E16 Corner (normal)				20.0400	0.0900		1.8036	
E6 Intermediate floor within a dwelling				27.5800	0.0000		0.0000	
E12 Gable (insulation at ceiling level)				10.1400	0.0600		0.6084	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.6667	(36)
Point Thermal bridges							0.0000	
Total fabric heat loss						(33) + (36) + (36a) =	65.3214	(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	45.7637	45.4199	45.0830	43.5003	43.2042	41.8257	41.8257	41.5705	42.3567	43.2042	43.8032	44.4295	(38)
Average = Sum(39)m / 12 =	111.0851	110.7414	110.4044	108.8217	108.5256	107.1472	107.1472	106.8919	107.6781	108.5256	109.1247	109.7509	(39)
												108.8203	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2563	1.2524	1.2486	1.2307	1.2274	1.2118	1.2118	1.2089	1.2178	1.2274	1.2342	1.2412	(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													2.6035 (42)
Hot water usage for mixer showers													
Hot water usage for baths	67.8714	66.8514	65.3651	62.5213	60.4227	58.0823	56.7521	58.2271	59.8440	62.3569	65.2618	67.6113	(42a)
Hot water usage for other uses	29.3101	28.8748	28.2619	27.1316	26.2853	25.3469	24.8400	25.4487	26.1115	27.1156	28.2691	29.2111	(42b)
Average daily hot water use (litres/day)	41.2921	39.7906	38.2891	36.7875	35.2860	33.7845	33.7845	35.2860	36.7875	38.2891	39.7906	41.2921	(42c)
												127.2886	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	138.4737	135.5169	131.9160	126.4405	121.9940	117.2137	115.3765	118.9618	122.7430	127.7616	133.3215	138.1145	(44)
Energy content (annual)	219.3084	192.9742	202.7500	173.0907	164.2274	144.1279	139.5379	147.2996	151.3544	173.3712	189.9409	216.2540	(45)
Distribution loss (46)m = 0.15 x (45)m													
Water storage loss:	32.8963	28.9461	30.4125	25.9636	24.6341	21.6192	20.9307	22.0949	22.7032	26.0057	28.4911	32.4381	(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	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	270.2673	239.0016	253.7089	222.4058	215.1863	193.4430	190.4968	198.2585	200.6695	224.3301	239.2560	267.2129	(62)
WWHRS	-31.0280	-27.4414	-28.7350	-23.7937	-22.1749	-18.9752	-17.7863	-18.9139	-19.6325	-23.1446	-26.2200	-30.4534	(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	239.2394	211.5602	224.9739	198.6120	193.0114	174.4677	172.7105	179.3446	181.0370	201.1856	213.0360	236.7595	(64)
12Total per year (kWh/year)													
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Heat gains from water heating, kWh/month	85.6598	75.6708	80.1541	69.8814	67.3453	60.2513	59.1361	61.7168	62.6541	70.3857	75.4841	84.6442	(65)

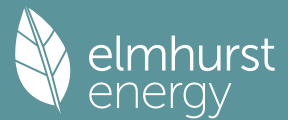
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	119.7053	132.5309	119.7053	123.6955	119.7053	123.6955	119.7053	119.7053	123.6955	119.7053	123.6955	119.7053	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	236.1407	238.5911	232.4162	219.2705	202.6764	187.0803	176.6611	174.2107	180.3857	193.5314	210.1255	225.7216	(68)
Pumps, fans	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	(69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Water heating gains (Table 5)	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	(71)
Total internal gains	115.1341	112.6053	107.7340	97.0575	90.5179	83.6823	79.4840	82.9527	87.0196	94.6044	104.8390	113.7691	(72)
	536.0322	548.7794	524.9076	505.0756	477.9517	456.5102	437.9025	438.9208	453.1528	472.8931	503.7121	524.2480	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W
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		W/m2	or Table 6b	or Table 6c	Table 6d	
North	0.7100	10.6334	0.6300	0.7000	0.7700	2.3073 (74)
East	10.2000	19.6403	0.6300	0.7000	0.7700	61.2237 (76)
West	7.1400	19.6403	0.6300	0.7000	0.7700	42.8566 (80)

Solar gains	106.3875	208.0124	342.7977	501.0575	615.5277	630.8617	600.2865	514.5741	398.9822	246.8409	132.6221	87.5140 (83)
Total gains	642.4197	756.7917	867.7053	1006.1331	1093.4794	1087.3719	1038.1890	953.4949	852.1351	719.7340	636.3342	611.7620 (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	48.8809	49.0326	49.1822	49.8975	50.0337	50.6774	50.6774	50.7984	50.4275	50.0337	49.7590	49.4751
alpha	4.2587	4.2688	4.2788	4.3265	4.3356	4.3785	4.3785	4.3866	4.3618	4.3356	4.3173	4.2983
util living area	0.9928	0.9850	0.9653	0.9033	0.7787	0.5969	0.4462	0.5016	0.7539	0.9433	0.9862	0.9942 (86)
MIT	19.4095	19.6434	20.0013	20.4643	20.7926	20.9516	20.9891	20.9823	20.8676	20.4091	19.8330	19.3808 (87)
Th 2	19.8752	19.8783	19.8813	19.8955	19.8982	19.9106	19.9106	19.9129	19.9058	19.8982	19.8928	19.8871 (88)
util rest of house	0.9907	0.9806	0.9549	0.8753	0.7207	0.5082	0.3396	0.3898	0.6712	0.9207	0.9814	0.9924 (89)
MIT 2	18.0415	18.3404	18.7920	19.3632	19.7268	19.8828	19.9070	19.9064	19.8158	19.3140	18.5937	18.0130 (90)
Living area fraction	18.2603	18.5488	18.9854	19.5393	19.8972	20.0537	20.0800	20.0784	19.9840	19.4891	18.7919	18.2317 (92)
MIT	18.2603	18.5488	18.9854	19.5393	19.8972	20.0537	20.0800	20.0784	19.9840	19.4891	18.7919	18.2317 (93)
Temperature adjustment												0.0000
adjusted MIT	18.2603	18.5488	18.9854	19.5393	19.8972	20.0537	20.0800	20.0784	19.9840	19.4891	18.7919	18.2317 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9861	0.9732	0.9440	0.8645	0.7207	0.5204	0.3566	0.4074	0.6777	0.9098	0.9745	0.9885 (94)
Useful gains	633.5110	736.5445	819.1164	869.8009	788.0289	565.8727	370.1664	388.4102	577.5274	654.8079	620.1053	604.7372 (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	1550.7805	1511.4829	1378.4418	1157.7852	889.6110	584.3504	372.8760	393.1948	633.5829	964.6973	1275.8698	1539.9960 (97)
Space heating kWh	682.4486	520.7586	416.1381	207.3486	75.5771	0.0000	0.0000	0.0000	0.0000	230.5577	472.1504	695.8325 (98a)
Space heating requirement - total per year (kWh/year)												3300.8117
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	682.4486	520.7586	416.1381	207.3486	75.5771	0.0000	0.0000	0.0000	0.0000	230.5577	472.1504	695.8325 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3300.8117
Space heating per m2										(98c) / (4) =		37.3311 (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	682.4486	520.7586	416.1381	207.3486	75.5771	0.0000	0.0000	0.0000	0.0000	230.5577	472.1504	695.8325 (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)	738.5807	563.5916	450.3659	224.4033	81.7934	0.0000	0.0000	0.0000	0.0000	249.5213	510.9853	753.0655 (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	239.2394	211.5602	224.9739	198.6120	193.0114	174.4677	172.7105	179.3446	181.0370	201.1856	213.0360	236.7595 (64)
Efficiency of water heater (217)m	86.4955	86.2320	85.6800	84.4738	82.5470	80.3000	80.3000	80.3000	80.3000	84.6742	86.0351	86.5468 (216)
Fuel for water heating, kWh/month	276.5917	245.3384	262.5747	235.1166	233.8200	217.2699	215.0816	223.3432	225.4508	237.5995	247.6151	273.5623 (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	24.8724	19.9536	17.9660	13.1626	10.1672	8.3067	9.2749	12.0558	15.6593	20.5459	23.2065	25.5637 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-40.8800	-57.3899	-82.1504	-91.9682	-98.8267	-92.1025	-90.9336	-85.9898	-77.2474	-65.4003	-44.8437	-35.3692 (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)	-23.8522	-50.0866	-99.3932	-149.0660	-196.9092	-197.7971	-195.4981	-165.6438	-121.5466	-71.5922	-31.8322	-18.8712 (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												3572.3070 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)

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Efficiency of water heater	80.3000	
Water heating fuel used	2893.3638	(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)	200.7345	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2185.1900	(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	4567.2153	(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	3572.3070	0.2100	750.1845 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2893.3638	0.2100	607.6064 (264)
Space and water heating			1357.7909 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	200.7345	0.1443	28.9722 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-863.1016	0.1347	-116.2434
PV Unit electricity exported	-1322.0884	0.1259	-166.4980
Total			-282.7414 (269)
Total CO2, kg/year			1115.9509 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.6200 (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	3572.3070	1.1300	4036.7069 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2893.3638	1.1300	3269.5011 (278)
Space and water heating			7306.2080 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	200.7345	1.5338	307.8933 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-863.1016	1.4978	-1292.7221
PV Unit electricity exported	-1322.0884	0.4623	-611.1642
Total			-1903.8863 (283)
Total Primary energy kWh/year			5840.3158 (286)
Target Primary Energy Rate (TPER)			66.0500 (287)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 33			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	93 A	DER	12.56	TER	12.62		
Environmental	89 B	% DER < TER				0.48	
CO ₂ Emissions (t/year)	1.06	DFEE	40.27	TFEE	43.44		
Compliance Check	See BREL	% DFEE < TFEE				7.30	
% DPER < TPER	0.27	DPER	65.87	TPER	66.05		
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	44.2100 (1b)	x 2.3800 (2b)	= 105.2198 (1b) - (3b)
First floor	44.2100 (1c)	x 2.6800 (2c)	= 118.4828 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 223.7026 (5)

2. Ventilation rate

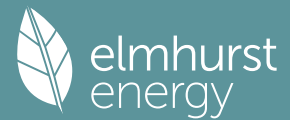
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1341 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3341 (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) = 0.3341 (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	0.4260	0.4176	0.4093	0.3675	0.3592	0.3174	0.3174	0.3090	0.3341	0.3592	0.3759	0.3926 (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	0.5907	0.5872	0.5838	0.5675	0.5645	0.5504	0.5504	0.5478	0.5558	0.5645	0.5706	0.5771 (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)			18.0500	1.2357	22.3051		(27)
Door			2.1400	1.3000	2.7820		(26a)
Ground Floor			44.2100	0.1300	5.7473	75.0000	3315.7500 (28a)
External Wall	138.1700	20.1900	117.9800	0.1900	22.4162	110.0000	12977.8000 (29a)
Plane Roof	44.2100		44.2100	0.0900	3.9789	9.0000	397.8900 (30)
Total net area of external elements Aum(A, m ²)			226.5900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	57.2295		(33)
Studs			156.0600			9.0000	1404.5400 (32c)
Internal Floor 1			44.2100			18.0000	795.7800 (32d)
Internal Ceiling 1			72.8900			9.0000	656.0100 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	19547.7700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							221.0786 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				14.3700	0.0240	0.3449	
E3 Sill				11.5400	0.0210	0.2423	

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E4 Jamb									30.0000	0.0160	0.4800	
E5 Ground floor (normal)									27.5800	0.0920	2.5374	
E10 Eaves (insulation at ceiling level)									17.4400	0.0580	1.0115	
E16 Corner (normal)									20.0400	0.0470	0.9419	
E6 Intermediate floor within a dwelling									27.5800	0.0010	0.0276	
E12 Gable (insulation at ceiling level)									10.1400	0.0570	0.5780	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												6.1635 (36)
Point Thermal bridges												0.0000
Total fabric heat loss												(33) + (36) + (36a) = 63.3931 (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
	43.6089	43.3488	43.0939	41.8964	41.6724	40.6295	40.6295	40.4363	41.0312	41.6724	42.1256	42.5995 (38)
Heat transfer coeff	107.0020	106.7419	106.4870	105.2895	105.0655	104.0225	104.0225	103.8294	104.4243	105.0655	105.5187	105.9925 (39)
Average = Sum(39)m / 12 =												105.2884
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1.2102	1.2072	1.2043	1.1908	1.1883	1.1765	1.1765	1.1743	1.1810	1.1883	1.1934	1.1987 (40)
HLP (average)												1.1908
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6035	(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	0.0000	(42a)
Hot water usage for baths														
	29.3101	28.8748	28.2619	27.1316	26.2853	25.3469	24.8400	25.4487	26.1115	27.1156	28.2691	29.2111	29.2111	(42b)
Hot water usage for other uses														
	41.2921	39.7906	38.2891	36.7875	35.2860	33.7845	33.7845	35.2860	36.7875	38.2891	39.7906	41.2921	41.2921	(42c)
Average daily hot water use (litres/day)													64.7134	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	70.6023	68.6655	66.5509	63.9192	61.5713	59.1314	58.6245	60.7347	62.8990	65.4047	68.0597	70.5032	70.5032	(44)
Energy conte	111.8168	97.7787	102.2863	87.5021	82.8868	72.7089	70.9012	75.2022	77.5607	88.7535	96.9636	110.3910	110.3910	(45)
Energy content (annual)										Total = Sum(45)m =			1074.7518	
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	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	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	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	0.0000	(61)
Total heat required for water heating calculated for each month														
	95.0442	83.1119	86.9434	74.3768	70.4538	61.8026	60.2660	63.9219	65.9266	75.4405	82.4190	93.8323	93.8323	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h														
	95.0442	83.1119	86.9434	74.3768	70.4538	61.8026	60.2660	63.9219	65.9266	75.4405	82.4190	93.8323	93.8323	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =			913.5391	(64)
Electric shower(s)													914	(64)
	54.3537	48.4296	52.8832	50.4658	51.4128	49.0428	50.6776	51.4128	50.4658	52.8832	51.8888	54.3537	54.3537	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													618.2698	(64a)
Heat gains from water heating, kWh/month														
	37.3495	32.8854	34.9566	31.2107	30.4666	27.7113	27.7359	28.8337	29.0981	32.0809	33.5770	37.0465	37.0465	(65)

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

Metabolic gains (Table 5), Watts														
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5														
	119.7053	132.5309	119.7053	123.6955	119.7053	123.6955	119.7053	119.7053	123.6955	119.7053	123.6955	119.7053	119.7053	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5														
	236.1407	238.5911	232.4162	219.2705	202.6764	187.0803	176.6611	174.2107	180.3857	193.5314	210.1255	225.7216	225.7216	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5														
	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	(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	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)														
	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	(71)
Water heating gains (Table 5)														
	50.2009	48.9366	46.9847	43.3481	40.9498	38.4880	37.2794	38.7549	40.4140	43.1195	46.6347	49.7937	49.7937	(72)
Total internal gains														
	468.0990	482.1106	461.1583	448.3662	425.3836	411.3158	395.6980	394.7231	406.5473	418.4083	442.5077	457.2726	457.2726	(73)

6. Solar gains

[Jan]												Gains
	Area				Solar flux		g		FF		Access	W
	m2				Table 6a		Specific data		Specific data		factor	
					W/m2		or Table 6b		or Table 6c		Table 6d	
North	0.7100				10.6334		0.7300		0.7000		0.7700	2.6735 (74)
East	10.2000				19.6403		0.7300		0.7000		0.7700	70.9417 (76)
West	7.1400				19.6403		0.7300		0.7000		0.7700	49.6592 (80)
Solar gains	123.2744	241.0302	397.2100	580.5905	713.2305	730.9985	695.5701	596.2525	462.3128	286.0220	153.6733	101.4051 (83)
Total gains	591.3734	723.1408	858.3683	1028.9567	1138.6141	1142.3143	1091.2680	990.9755	868.8600	704.4302	596.1810	558.6777 (84)

7. Mean internal temperature (heating season)

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Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	50.7461	50.8698	50.9916	51.5715	51.6814	52.1996	52.1996	52.2967	51.9988	51.6814	51.4595	51.2294
alpha	4.3831	4.3913	4.3994	4.4381	4.4454	4.4800	4.4800	4.4864	4.4666	4.4454	4.4306	4.4153
util living area	0.9947	0.9869	0.9650	0.8915	0.7491	0.5600	0.4144	0.4723	0.7335	0.9444	0.9889	0.9959 (86)
MIT	19.4195	19.6743	20.0552	20.5279	20.8355	20.9654	20.9927	20.9873	20.8896	20.4340	19.8396	19.3821 (87)
Th 2	19.9119	19.9142	19.9165	19.9274	19.9294	19.9389	19.9389	19.9406	19.9352	19.9294	19.9253	19.9210 (88)
util rest of house	0.9932	0.9831	0.9547	0.8618	0.6902	0.4761	0.3170	0.3682	0.6512	0.9224	0.9850	0.9947 (89)
MIT 2	18.4837	18.7378	19.1123	19.5643	19.8251	19.9236	19.9370	19.9370	19.8774	19.4918	18.9119	18.4533 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.6334	18.8876	19.2631	19.7184	19.9866	20.0902	20.1058	20.1050	20.0393	19.6425	19.0603	18.6019 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.6334	18.8876	19.2631	19.7184	19.9866	20.0902	20.1058	20.1050	20.0393	19.6425	19.0603	18.6019 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9905	0.9782	0.9468	0.8550	0.6936	0.4885	0.3325	0.3848	0.6600	0.9149	0.9806	0.9925 (94)
Useful gains	585.7650	707.3731	812.6676	879.7972	789.7110	558.0207	362.8929	381.2955	573.4255	644.4958	584.6431	554.4732 (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	1533.7000	1493.0611	1359.1061	1139.0601	870.6406	571.1059	364.6869	384.6872	620.2082	950.0540	1262.0304	1526.4904 (97)
Space heating kWh	705.2637	527.9823	406.5502	186.6692	60.2116	0.0000	0.0000	0.0000	0.0000	227.3353	487.7188	723.1809 (98a)
Space heating requirement - total per year (kWh/year)												3324.9121
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	705.2637	527.9823	406.5502	186.6692	60.2116	0.0000	0.0000	0.0000	0.0000	227.3353	487.7188	723.1809 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3324.9121
Space heating per m2												(98c) / (4) = 37.6036 (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	977.8119	769.7668	789.1035	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9100	0.9504	0.9272	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	889.8250	731.6131	731.6745	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1287.8936	1230.5677	1115.6938	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	286.6094	371.2222	285.7103	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fC = cooled area / (4) =											
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	71.6523	92.8056	71.4276	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												235.8855 (107)
Energy for space heating												37.6036 (99)
Energy for space cooling												2.6678 (108)
Total												40.2714 (109)
Fabric Energy Efficiency (DFEE)												40.3 (109)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	44.2100 (1b)	x 2.3800 (2b)	= 105.2198 (1b) - (3b)
First floor	44.2100 (1c)	x 2.6800 (2c)	= 118.4828 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	223.7026 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 30.0000 / (5) = 0.1341 (8)
Pressure test	Yes

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Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered

Blower Door
5.0000 (17)
0.3841 (18)
0 (19)

Shelter factor
Infiltration rate adjusted to include shelter factor

$$(20) = 1 - [0.075 \times (19)] = 1.0000 (20)$$
$$(21) = (18) \times (20) = 0.3841 (21)$$

	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	0.4897	0.4801	0.4705	0.4225	0.4129	0.3649	0.3649	0.3553	0.3841	0.4129	0.4321	0.4513	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													(23c)
Effective ac	0.6199	0.6153	0.6107	0.5893	0.5852	0.5666	0.5666	0.5631	0.5738	0.5852	0.5934	0.6018	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Semi-glazed door			2.1400	1.0000	2.1400			(26a)
TER Opening Type (Uw = 1.20)			18.0500	1.1450	20.6679			(27)
Ground Floor			44.2100	0.1300	5.7473			(28a)
External Wall	138.1700	20.1900	117.9800	0.1800	21.2364			(29a)
Plane Roof	44.2100		44.2100	0.1100	4.8631			(30)
Total net area of external elements Aum(A, m2)			226.5900					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 54.6547			(33)

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

221.0786 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element	14.3700	0.0500	0.7185	
E2 Other lintels (including other steel lintels)				
E3 Sill	11.5400	0.0500	0.5770	
E4 Jamb	30.0000	0.0500	1.5000	
E5 Ground floor (normal)	27.5800	0.1600	4.4128	
E10 Eaves (insulation at ceiling level)	17.4400	0.0600	1.0464	
E16 Corner (normal)	20.0400	0.0900	1.8036	
E6 Intermediate floor within a dwelling	27.5800	0.0000	0.0000	
E12 Gable (insulation at ceiling level)	10.1400	0.0600	0.6084	

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

10.6667 (36)

Point Thermal Bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 65.3214 (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	45.7637	45.4199	45.0830	43.5003	43.2042	41.8257	41.8257	41.5705	42.3567	43.2042	43.8032	44.4295	(38)
Heat transfer coeff	111.0851	110.7414	110.4044	108.8217	108.5256	107.1472	107.1472	106.8919	107.6781	108.5256	109.1247	109.7509	(39)
Average = Sum(39)m / 12 =													108.8203

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2563	1.2524	1.2486	1.2307	1.2274	1.2118	1.2118	1.2089	1.2178	1.2274	1.2342	1.2412	(40)
HLP (average)												1.2307	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6035 (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	29.3101	28.8748	28.2619	27.1316	26.2853	25.3469	24.8400	25.4487	26.1115	27.1156	28.2691	29.2111	(42b)
Hot water usage for other uses	41.2921	39.7906	38.2891	36.7875	35.2860	33.7845	33.7845	35.2860	36.7875	38.2891	39.7906	41.2921	(42c)
Average daily hot water use (litres/day)													64.7134 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.6023	68.6655	66.5509	63.9192	61.5713	59.1314	58.6245	60.7347	62.8990	65.4047	68.0597	70.5032	(44)
Energy conte	111.8168	97.7787	102.2863	87.5021	82.8868	72.7089	70.9012	75.2022	77.5607	88.7535	96.9636	110.3910	(45)
Energy content (annual)										Total = Sum(45)m =		1074.7518	
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													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Total heat required for water heating calculated for each month	95.0442	83.1119	86.9434	74.3768	70.4538	61.8026	60.2660	63.9219	65.9266	75.4405	82.4190	93.8323	(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	95.0442	83.1119	86.9434	74.3768	70.4538	61.8026	60.2660	63.9219	65.9266	75.4405	82.4190	93.8323	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		913.5391	(64)
Electric shower(s)	54.3537	48.4296	52.8832	50.4658	51.4128	49.0428	50.6776	51.4128	50.4658	52.8832	51.8888	54.3537	(64a)
Heat gains from water heating, kWh/month	37.3495	32.8854	34.9566	31.2107	30.4666	27.7113	27.7359	28.8337	29.0981	32.0809	33.5770	37.0465	(65)

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

Metabolic gains (Table 5), Watts

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.7053	132.5309	119.7053	123.6955	119.7053	123.6955	119.7053	119.7053	123.6955	119.7053	123.6955	119.7053	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.1407	238.5911	232.4162	219.2705	202.6764	187.0803	176.6611	174.2107	180.3857	193.5314	210.1255	225.7216	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	(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)	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	(71)
Water heating gains (Table 5)	50.2009	48.9366	46.9847	43.3481	40.9498	38.4880	37.2794	38.7549	40.4140	43.1195	46.6347	49.7937	(72)
Total internal gains	468.0990	482.1106	461.1583	448.3662	425.3836	411.3158	395.6980	394.7231	406.5473	418.4083	442.5077	457.2726	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				0.7100	10.6334		0.6300		0.7000		0.7700		2.3073 (74)
East				10.2000	19.6403		0.6300		0.7000		0.7700		61.2237 (76)
West				7.1400	19.6403		0.6300		0.7000		0.7700		42.8566 (80)
Solar gains	106.3875	208.0124	342.7977	501.0575	615.5277	630.8617	600.2865	514.5741	398.9822	246.8409	132.6221		87.5140 (83)
Total gains	574.4865	690.1230	803.9560	949.4237	1040.9113	1042.1775	995.9845	909.2971	805.5295	665.2492	575.1298		544.7866 (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	48.8809	49.0326	49.1822	49.8975	50.0337	50.6774	50.6774	50.7984	50.4275	50.0337	49.7590	49.4751	
alpha	4.2587	4.2688	4.2788	4.3265	4.3356	4.3785	4.3785	4.3866	4.3618	4.3356	4.3173	4.2983	
util living area	0.9953	0.9893	0.9732	0.9178	0.7998	0.6178	0.4637	0.5234	0.7792	0.9559	0.9905	0.9963	(86)
MIT	19.3233	19.5614	19.9290	20.4152	20.7678	20.9447	20.9874	20.9792	20.8482	20.3525	19.7571	19.2950	(87)
Th 2	19.8752	19.8783	19.8813	19.8955	19.8982	19.9106	19.9106	19.9129	19.9058	19.8982	19.8928	19.8871	(88)
util rest of house	0.9939	0.9860	0.9648	0.8928	0.7439	0.5278	0.3536	0.4079	0.6987	0.9372	0.9871	0.9951	(89)
MIT 2	18.3606	18.5992	18.9632	19.4374	19.7465	19.8855	19.9073	19.9068	19.8237	19.3915	18.8058	18.3414	(90)
Living area fraction	fLA = Living area / (4) =												
MIT	18.5146	18.7531	19.1176	19.5938	19.9099	20.0549	20.0800	20.0783	19.9875	19.5452	18.9580	18.4939	(92)
Temperature adjustment	0.0000												
adjusted MIT	18.5146	18.7531	19.1176	19.5938	19.9099	20.0549	20.0800	20.0783	19.9875	19.5452	18.9580	18.4939	(93)

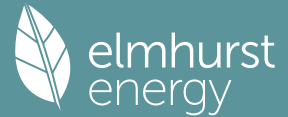
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9914	0.9816	0.9574	0.8846	0.7446	0.5403	0.3712	0.4261	0.7055	0.9295	0.9830	0.9931	(94)
Useful gains	569.5326	677.3902	769.7192	839.9004	775.0198	563.1271	369.6981	387.4769	568.2721	618.3319	565.3587	541.0005	(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	1579.0290	1534.1085	1393.0396	1163.7128	890.9798	584.4799	372.8736	393.1813	633.9596	970.7795	1293.9950	1568.7726	(97)
Space heating kWh	751.0653	575.7146	463.7504	233.1449	86.2742	0.0000	0.0000	0.0000	0.0000	262.2210	524.6182	764.6624	(98a)
Space heating requirement - total per year (kWh/year)	3661.4511												
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	751.0653	575.7146	463.7504	233.1449	86.2742	0.0000	0.0000	0.0000	0.0000	262.2210	524.6182	764.6624	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)	3661.4511												
Space heating per m ²	(98c) / (4) = 41.4098 (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	1007.1834	792.8890	812.3784	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8697	0.9236	0.8939	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	875.9957	732.2880	726.1853	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1170.8506	1119.1973	1020.2255	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	212.2955	287.8605	218.7659	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											
Intermittency factor (Table 10b)												1.0000 (105)
	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	53.0739	71.9651	54.6915	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	179.7305 (107)											
Energy for space heating	41.4098 (99)											
Energy for space cooling	2.0327 (108)											
Total	43.4425 (109)											
Fabric Energy Efficiency (TFEE)	43.4 (109)											

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 33			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	93 A	DER	12.56	TER	12.62		
Environmental	89 B	% DER < TER				0.48	
CO ₂ Emissions (t/year)	1.06	DFEE	40.27	TFEE	43.44		
Compliance Check	See BREL	% DFEE < TFEE				7.30	
% DPER < TPER	0.27	DPER	65.87	TPER	66.05		
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	44.2100 (1b)	x 2.3800 (2b)	= 105.2198 (1b) - (3b)
First floor	44.2100 (1c)	x 2.6800 (2c)	= 118.4828 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 223.7026 (5)

2. Ventilation rate

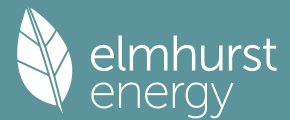
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	50.0000 / (5) = 0.2235 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.4235 (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) = 0.4235 (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	0.5400	0.5294	0.5188	0.4659	0.4553	0.4023	0.4023	0.3917	0.4235	0.4553	0.4764	0.4976 (22b)
Effective ac	0.6458	0.6401	0.6346	0.6085	0.6036	0.5809	0.5809	0.5767	0.5897	0.6036	0.6135	0.6238 (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)			18.0500	1.2357	22.3051		(27)
Door			2.1400	1.3000	2.7820		(26a)
Ground Floor			44.2100	0.1300	5.7473	75.0000	3315.7500 (28a)
External Wall	138.1700	20.1900	117.9800	0.1900	22.4162	110.0000	12977.8000 (29a)
Plane Roof	44.2100		44.2100	0.0900	3.9789	9.0000	397.8900 (30)
Total net area of external elements Aum(A, m ²)			226.5900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	57.2295		(33)
Studs			156.0600			9.0000	1404.5400 (32c)
Internal Floor 1			44.2100			18.0000	795.7800 (32d)
Internal Ceiling 1			72.8900			9.0000	656.0100 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	19547.7700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							221.0786 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				14.3700	0.0240	0.3449	
E3 Sill				11.5400	0.0210	0.2423	
E4 Jamb				30.0000	0.0160	0.4800	
E5 Ground floor (normal)				27.5800	0.0920	2.5374	

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E10 Eaves (insulation at ceiling level)	17.4400	0.0580	1.0115										
E16 Corner (normal)	20.0400	0.0470	0.9419										
E6 Intermediate floor within a dwelling	27.5800	0.0010	0.0276										
E12 Gable (insulation at ceiling level)	10.1400	0.0570	0.5780										
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				6.1635 (36)									
Point Thermal bridges			(36a) =	0.0000									
Total fabric heat loss		(33) + (36) + (36a) =		63.3931 (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	47.6732	47.2553	46.8457	44.9216	44.5616	42.8858	42.8858	42.5755	43.5313	44.5616	45.2899	46.0512	(38)
Average = Sum(39)m / 12 =	111.0663	110.6484	110.2387	108.3147	107.9547	106.2789	106.2789	105.9686	106.9244	107.9547	108.6829	109.4443	(39)
												108.3130	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2561	1.2514	1.2468	1.2250	1.2209	1.2020	1.2020	1.1985	1.2093	1.2209	1.2292	1.2378	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

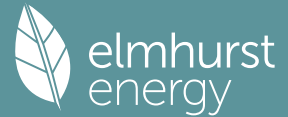
4. Water heating energy requirements (kWh/year)													
Assumed occupancy												2.6035 (42)	
Hot water usage for mixer showers	67.8714	66.8514	65.3651	62.5213	60.4227	58.0823	56.7521	58.2271	59.8440	62.3569	65.2618	67.6113 (42a)	
Hot water usage for baths	29.3101	28.8748	28.2619	27.1316	26.2853	25.3469	24.8400	25.4487	26.1115	27.1156	28.2691	29.2111 (42b)	
Hot water usage for other uses	41.2921	39.7906	38.2891	36.7875	35.2860	33.7845	33.7845	35.2860	36.7875	38.2891	39.7906	41.2921 (42c)	
Average daily hot water use (litres/day)												127.2886 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.4737	135.5169	131.9160	126.4405	121.9940	117.2137	115.3765	118.9618	122.7430	127.7616	133.3215	138.1145 (44)	
Energy content (annual)	219.3084	192.9742	202.7500	173.0907	164.2274	144.1279	139.5379	147.2996	151.3544	173.3712	189.9409	216.2540 (45)	
Distribution loss (46)m = 0.15 x (45)m											Total = Sum(45)m =		2114.2367
	32.8963	28.9461	30.4125	25.9636	24.6341	21.6192	20.9307	22.0949	22.7032	26.0057	28.4911	32.4381 (46)	
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)	
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)	
Combi loss	19.4030	17.4736	19.2357	18.3817	18.8466	18.0892	18.5973	18.6757	18.1622	18.9390	18.5519	19.3721 (61)	
Total heat required for water heating calculated for each month													
	238.7114	210.4478	221.9858	191.4724	183.0740	162.2171	158.1352	165.9752	169.5166	192.3102	208.4928	235.6261 (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													
	238.7114	210.4478	221.9858	191.4724	183.0740	162.2171	158.1352	165.9752	169.5166	192.3102	208.4928	235.6261 (64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =			2337.9647 (64)
Electric shower(s)												2338 (64)	
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)	
Heat gains from water heating, kWh/month													
	77.7708	68.5323	72.2233	62.1481	59.3173	52.4448	51.0457	53.6460	54.8659	62.3807	67.7933	76.7475 (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	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.7053	132.5309	119.7053	123.6955	119.7053	123.6955	119.7053	119.7053	123.6955	119.7053	123.6955	119.7053 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.1407	238.5911	232.4162	219.2705	202.6764	187.0803	176.6611	174.2107	180.3857	193.5314	210.1255	225.7216 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174 (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)	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388 (71)
Water heating gains (Table 5)	104.5306	101.9826	97.0744	86.3168	79.7275	72.8400	68.6098	72.1049	76.2026	83.8450	94.1574	103.1552 (72)
Total internal gains	525.4287	538.1567	514.2479	494.3348	467.1613	445.6679	427.0283	428.0730	442.3359	462.1338	493.0304	513.6342 (73)

6. Solar gains												
[Jan]			Area	Solar flux	g	FF	Access	Gains				
			m2	Table 6a	Specific data	Specific data	factor	W				
				W/m2	or Table 6b	or Table 6c	Table 6d					
North			0.7100	10.6334	0.7300	0.7000	0.7700	2.6735 (74)				
East			10.2000	19.6403	0.7300	0.7000	0.7700	70.9417 (76)				
West			7.1400	19.6403	0.7300	0.7000	0.7700	49.6592 (80)				
Solar gains	123.2744	241.0302	397.2100	580.5905	713.2305	730.9985	695.5701	596.2525	462.3128	286.0220	153.6733	101.4051 (83)
Total gains	648.7032	779.1869	911.4580	1074.9253	1180.3918	1176.6664	1122.5984	1024.3255	904.6486	748.1557	646.7037	615.0392 (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)												

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	48.8891	49.0738	49.2561	50.1311	50.2983	51.0914	51.0914	51.2410	50.7829	50.2983	49.9613	49.6137
alpha	4.2593	4.2716	4.2837	4.3421	4.3532	4.4061	4.4061	4.4161	4.3855	4.3532	4.3308	4.3076
util living area	0.9926	0.9833	0.9592	0.8836	0.7421	0.5551	0.4114	0.4663	0.7232	0.9357	0.9853	0.9940 (86)
MIT	19.7408	19.9318	20.2168	20.5731	20.8027	20.9030	20.9241	20.9203	20.8469	20.5119	20.0681	19.7212 (87)
Th 2	19.8754	19.8791	19.8828	19.9001	19.9033	19.9184	19.9184	19.9212	19.9126	19.9033	19.8967	19.8899 (88)
util rest of house	0.9904	0.9785	0.9473	0.8521	0.6819	0.4703	0.3128	0.3616	0.6392	0.9108	0.9803	0.9923 (89)
MIT 2	18.4148	18.6598	19.0194	19.4601	19.7101	19.8133	19.8265	19.8279	19.7673	19.4033	18.8484	18.4009 (90)
Living area fraction	18.6269	18.8632	19.2109	19.6381	19.8848	19.9876	20.0020	20.0026	19.9399	19.5805	19.0434	0.1599 (91)
MIT	18.4769	18.7132	19.0609	19.4881	19.7348	19.8376	19.8520	19.8526	19.7899	19.4305	18.8934	18.6121 (92)
Temperature adjustment												-0.1500
adjusted MIT												18.4621 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9864	0.9716	0.9360	0.8381	0.6718	0.4637	0.3067	0.3547	0.6287	0.8969	0.9737	0.9890 (94)
Useful gains	639.8880	757.0668	853.1208	900.9383	792.9375	545.6123	344.2863	363.3599	568.7347	671.0040	629.7004	608.2446 (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	1574.5737	1528.4134	1384.6928	1146.8450	867.3955	556.6450	345.6206	365.8634	608.3916	953.2990	1281.7443	1560.9011 (97)
Space heating kWh	695.4061	518.3449	395.4896	177.0528	55.3968	0.0000	0.0000	0.0000	0.0000	210.0275	469.4716	708.7764 (98a)
Space heating requirement - total per year (kWh/year)												3229.9658
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	695.4061	518.3449	395.4896	177.0528	55.3968	0.0000	0.0000	0.0000	0.0000	210.0275	469.4716	708.7764 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3229.9658
Space heating per m2										(98c) / (4) =		36.5298 (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	695.4061	518.3449	395.4896	177.0528	55.3968	0.0000	0.0000	0.0000	0.0000	210.0275	469.4716	708.7764 (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)	785.7696	585.7005	446.8809	200.0597	62.5952	0.0000	0.0000	0.0000	0.0000	237.3192	530.4764	800.8773 (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	238.7114	210.4478	221.9858	191.4724	183.0740	162.2171	158.1352	165.9752	169.5166	192.3102	208.4928	235.6261 (64)
Efficiency of water heater (217)m	88.1118	88.0616	87.9548	87.7143	87.3439	87.0000	87.0000	87.0000	87.0000	87.7766	88.0332	88.1209 (216)
Fuel for water heating, kWh/month	270.9188	238.9781	252.3861	218.2911	209.6014	186.4564	181.7646	190.7761	194.8467	219.0905	236.8342	267.3895 (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	24.3640	19.5457	17.5988	12.8936	9.9594	8.1369	9.0853	11.8094	15.3392	20.1259	22.7322	25.0412 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-30.9425	-47.5571	-74.7039	-89.3512	-98.9541	-93.0596	-91.5220	-84.8716	-72.7612	-56.5888	-35.0525	-26.0817 (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)	-14.4775	-34.6718	-80.7865	-138.7408	-197.9528	-204.5537	-199.7829	-159.9391	-105.0395	-52.8880	-20.1311	-11.0221 (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												3649.6788 (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												2667.3335 (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)												196.6316 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2021.4319 (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)

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Energy used
Total delivered energy for all uses

0.0000 (237)
4578.2121 (238)

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

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	3649.6788	0.2100	766.4326 (261)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating (other fuel)	2667.3335	0.2100	560.1400 (264)
Space and water heating			1326.5726 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	196.6316	0.1443	28.3800 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-801.4461	0.1333	-106.8705
PV Unit electricity exported	-1219.9857	0.1227	-149.6896
Total			-256.5601 (269)
Total CO ₂ , kg/year			1110.3218 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.5600 (273)

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

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	3649.6788	1.1300	4124.1371 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	2667.3335	1.1300	3014.0869 (278)
Space and water heating			7138.2240 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	196.6316	1.5338	301.6001 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-801.4461	1.4928	-1196.3719
PV Unit electricity exported	-1219.9857	0.4502	-549.2798
Total			-1745.6516 (283)
Total Primary energy kWh/year			5824.2733 (286)
Dwelling Primary energy Rate (DPER)			65.8700 (287)

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

1. Overall dwelling characteristics

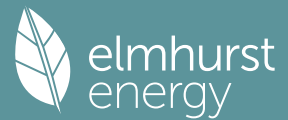
	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	44.2100 (1b)	x 2.3800 (2b)	= 105.2198 (1b) - (3b)
First floor	44.2100 (1c)	x 2.6800 (2c)	= 118.4828 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 223.7026 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1341 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3841 (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) = 0.3841 (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	0.4897 0.4801 0.4705 0.4225 0.4129 0.3649 0.3649 0.3553 0.3841 0.4129 0.4321 0.4513 (22b)
Effective ac	0.6199 0.6153 0.6107 0.5893 0.5852 0.5666 0.5666 0.5631 0.5738 0.5852 0.5934 0.6018 (25)

3. Heat losses and heat loss parameter

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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)			18.0500	1.1450	20.6679			(27)
Ground Floor			44.2100	0.1300	5.7473			(28a)
External Wall	138.1700	20.1900	117.9800	0.1800	21.2364			(29a)
Plane Roof	44.2100		44.2100	0.1100	4.8631			(30)
Total net area of external elements Aum(A, m2)			226.5900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	54.6547			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								221.0786 (35)
List of Thermal Bridges								
K1 Element				Length	Psi-value		Total	
E2 Other lintels (including other steel lintels)				14.3700	0.0500		0.7185	
E3 Sill				11.5400	0.0500		0.5770	
E4 Jamb				30.0000	0.0500		1.5000	
E5 Ground floor (normal)				27.5800	0.1600		4.4128	
E10 Eaves (insulation at ceiling level)				17.4400	0.0600		1.0464	
E16 Corner (normal)				20.0400	0.0900		1.8036	
E6 Intermediate floor within a dwelling				27.5800	0.0000		0.0000	
E12 Gable (insulation at ceiling level)				10.1400	0.0600		0.6084	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.6667	(36)
Point Thermal bridges							0.0000	
Total fabric heat loss						(33) + (36) + (36a) =	65.3214	(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	45.7637	45.4199	45.0830	43.5003	43.2042	41.8257	41.8257	41.5705	42.3567	43.2042	43.8032	44.4295	(38)
Average = Sum(39)m / 12 =	111.0851	110.7414	110.4044	108.8217	108.5256	107.1472	107.1472	106.8919	107.6781	108.5256	109.1247	109.7509	(39)
												108.8203	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2563	1.2524	1.2486	1.2307	1.2274	1.2118	1.2118	1.2089	1.2178	1.2274	1.2342	1.2412	(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													2.6035 (42)
Hot water usage for mixer showers													
Hot water usage for baths	67.8714	66.8514	65.3651	62.5213	60.4227	58.0823	56.7521	58.2271	59.8440	62.3569	65.2618	67.6113	(42a)
Hot water usage for other uses	29.3101	28.8748	28.2619	27.1316	26.2853	25.3469	24.8400	25.4487	26.1115	27.1156	28.2691	29.2111	(42b)
Average daily hot water use (litres/day)	41.2921	39.7906	38.2891	36.7875	35.2860	33.7845	33.7845	35.2860	36.7875	38.2891	39.7906	41.2921	(42c)
												127.2886	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	138.4737	135.5169	131.9160	126.4405	121.9940	117.2137	115.3765	118.9618	122.7430	127.7616	133.3215	138.1145	(44)
Energy content (annual)	219.3084	192.9742	202.7500	173.0907	164.2274	144.1279	139.5379	147.2996	151.3544	173.3712	189.9409	216.2540	(45)
Distribution loss (46)m = 0.15 x (45)m													
Water storage loss:	32.8963	28.9461	30.4125	25.9636	24.6341	21.6192	20.9307	22.0949	22.7032	26.0057	28.4911	32.4381	(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	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	270.2673	239.0016	253.7089	222.4058	215.1863	193.4430	190.4968	198.2585	200.6695	224.3301	239.2560	267.2129	(62)
WWHRS	-31.0280	-27.4414	-28.7350	-23.7937	-22.1749	-18.9752	-17.7863	-18.9139	-19.6325	-23.1446	-26.2200	-30.4534	(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	239.2394	211.5602	224.9739	198.6120	193.0114	174.4677	172.7105	179.3446	181.0370	201.1856	213.0360	236.7595	(64)
12Total per year (kWh/year)													
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Heat gains from water heating, kWh/month	85.6598	75.6708	80.1541	69.8814	67.3453	60.2513	59.1361	61.7168	62.6541	70.3857	75.4841	84.6442	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	130.1735	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	119.7053	132.5309	119.7053	123.6955	119.7053	123.6955	119.7053	119.7053	123.6955	119.7053	123.6955	119.7053	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	236.1407	238.5911	232.4162	219.2705	202.6764	187.0803	176.6611	174.2107	180.3857	193.5314	210.1255	225.7216	(68)
Pumps, fans	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	36.0174	(69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Water heating gains (Table 5)	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	(71)
Total internal gains	115.1341	112.6053	107.7340	97.0575	90.5179	83.6823	79.4840	82.9527	87.0196	94.6044	104.8390	113.7691	(72)
	536.0322	548.7794	524.9076	505.0756	477.9517	456.5102	437.9025	438.9208	453.1528	472.8931	503.7121	524.2480	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W
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	W/m2			or Table 6b			or Table 6c			Table 6d		
North		0.7100	10.6334		0.6300		0.7000		0.7700		2.3073	(74)
East		10.2000	19.6403		0.6300		0.7000		0.7700		61.2237	(76)
West		7.1400	19.6403		0.6300		0.7000		0.7700		42.8566	(80)

Solar gains	106.3875	208.0124	342.7977	501.0575	615.5277	630.8617	600.2865	514.5741	398.9822	246.8409	132.6221	87.5140	(83)
Total gains	642.4197	756.7917	867.7053	1006.1331	1093.4794	1087.3719	1038.1890	953.4949	852.1351	719.7340	636.3342	611.7620	(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	48.8809	49.0326	49.1822	49.8975	50.0337	50.6774	50.6774	50.7984	50.4275	50.0337	49.7590	49.4751	
alpha	4.2587	4.2688	4.2788	4.3265	4.3356	4.3785	4.3785	4.3866	4.3618	4.3356	4.3173	4.2983	
util living area	0.9928	0.9850	0.9653	0.9033	0.7787	0.5969	0.4462	0.5016	0.7539	0.9433	0.9862	0.9942	(86)
MIT	19.4095	19.6434	20.0013	20.4643	20.7926	20.9516	20.9891	20.9823	20.8676	20.4091	19.8330	19.3808	(87)
Th 2	19.8752	19.8783	19.8813	19.8955	19.8982	19.9106	19.9106	19.9129	19.9058	19.8982	19.8928	19.8871	(88)
util rest of house	0.9907	0.9806	0.9549	0.8753	0.7207	0.5082	0.3396	0.3898	0.6712	0.9207	0.9814	0.9924	(89)
MIT 2	18.0415	18.3404	18.7920	19.3632	19.7268	19.8828	19.9070	19.9064	19.8158	19.3140	18.5937	18.0130	(90)
Living area fraction													
MIT	18.2603	18.5488	18.9854	19.5393	19.8972	20.0537	20.0800	20.0784	19.9840	19.4891	18.7919	18.2317	(91)
Temperature adjustment												0.0000	
adjusted MIT	18.2603	18.5488	18.9854	19.5393	19.8972	20.0537	20.0800	20.0784	19.9840	19.4891	18.7919	18.2317	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9861	0.9732	0.9440	0.8645	0.7207	0.5204	0.3566	0.4074	0.6777	0.9098	0.9745	0.9885	(94)
Useful gains	633.5110	736.5445	819.1164	869.8009	788.0289	565.8727	370.1664	388.4102	577.5274	654.8079	620.1053	604.7372	(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	1550.7805	1511.4829	1378.4418	1157.7852	889.6110	584.3504	372.8760	393.1948	633.5829	964.6973	1275.8698	1539.9960	(97)
Space heating kWh	682.4486	520.7586	416.1381	207.3486	75.5771	0.0000	0.0000	0.0000	0.0000	230.5577	472.1504	695.8325	(98a)
Space heating requirement - total per year (kWh/year)												3300.8117	
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	682.4486	520.7586	416.1381	207.3486	75.5771	0.0000	0.0000	0.0000	0.0000	230.5577	472.1504	695.8325	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3300.8117	
Space heating per m2										(98c) / (4) =		37.3311	(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	682.4486	520.7586	416.1381	207.3486	75.5771	0.0000	0.0000	0.0000	0.0000	230.5577	472.1504	695.8325	(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)	738.5807	563.5916	450.3659	224.4033	81.7934	0.0000	0.0000	0.0000	0.0000	249.5213	510.9853	753.0655	(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	239.2394	211.5602	224.9739	198.6120	193.0114	174.4677	172.7105	179.3446	181.0370	201.1856	213.0360	236.7595	(64)
Efficiency of water heater (217)m	86.4955	86.2320	85.6800	84.4738	82.5470	80.3000	80.3000	80.3000	80.3000	84.6742	86.0351	86.5468	(216)
Fuel for water heating, kWh/month	276.5917	245.3384	262.5747	235.1166	233.8200	217.2699	215.0816	223.3432	225.4508	237.5995	247.6151	273.5623	(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	24.8724	19.9536	17.9660	13.1626	10.1672	8.3067	9.2749	12.0558	15.6593	20.5459	23.2065	25.5637	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-40.8800	-57.3899	-82.1504	-91.9682	-98.8267	-92.1025	-90.9336	-85.9898	-77.2474	-65.4003	-44.8437	-35.3692	(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)	-23.8522	-50.0866	-99.3932	-149.0660	-196.9092	-197.7971	-195.4981	-165.6438	-121.5466	-71.5922	-31.8322	-18.8712	(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												3572.3070	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

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Efficiency of water heater	80.3000	
Water heating fuel used	2893.3638	(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)	200.7345	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2185.1900	(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	4567.2153	(238)

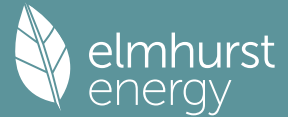
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3572.3070	0.2100	750.1845 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2893.3638	0.2100	607.6064 (264)
Space and water heating			1357.7909 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	200.7345	0.1443	28.9722 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-863.1016	0.1347	-116.2434
PV Unit electricity exported	-1322.0884	0.1259	-166.4980
Total			-282.7414 (269)
Total CO2, kg/year			1115.9509 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.6200 (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	3572.3070	1.1300	4036.7069 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2893.3638	1.1300	3269.5011 (278)
Space and water heating			7306.2080 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	200.7345	1.5338	307.8933 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-863.1016	1.4978	-1292.7221
PV Unit electricity exported	-1322.0884	0.4623	-611.1642
Total			-1903.8863 (283)
Total Primary energy kWh/year			5840.3158 (286)
Target Primary Energy Rate (TPER)			66.0500 (287)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 33			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	93 A	DER	12.56	TER	12.62		
Environmental	89 B	% DER < TER				0.48	
CO ₂ Emissions (t/year)	1.06	DFEE	40.27	TFEE	43.44		
Compliance Check	See BREL	% DFEE < TFEE				7.30	
% DPER < TPER	0.27	DPER	65.87	TPER	66.05		
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	44.2100 (1b)	x 2.3800 (2b)	= 105.2198 (1b) - (3b)
First floor	44.2100 (1c)	x 2.6800 (2c)	= 118.4828 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 223.7026 (5)

2. Ventilation rate

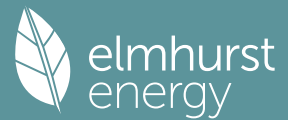
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.2235 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.4235 (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) = 0.4235 (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	0.5400	0.5294	0.5188	0.4659	0.4553	0.4023	0.4023	0.3917	0.4235	0.4553	0.4764	0.4976 (22b)
Effective ac	0.6458	0.6401	0.6346	0.6085	0.6036	0.5809	0.5809	0.5767	0.5897	0.6036	0.6135	0.6238 (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)			18.0500	1.2357	22.3051		(27)
Door			2.1400	1.3000	2.7820		(26a)
Ground Floor			44.2100	0.1300	5.7473	75.0000	3315.7500 (28a)
External Wall	138.1700	20.1900	117.9800	0.1900	22.4162	110.0000	12977.8000 (29a)
Plane Roof	44.2100		44.2100	0.0900	3.9789	9.0000	397.8900 (30)
Total net area of external elements Aum(A, m ²)			226.5900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		57.2295		(33)
Studs			156.0600			9.0000	1404.5400 (32c)
Internal Floor 1			44.2100			18.0000	795.7800 (32d)
Internal Ceiling 1			72.8900			9.0000	656.0100 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	19547.7700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							221.0786 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				14.3700	0.0240	0.3449	
E3 Sill				11.5400	0.0210	0.2423	
E4 Jamb				30.0000	0.0160	0.4800	
E5 Ground floor (normal)				27.5800	0.0920	2.5374	

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E10 Eaves (insulation at ceiling level)	17.4400	0.0580	1.0115										
E16 Corner (normal)	20.0400	0.0470	0.9419										
E6 Intermediate floor within a dwelling	27.5800	0.0010	0.0276										
E12 Gable (insulation at ceiling level)	10.1400	0.0570	0.5780										
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				6.1635 (36)									
Point Thermal bridges				0.0000									
Total fabric heat loss		(33) + (36) + (36a) =		63.3931 (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	47.6732	47.2553	46.8457	44.9216	44.5616	42.8858	42.8858	42.5755	43.5313	44.5616	45.2899	46.0512	(38)
Average = Sum(39)m / 12 =	111.0663	110.6484	110.2387	108.3147	107.9547	106.2789	106.2789	105.9686	106.9244	107.9547	108.6829	109.4443	(39)
												108.3130	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2561	1.2514	1.2468	1.2250	1.2209	1.2020	1.2020	1.1985	1.2093	1.2209	1.2292	1.2378	(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													2.6035 (42)
Hot water usage for mixer showers													67.6113 (42a)
Hot water usage for baths													29.2111 (42b)
Hot water usage for other uses													41.2921 (42c)
Average daily hot water use (litres/day)													127.2886 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	138.4737	135.5169	131.9160	126.4405	121.9940	117.2137	115.3765	118.9618	122.7430	127.7616	133.3215	138.1145	(44)
Energy content (annual)	219.3084	192.9742	202.7500	173.0907	164.2274	144.1279	139.5379	147.2996	151.3544	173.3712	189.9409	216.2540	(45)
Distribution loss (46)m = 0.15 x (45)m													2114.2367
Water storage loss:													
Total storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	19.4030	17.4736	19.2357	18.3817	18.8466	18.0892	18.5973	18.6757	18.1622	18.9390	18.5519	19.3721	(61)
Total heat required for water heating calculated for each month													
WWHRS	238.7114	210.4478	221.9858	191.4724	183.0740	162.2171	158.1352	165.9752	169.5166	192.3102	208.4928	235.6261	(62)
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	(63a)
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	(63b)
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	(63c)
Output from w/h	238.7114	210.4478	221.9858	191.4724	183.0740	162.2171	158.1352	165.9752	169.5166	192.3102	208.4928	235.6261	(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	77.7708	68.5323	72.2233	62.1481	59.3173	52.4448	51.0457	53.6460	54.8659	62.3807	67.7933	76.7475	(65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a) m =													0.0000 (64a)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	156.2082	156.2082	156.2082	156.2082	156.2082	156.2082	156.2082	156.2082	156.2082	156.2082	156.2082	156.2082	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	27.8352	24.7230	20.1061	15.2216	11.3783	9.6061	10.3797	13.4919	18.1088	22.9933	26.8366	28.6089	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	352.4488	356.1062	346.8898	327.2694	302.5021	279.2243	263.6734	260.0160	269.2324	288.8528	313.6201	336.8979	(68)
Pumps, fans	53.2243	53.2243	53.2243	53.2243	53.2243	53.2243	53.2243	53.2243	53.2243	53.2243	53.2243	53.2243	(69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Water heating gains (Table 5)	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	(71)
Total internal gains	104.5306	101.9826	97.0744	86.3168	79.7275	72.8400	68.6098	72.1049	76.2026	83.8450	94.1574	103.1552	(72)
	593.1084	591.1055	572.3640	537.1015	501.9016	466.9641	447.9565	450.9065	468.8375	503.9848	542.9078	576.9556	(73)

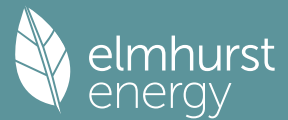
6. Solar gains

[Jan]													
	Area	Solar flux	g	FF	Access	Gains							
	m2	Table 6a	Specific data	Specific data	factor	W							
		W/m2	or Table 6b	or Table 6c	Table 6d								
North	0.7100	10.6334	0.7300	0.7000	0.7700	2.6735	(74)						
East	10.2000	19.6403	0.7300	0.7000	0.7700	70.9417	(76)						
West	7.1400	19.6403	0.7300	0.7000	0.7700	49.6592	(80)						
Solar gains	123.2744	241.0302	397.2100	580.5905	713.2305	730.9985	695.5701	596.2525	462.3128	286.0220	153.6733	101.4051	(83)
Total gains	716.3828	832.1357	969.5740	1117.6920	1215.1322	1197.9626	1143.5266	1047.1590	931.1503	790.0068	696.5811	678.3607	(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	

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tau	48.8891	49.0738	49.2561	50.1311	50.2983	51.0914	51.0914	51.2410	50.7829	50.2983	49.9613	49.6137
alpha	4.2593	4.2716	4.2837	4.3421	4.3532	4.4061	4.4061	4.4161	4.3855	4.3532	4.3308	4.3076
util living area	0.9893	0.9790	0.9502	0.8713	0.7285	0.5465	0.4042	0.4569	0.7094	0.9243	0.9808	0.9914 (86)
MIT	19.8043	19.9794	20.2631	20.5968	20.8118	20.9046	20.9245	20.9210	20.8531	20.5417	20.1134	19.7813 (87)
Th 2	19.8754	19.8791	19.8828	19.9001	19.9033	19.9184	19.9184	19.9212	19.9126	19.9033	19.8967	19.8899 (88)
util rest of house	0.9862	0.9730	0.9363	0.8378	0.6677	0.4626	0.3072	0.3539	0.6249	0.8962	0.9744	0.9888 (89)
MIT 2	18.4953	18.7193	19.0753	19.4860	19.7182	19.8143	19.8266	19.8282	19.7719	19.4370	18.9050	18.4773 (90)
Living area fraction	18.7047	18.9208	19.2652	19.6636	19.8931	19.9886	20.0022	20.0029	19.9448	19.6136	19.0982	18.6858 (92)
MIT	18.5547	18.7708	19.1152	19.5136	19.7431	19.8386	19.8522	19.8529	19.7948	19.4636	18.9482	-0.1500
Temperature adjustment												18.5358 (93)
adjusted MIT												

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9810	0.9651	0.9241	0.8241	0.6580	0.4561	0.3012	0.3472	0.6148	0.8820	0.9667	0.9845 (94)
Useful gains	702.7863	803.1053	896.0167	921.0548	799.5281	546.4060	344.3988	363.6026	572.5009	696.7548	673.3572	667.8410 (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	1583.2124	1534.7838	1390.6871	1149.6139	868.2853	556.7555	345.6390	365.9016	608.9112	956.8719	1287.7023	1568.9747 (97)
Space heating kWh	655.0370	491.6880	368.0347	164.5625	51.1554	0.0000	0.0000	0.0000	0.0000	193.5271	442.3284	670.4435 (98a)
Space heating requirement - total per year (kWh/year)												3036.7766
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	655.0370	491.6880	368.0347	164.5625	51.1554	0.0000	0.0000	0.0000	0.0000	193.5271	442.3284	670.4435 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3036.7766
Space heating per m2										(98c) / (4) =		34.3449 (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	655.0370	491.6880	368.0347	164.5625	51.1554	0.0000	0.0000	0.0000	0.0000	193.5271	442.3284	670.4435 (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)	740.1548	555.5796	415.8584	185.9464	57.8027	0.0000	0.0000	0.0000	0.0000	218.6747	499.8062	757.5632 (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	238.7114	210.4478	221.9858	191.4724	183.0740	162.2171	158.1352	165.9752	169.5166	192.3102	208.4928	235.6261 (64)
Efficiency of water heater (217)m	88.0943	88.0450	87.9296	87.6869	87.3232	87.0000	87.0000	87.0000	87.0000	87.7460	88.0139	87.0000 (216)
Fuel for water heating, kWh/month	270.9725	239.0230	252.4585	218.3591	209.6510	186.4564	181.7646	190.7761	194.8467	219.1671	236.8863	267.4379 (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	24.3640	19.5457	17.5988	12.8936	9.9594	8.1369	9.0853	11.8094	15.3392	20.1259	22.7322	25.0412 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-30.9425	-47.5571	-74.7039	-89.3512	-98.9541	-93.0596	-91.5220	-84.8716	-72.7612	-56.5888	-35.0525	-26.0817 (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	-14.4775	-34.6718	-80.7865	-138.7408	-197.9528	-204.5537	-199.7829	-159.9391	-105.0395	-52.8880	-20.1311	-11.0221 (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												3431.3860 (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												2667.7992 (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)												196.6316 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2021.4319 (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)

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Total delivered energy for all uses

4360.3849 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3431.3860	3.6400	124.9025 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2667.7992	3.6400	97.1079 (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	196.6316	16.4900	32.4246 (250)
Additional standing charges			92.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-801.4461	16.4900	-132.1585
PV Unit electricity exported	-1219.9857	5.5900	-68.1972
Total			-200.3557 (252)
Total energy cost			160.2606 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.4324 (257)
SAP value		92.9904
SAP rating (Section 12)		93 (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	3431.3860	0.2100	720.5911 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2667.7992	0.2100	560.2378 (264)
Space and water heating			1280.8289 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	196.6316	0.1443	28.3800 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-801.4461	0.1333	-106.8705
PV Unit electricity exported	-1219.9857	0.1227	-149.6896
Total			-256.5601 (269)
Total CO2, kg/year			1064.5781 (272)
CO2 emissions per m2			12.0400 (273)
EI value			89.3079
EI rating			89 (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

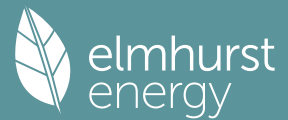
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	44.2100 (1b)	x 2.3800 (2b)	= 105.2198 (1b) - (3b)
First floor	44.2100 (1c)	x 2.6800 (2c)	= 118.4828 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	223.7026 (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) = 0.2235 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.4235 (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) = 0.4235 (21)

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Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Effective ac	0.5400	0.5294	0.5188	0.4659	0.4553	0.4023	0.4023	0.3917	0.4235	0.4553	0.4764	0.4976	(22b)
	0.6458	0.6401	0.6346	0.6085	0.6036	0.5809	0.5809	0.5767	0.5897	0.6036	0.6135	0.6238	(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)			18.0500	1.2357	22.3051			(27)
Door			2.1400	1.3000	2.7820			(26a)
Ground Floor			44.2100	0.1300	5.7473	75.0000	3315.7500	(28a)
External Wall	138.1700	20.1900	117.9800	0.1900	22.4162	110.0000	12977.8000	(29a)
Plane Roof	44.2100		44.2100	0.0900	3.9789	9.0000	397.8900	(30)
Total net area of external elements Aum (A, m2)			226.5900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	57.2295			(33)
Studs			156.0600			9.0000	1404.5400	(32c)
Internal Floor 1			44.2100			18.0000	795.7800	(32d)
Internal Ceiling 1			72.8900			9.0000	656.0100	(32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	19547.7700	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							221.0786	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	14.3700	0.0240	0.3449	
E3 Sill	11.5400	0.0210	0.2423	
E4 Jamb	30.0000	0.0160	0.4800	
E5 Ground floor (normal)	27.5800	0.0920	2.5374	
E10 Eaves (insulation at ceiling level)	17.4400	0.0580	1.0115	
E16 Corner (normal)	20.0400	0.0470	0.9419	
E6 Intermediate floor within a dwelling	27.5800	0.0010	0.0276	
E12 Gable (insulation at ceiling level)	10.1400	0.0570	0.5780	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.1635	(36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	63.3931 (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	47.6732	47.2553	46.8457	44.9216	44.5616	42.8858	42.8858	42.5755	43.5313	44.5616	45.2899	46.0512	(38)
Average = Sum(39)m / 12 =	111.0663	110.6484	110.2387	108.3147	107.9547	106.2789	106.2789	105.9686	106.9244	107.9547	108.6829	109.4443	(39)
												108.3130	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2561	1.2514	1.2468	1.2250	1.2209	1.2020	1.2020	1.1985	1.2093	1.2209	1.2292	1.2378	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

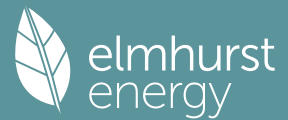
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6035 (42)
Hot water usage for mixer showers													
Hot water usage for baths	67.8714	66.8514	65.3651	62.5213	60.4227	58.0823	56.7521	58.2271	59.8440	62.3569	65.2618	67.6113	(42a)
Hot water usage for other uses	29.3101	28.8748	28.2619	27.1316	26.2853	25.3469	24.8400	25.4487	26.1115	27.1156	28.2691	29.2111	(42b)
Average daily hot water use (litres/day)	41.2921	39.7906	38.2891	36.7875	35.2860	33.7845	33.7845	35.2860	36.7875	38.2891	39.7906	41.2921	(42c)
												127.2886	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	138.4737	135.5169	131.9160	126.4405	121.9940	117.2137	115.3765	118.9618	122.7430	127.7616	133.3215	138.1145	(44)
Energy content (annual)	219.3084	192.9742	202.7500	173.0907	164.2274	144.1279	139.5379	147.2996	151.3544	173.3712	189.9409	216.2540	(45)
Distribution loss (46)m = 0.15 x (45)m													
Water storage loss:	32.8963	28.9461	30.4125	25.9636	24.6341	21.6192	20.9307	22.0949	22.7032	26.0057	28.4911	32.4381	(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	19.4030	17.4736	19.2357	18.3817	18.8466	18.0892	18.5973	18.6757	18.1622	18.9390	18.5519	19.3721	(61)
Total heat required for water heating calculated for each month	238.7114	210.4478	221.9858	191.4724	183.0740	162.2171	158.1352	165.9752	169.5166	192.3102	208.4928	235.6261	(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	238.7114	210.4478	221.9858	191.4724	183.0740	162.2171	158.1352	165.9752	169.5166	192.3102	208.4928	235.6261	(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	77.7708	68.5323	72.2233	62.1481	59.3173	52.4448	51.0457	53.6460	54.8659	62.3807	67.7933	76.7475	(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	156.2082	156.2082	156.2082	156.2082	156.2082	156.2082	156.2082	156.2082	156.2082	156.2082	156.2082	156.2082	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.8352	24.7230	20.1061	15.2216	11.3783	9.6061	10.3797	13.4919	18.1088	22.9933	26.8366	28.6089	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	352.4488	356.1062	346.8898	327.2694	302.5021	279.2243	263.6734	260.0160	269.2324	288.8528	313.6201	336.8979	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													

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Pumps, fans	53.2243 3.0000	53.2243 3.0000	53.2243 3.0000	53.2243 3.0000	53.2243 3.0000	53.2243 0.0000	53.2243 0.0000	53.2243 0.0000	53.2243 0.0000	53.2243 3.0000	53.2243 3.0000	53.2243 (69) 3.0000 (70)
Losses e.g. evaporation	(negative values) (Table 5)											
	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388 (71)
Water heating gains (Table 5)	104.5306	101.9826	97.0744	86.3168	79.7275	72.8400	68.6098	72.1049	76.2026	83.8450	94.1574	103.1552 (72)
Total internal gains	593.1084	591.1055	572.3640	537.1015	501.9016	466.9641	447.9565	450.9065	468.8375	503.9848	542.9078	576.9556 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W
North					0.7100	10.6334		0.7300	0.7000	0.7700		2.6735 (74)
East					10.2000	19.6403		0.7300	0.7000	0.7700		70.9417 (76)
West					7.1400	19.6403		0.7300	0.7000	0.7700		49.6592 (80)
Solar gains	123.2744	241.0302	397.2100	580.5905	713.2305	730.9985	695.5701	596.2525	462.3128	286.0220	153.6733	101.4051 (83)
Total gains	716.3828	832.1357	969.5740	1117.6920	1215.1322	1197.9626	1143.5266	1047.1590	931.1503	790.0068	696.5811	678.3607 (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	48.8891	49.0738	49.2561	50.1311	50.2983	51.0914	51.0914	51.2410	50.7829	50.2983	49.9613	49.6137
alpha	4.2593	4.2716	4.2837	4.3421	4.3532	4.4061	4.4061	4.4161	4.3855	4.3532	4.3308	4.3076
util living area	0.9893	0.9790	0.9502	0.8713	0.7285	0.5465	0.4042	0.4569	0.7094	0.9243	0.9808	0.9914 (86)
MIT	19.8043	19.9794	20.2631	20.5968	20.8118	20.9046	20.9245	20.9210	20.8531	20.5417	20.1134	19.7813 (87)
Th 2	19.8754	19.8791	19.8828	19.9001	19.9033	19.9184	19.9184	19.9212	19.9126	19.9033	19.8967	19.8899 (88)
util rest of house	0.9862	0.9730	0.9363	0.8378	0.6677	0.4626	0.3072	0.3539	0.6249	0.8962	0.9744	0.9888 (89)
MIT 2	18.4953	18.7193	19.0753	19.4860	19.7182	19.8143	19.8266	19.8282	19.7719	19.4370	18.9050	18.4773 (90)
Living area fraction	18.7047	18.9208	19.2652	19.6636	19.8931	19.9886	20.0022	20.0029	19.9448	19.6136	19.0982	0.1599 (91)
MIT	18.7047	18.9208	19.2652	19.6636	19.8931	19.9886	20.0022	20.0029	19.9448	19.6136	19.0982	18.6858 (92)
Temperature adjustment	18.5547	18.7708	19.1152	19.5136	19.7431	19.8386	19.8522	19.8529	19.7948	19.4636	18.9482	-0.1500
adjusted MIT	18.5547	18.7708	19.1152	19.5136	19.7431	19.8386	19.8522	19.8529	19.7948	19.4636	18.9482	18.5358 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9810	0.9651	0.9241	0.8241	0.6580	0.4561	0.3012	0.3472	0.6148	0.8820	0.9667	0.9845 (94)
Useful gains	702.7863	803.1053	896.0167	921.0548	799.5281	546.4060	344.3988	363.6026	572.5009	696.7548	673.3572	667.8410 (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	1583.2124	1534.7838	1390.6871	1149.6139	868.2853	556.7555	345.6390	365.9016	608.9112	956.8719	1287.7023	1568.9747 (97)
Space heating kWh	655.0370	491.6880	368.0347	164.5625	51.1554	0.0000	0.0000	0.0000	0.0000	193.5271	442.3284	670.4435 (98a)
Space heating requirement - total per year (kWh/year)												3036.7766
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	655.0370	491.6880	368.0347	164.5625	51.1554	0.0000	0.0000	0.0000	0.0000	193.5271	442.3284	670.4435 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3036.7766
Space heating per m ²										(98c) / (4) =		34.3449 (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	655.0370	491.6880	368.0347	164.5625	51.1554	0.0000	0.0000	0.0000	0.0000	193.5271	442.3284	670.4435	(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)	740.1548	555.5796	415.8584	185.9464	57.8027	0.0000	0.0000	0.0000	0.0000	218.6747	499.8062	757.5632	(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	238.7114	210.4478	221.9858	191.4724	183.0740	162.2171	158.1352	165.9752	169.5166	192.3102	208.4928	235.6261	(64)
Efficiency of water heater (217)m	88.0943	88.0450	87.9296	87.6869	87.3232	87.0000	87.0000	87.0000	87.0000	87.7460	88.0139	88.1050	(216)
Fuel for water heating, kWh/month	270.9725	239.0230	252.4585	218.3591	209.6510	186.4564	181.7646	190.7761	194.8467	219.1671	236.8863	267.4379	(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	(219)
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	(221)
Lighting	24.3640	19.5457	17.5988	12.8936	9.9594	8.1369	9.0853	11.8094	15.3392	20.1259	22.7322	25.0412	(223a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-30.9425	-47.5571	-74.7039	-89.3512	-98.9541	-93.0596	-91.5220	-84.8716	-72.7612	-56.5888	-35.0525	-26.0817	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

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(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	-14.4775	-34.6718	-80.7865	-138.7408	-197.9528	-204.5537	-199.7829	-159.9391	-105.0395	-52.8880	-20.1311	-11.0221	(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												3431.3860	(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												2667.7992	(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)												196.6316	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2021.4319	(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												4360.3849	(238)

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

	Fuel kWh/year	Fuel price £/kWh	Fuel cost £/year	
Space heating - main system 1	3431.3860	5.6000	192.1576	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2667.7992	5.6000	149.3968	(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	196.6316	26.0600	51.2422	(250)
Additional standing charges			99.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-801.4461	26.0600	-208.8569	
PV Unit electricity exported	-1219.9857	5.8100	-70.8812	
Total			-279.7380	(252)
Total energy cost			234.4701	(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	3431.3860	0.2100	720.5911	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2667.7992	0.2100	560.2378	(264)
Space and water heating			1280.8289	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	196.6316	0.1443	28.3800	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-801.4461	0.1333	-106.8705	
PV Unit electricity exported	-1219.9857	0.1227	-149.6896	
Total			-256.5601	(269)
Total CO2, kg/year			1064.5781	(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	3431.3860	1.1300	3877.4662	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2667.7992	1.1300	3014.6131	(278)
Space and water heating			6892.0793	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	196.6316	1.5338	301.6001	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-801.4461	1.4928	-1196.3719	
PV Unit electricity exported	-1219.9857	0.4502	-549.2798	
Total			-1745.6516	(283)
Total Primary energy kWh/year			5578.1285	(286)

SAP 10 EPC IMPROVEMENTS

Plot 33

Current energy efficiency rating: A 93
Current environmental impact rating: B 89

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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 + 0.6 -£ 20 -135 kg (12.6%)

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

Potential energy efficiency rating: A 93
Potential environmental impact rating: B 89

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	£74	£74	£0
Mains gas	£441	£441	£0
Space heating	£314	£314	£0
Water heating	£149	£149	£0
Lighting	£51	£51	£0
Generated (PV)	-£280	-£280	£0
Total cost of fuels	£235	£235	£0
Total cost of uses	£234	£234	£0
Delivered energy	49 kWh/m²	49 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.1 tonnes	1.1 tonnes	0.0 tonnes
CO2 emissions per m²	12 kg/m²	12 kg/m²	0 kg/m²
Primary energy	63 kWh/m²	63 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m²)	Storey height (m)	Volume (m³)
Ground floor	44.2100 (1b)	x 2.3800 (2b)	= 105.2198 (1b) - (3b)
First floor	44.2100 (1c)	x 2.6800 (2c)	= 118.4828 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 223.7026 (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) = 0.2235 (8)

Pressure test Yes

Pressure Test Method Blower Door

Measured/design AP50 4.0000 (17)

Infiltration rate 0.4235 (18)

Number of sides sheltered 0 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 1.0000 (20)

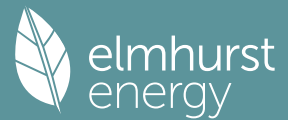
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.4235 (21)

	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	0.5400	0.5294	0.5188	0.4659	0.4553	0.4023	0.4023	0.3917	0.4235	0.4553	0.4764	0.4976 (22b)
Effective ac	0.6458	0.6401	0.6346	0.6085	0.6036	0.5809	0.5809	0.5767	0.5897	0.6036	0.6135	0.6238 (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)			18.0500	1.2357	22.3051		(27)

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Door			2.1400	1.3000	2.7820			(26a)
Ground Floor			44.2100	0.1300	5.7473	75.0000	3315.7500	(28a)
External Wall	138.1700	20.1900	117.9800	0.1900	22.4162	110.0000	12977.8000	(29a)
Plane Roof	44.2100		44.2100	0.0900	3.9789	9.0000	397.8900	(30)
Total net area of external elements Aum(A, m2)			226.5900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		57.2295			(33)
Studs			156.0600			9.0000	1404.5400	(32c)
Internal Floor 1			44.2100			18.0000	795.7800	(32d)
Internal Ceiling 1			72.8900			9.0000	656.0100	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 19547.7700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 221.0786 (35)

List of Thermal Bridges								
K1 Element			Length	Psi-value	Total			
E2 Other lintels (including other steel lintels)			14.3700	0.0240	0.3449			
E3 Sill			11.5400	0.0210	0.2423			
E4 Jamb			30.0000	0.0160	0.4800			
E5 Ground floor (normal)			27.5800	0.0920	2.5374			
E10 Eaves (insulation at ceiling level)			17.4400	0.0580	1.0115			
E16 Corner (normal)			20.0400	0.0470	0.9419			
E6 Intermediate floor within a dwelling			27.5800	0.0010	0.0276			
E12 Gable (insulation at ceiling level)			10.1400	0.0570	0.5780			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.1635	(36)
Point Thermal bridges							(36a) =	0.0000
Total fabric heat loss							(33) + (36) + (36a) =	63.3931 (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	47.6732	47.2553	46.8457	44.9216	44.5616	42.8858	42.8858	42.5755	43.5313	44.5616	45.2899	46.0512	(38)
	111.0663	110.6484	110.2387	108.3147	107.9547	106.2789	106.2789	105.9686	106.9244	107.9547	108.6829	109.4443	(39)
Average = Sum(39)m / 12 =												108.3130	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2561	1.2514	1.2468	1.2250	1.2209	1.2020	1.2020	1.1985	1.2093	1.2209	1.2292	1.2378	(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													2.6035	(42)
Hot water usage for mixer showers														
	67.8714	66.8514	65.3651	62.5213	60.4227	58.0823	56.7521	58.2271	59.8440	62.3569	65.2618	67.6113	(42a)	
Hot water usage for baths														
	29.3101	28.8748	28.2619	27.1316	26.2853	25.3469	24.8400	25.4487	26.1115	27.1156	28.2691	29.2111	(42b)	
Hot water usage for other uses														
	41.2921	39.7906	38.2891	36.7875	35.2860	33.7845	33.7845	35.2860	36.7875	38.2891	39.7906	41.2921	(42c)	
Average daily hot water use (litres/day)													127.2886	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	138.4737	135.5169	131.9160	126.4405	121.9940	117.2137	115.3765	118.9618	122.7430	127.7616	133.3215	138.1145	(44)	
Energy conte	219.3084	192.9742	202.7500	173.0907	164.2274	144.1279	139.5379	147.2996	151.3544	173.3712	189.9409	216.2540	(45)	
Energy content (annual)										Total = Sum(45)m =		2114.2367		
Distribution loss (46)m = 0.15 x (45)m														
	32.8963	28.9461	30.4125	25.9636	24.6341	21.6192	20.9307	22.0949	22.7032	26.0057	28.4911	32.4381	(46)	
Water storage loss:														
Total storage loss														
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)	
If cylinder contains dedicated solar storage														
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)	
Combi loss	19.4030	17.4736	19.2357	18.3817	18.8466	18.0892	18.5973	18.6757	18.1622	18.9390	18.5519	19.3721	(61)	
Total heat required for water heating calculated for each month														
	238.7114	210.4478	221.9858	191.4724	183.0740	162.2171	158.1352	165.9752	169.5166	192.3102	208.4928	235.6261	(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														
	238.7114	210.4478	221.9858	191.4724	183.0740	162.2171	158.1352	165.9752	169.5166	192.3102	208.4928	235.6261	(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														
	77.7708	68.5323	72.2233	62.1481	59.3173	52.4448	51.0457	53.6460	54.8659	62.3807	67.7933	76.7475	(65)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000	(64a)

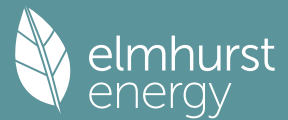
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts														
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	156.2082	156.2082	156.2082	156.2082	156.2082	156.2082	156.2082	156.2082	156.2082	156.2082	156.2082	156.2082	(66)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	27.8352	24.7230	20.1061	15.2216	11.3783	9.6061	10.3797	13.4919	18.1088	22.9933	26.8366	28.6089	(67)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	352.4488	356.1062	346.8898	327.2694	302.5021	279.2243	263.6734	260.0160	269.2324	288.8528	313.6201	336.8979	(68)	
Pumps, fans	53.2243	53.2243	53.2243	53.2243	53.2243	53.2243	53.2243	53.2243	53.2243	53.2243	53.2243	53.2243	(69)	
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)	
Water heating gains (Table 5)	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	(71)	
Total internal gains	104.5306	101.9826	97.0744	86.3168	79.7275	72.8400	68.6098	72.1049	76.2026	83.8450	94.1574	103.1552	(72)	
	593.1084	591.1055	572.3640	537.1015	501.9016	466.9641	447.9565	450.9065	468.8375	503.9848	542.9078	576.9556	(73)	

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W
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		W/m2	or Table 6b	or Table 6c	Table 6d	
North	0.7100	10.6334	0.7300	0.7000	0.7700	2.6735 (74)
East	10.2000	19.6403	0.7300	0.7000	0.7700	70.9417 (76)
West	7.1400	19.6403	0.7300	0.7000	0.7700	49.6592 (80)

Solar gains	123.2744	241.0302	397.2100	580.5905	713.2305	730.9985	695.5701	596.2525	462.3128	286.0220	153.6733	101.4051 (83)
Total gains	716.3828	832.1357	969.5740	1117.6920	1215.1322	1197.9626	1143.5266	1047.1590	931.1503	790.0068	696.5811	678.3607 (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	48.8891	49.0738	49.2561	50.1311	50.2983	51.0914	51.0914	51.2410	50.7829	50.2983	49.9613	49.6137
alpha	4.2593	4.2716	4.2837	4.3421	4.3532	4.4061	4.4061	4.4161	4.3855	4.3532	4.3308	4.3076
util living area	0.9893	0.9790	0.9502	0.8713	0.7285	0.5465	0.4042	0.4569	0.7094	0.9243	0.9808	0.9914 (86)
MIT	19.8043	19.9794	20.2631	20.5968	20.8118	20.9046	20.9245	20.9210	20.8531	20.5417	20.1134	19.7813 (87)
Th 2	19.8754	19.8791	19.8828	19.9001	19.9033	19.9184	19.9184	19.9212	19.9126	19.9033	19.8967	19.8899 (88)
util rest of house	0.9862	0.9730	0.9363	0.8378	0.6677	0.4626	0.3072	0.3539	0.6249	0.8962	0.9744	0.9888 (89)
MIT 2	18.4953	18.7193	19.0753	19.4860	19.7182	19.8143	19.8266	19.8282	19.7719	19.4370	18.9050	18.4773 (90)
Living area fraction	18.7047	18.9208	19.2652	19.6636	19.8931	19.9886	20.0022	20.0029	19.9448	19.6136	19.0982	0.1599 (91)
MIT	18.7047	18.9208	19.2652	19.6636	19.8931	19.9886	20.0022	20.0029	19.9448	19.6136	19.0982	18.6858 (92)
Temperature adjustment	18.5547	18.7708	19.1152	19.5136	19.7431	19.8386	19.8522	19.8529	19.7948	19.4636	18.9482	-0.1500
adjusted MIT	18.5547	18.7708	19.1152	19.5136	19.7431	19.8386	19.8522	19.8529	19.7948	19.4636	18.9482	18.5358 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9810	0.9651	0.9241	0.8241	0.6580	0.4561	0.3012	0.3472	0.6148	0.8820	0.9667	0.9845 (94)
Useful gains	702.7863	803.1053	896.0167	921.0548	799.5281	546.4060	344.3988	363.6026	572.5009	696.7548	673.3572	667.8410 (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	1583.2124	1534.7838	1390.6871	1149.6139	868.2853	556.7555	345.6390	365.9016	608.9112	956.8719	1287.7023	1568.9747 (97)
Space heating kWh	655.0370	491.6880	368.0347	164.5625	51.1554	0.0000	0.0000	0.0000	0.0000	193.5271	442.3284	670.4435 (98a)
Space heating requirement - total per year (kWh/year)												3036.7766
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	655.0370	491.6880	368.0347	164.5625	51.1554	0.0000	0.0000	0.0000	0.0000	193.5271	442.3284	670.4435 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3036.7766
Space heating per m2										(98c) / (4) =		34.3449 (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	655.0370	491.6880	368.0347	164.5625	51.1554	0.0000	0.0000	0.0000	0.0000	193.5271	442.3284	670.4435 (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)	740.1548	555.5796	415.8584	185.9464	57.8027	0.0000	0.0000	0.0000	0.0000	218.6747	499.8062	757.5632 (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	238.7114	210.4478	221.9858	191.4724	183.0740	162.2171	158.1352	165.9752	169.5166	192.3102	208.4928	235.6261 (64)
Efficiency of water heater (217)m	88.0943	88.0450	87.9296	87.6869	87.3232	87.0000	87.0000	87.0000	87.0000	87.7460	88.0139	88.1050 (216)
Fuel for water heating, kWh/month	270.9725	239.0230	252.4585	218.3591	209.6510	186.4564	181.7646	190.7761	194.8467	219.1671	236.8863	267.4379 (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	7.0685	7.3041	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	24.3640	19.5457	17.5988	12.8936	9.9594	8.1369	9.0853	11.8094	15.3392	20.1259	22.7322	25.0412 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-30.9425	-47.5571	-74.7039	-89.3512	-98.9541	-93.0596	-91.5220	-84.8716	-72.7612	-56.5888	-35.0525	-26.0817 (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)	-14.4775	-34.6718	-80.7865	-138.7408	-197.9528	-204.5537	-199.7829	-159.9391	-105.0395	-52.8880	-20.1311	-11.0221 (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												3431.3860 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)

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Efficiency of water heater	87.0000	
Water heating fuel used	2667.7992	(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)	196.6316	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2021.4319	(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	4360.3849	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3431.3860	3.6400	124.9025 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2667.7992	3.6400	97.1079 (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	196.6316	16.4900	32.4246 (250)
Additional standing charges			92.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-801.4461	16.4900	-132.1585
PV Unit electricity exported	-1219.9857	5.5900	-68.1972
Total			-200.3557 (252)
Total energy cost			160.2606 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.4324 (257)
SAP value		92.9904
SAP rating (Section 12)		93 (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	3431.3860	0.2100	720.5911 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2667.7992	0.2100	560.2378 (264)
Space and water heating			1280.8289 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	196.6316	0.1443	28.3800 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-801.4461	0.1333	-106.8705
PV Unit electricity exported	-1219.9857	0.1227	-149.6896
Total			-256.5601 (269)
Total CO2, kg/year			1064.5781 (272)
CO2 emissions per m2			12.0400 (273)
EI value			89.3079
EI rating			89 (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

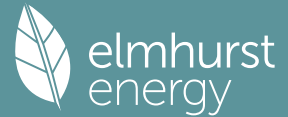
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	44.2100 (1b)	x 2.3800 (2b)	= 105.2198 (1b) - (3b)
First floor	44.2100 (1c)	x 2.6800 (2c)	= 118.4828 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	223.7026 (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)

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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	Air changes per hour	
Pressure test	50.0000 / (5) =	0.2235 (8)
Pressure Test Method	Yes	
Measured/design AP50	Blower Door	4.0000 (17)
Infiltration rate		0.4235 (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) =	0.4235 (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													
Effective ac	0.5400	0.5294	0.5188	0.4659	0.4553	0.4023	0.4023	0.3917	0.4235	0.4553	0.4764	0.4976	(22b)
	0.6458	0.6401	0.6346	0.6085	0.6036	0.5809	0.5809	0.5767	0.5897	0.6036	0.6135	0.6238	(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)			18.0500	1.2357	22.3051			(27)
Door			2.1400	1.3000	2.7820			(26a)
Ground Floor			44.2100	0.1300	5.7473	75.0000	3315.7500	(28a)
External Wall	138.1700	20.1900	117.9800	0.1900	22.4162	110.0000	12977.8000	(29a)
Plane Roof	44.2100		44.2100	0.0900	3.9789	9.0000	397.8900	(30)
Total net area of external elements Aum(A, m2)			226.5900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	57.2295			(33)
Studs			156.0600			9.0000	1404.5400	(32c)
Internal Floor 1			44.2100			18.0000	795.7800	(32d)
Internal Ceiling 1			72.8900			9.0000	656.0100	(32e)
Heat capacity Cm = Sum(A x k)								
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								(34)
List of Thermal Bridges								(35)
K1 Element				Length	Psi-value		Total	
E2 Other lintels (including other steel lintels)				14.3700	0.0240		0.3449	
E3 Sill				11.5400	0.0210		0.2423	
E4 Jamb				30.0000	0.0160		0.4800	
E5 Ground floor (normal)				27.5800	0.0920		2.5374	
E10 Eaves (insulation at ceiling level)				17.4400	0.0580		1.0115	
E16 Corner (normal)				20.0400	0.0470		0.9419	
E6 Intermediate floor within a dwelling				27.5800	0.0010		0.0276	
E12 Gable (insulation at ceiling level)				10.1400	0.0570		0.5780	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.1635	(36)
Point Thermal bridges							0.0000	
Total fabric heat loss							(33) + (36) + (36a) =	63.3931 (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	
	47.6732	47.2553	46.8457	44.9216	44.5616	42.8858	42.8858	42.5755	43.5313	44.5616	45.2899	46.0512	(38)
Heat transfer coeff	111.0663	110.6484	110.2387	108.3147	107.9547	106.2789	106.2789	105.9686	106.9244	107.9547	108.6829	109.4443	(39)
Average = Sum(39)m / 12 =												108.3130	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	1.2561	1.2514	1.2468	1.2250	1.2209	1.2020	1.2020	1.1985	1.2093	1.2209	1.2292	1.2378	(40)
HLP (average)												1.2250	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6035 (42)
Hot water usage for mixer showers													
	67.8714	66.8514	65.3651	62.5213	60.4227	58.0823	56.7521	58.2271	59.8440	62.3569	65.2618	67.6113	(42a)
Hot water usage for baths													
	29.3101	28.8748	28.2619	27.1316	26.2853	25.3469	24.8400	25.4487	26.1115	27.1156	28.2691	29.2111	(42b)
Hot water usage for other uses													
	41.2921	39.7906	38.2891	36.7875	35.2860	33.7845	33.7845	35.2860	36.7875	38.2891	39.7906	41.2921	(42c)
Average daily hot water use (litres/day)												127.2886	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	138.4737	135.5169	131.9160	126.4405	121.9940	117.2137	115.3765	118.9618	122.7430	127.7616	133.3215	138.1145	(44)
Energy conte	219.3084	192.9742	202.7500	173.0907	164.2274	144.1279	139.5379	147.2996	151.3544	173.3712	189.9409	216.2540	(45)
Energy content (annual)													Total = Sum(45)m = 2114.2367
Distribution loss (46)m = 0.15 x (45)m													
	32.8963	28.9461	30.4125	25.9636	24.6341	21.6192	20.9307	22.0949	22.7032	26.0057	28.4911	32.4381	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	19.4030	17.4736	19.2357	18.3817	18.8466	18.0892	18.5973	18.6757	18.1622	18.9390	18.5519	19.3721	(61)
Total heat required for water heating calculated for each month													
	238.7114	210.4478	221.9858	191.4724	183.0740	162.2171	158.1352	165.9752	169.5166	192.3102	208.4928	235.6261	(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	238.7114	210.4478	221.9858	191.4724	183.0740	162.2171	158.1352	165.9752	169.5166	192.3102	208.4928	235.6261	(64)
Electric shower(s)													Total per year (kWh/year) = Sum(64)m = 2337.9647 (64)

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	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	77.7708	68.5323	72.2233	62.1481	59.3173	52.4448	51.0457	53.6460	54.8659	62.3807	67.7933	76.7475 (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	156.2082	156.2082	156.2082	156.2082	156.2082	156.2082	156.2082	156.2082	156.2082	156.2082	156.2082	156.2082	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.8352	24.7230	20.1061	15.2216	11.3783	9.6061	10.3797	13.4919	18.1088	22.9933	26.8366	28.6089	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	352.4488	356.1062	346.8898	327.2694	302.5021	279.2243	263.6734	260.0160	269.2324	288.8528	313.6201	336.8979	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.2243	53.2243	53.2243	53.2243	53.2243	53.2243	53.2243	53.2243	53.2243	53.2243	53.2243	53.2243	(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)	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	-104.1388	(71)
Water heating gains (Table 5)	104.5306	101.9826	97.0744	86.3168	79.7275	72.8400	68.6098	72.1049	76.2026	83.8450	94.1574	103.1552	(72)
Total internal gains	593.1084	591.1055	572.3640	537.1015	501.9016	466.9641	447.9565	450.9065	468.8375	503.9848	542.9078	576.9556	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North					0.7100	10.6334		0.7300	0.7000	0.7700		2.6735 (74)	
East					10.2000	19.6403		0.7300	0.7000	0.7700		70.9417 (76)	
West					7.1400	19.6403		0.7300	0.7000	0.7700		49.6592 (80)	
Solar gains	123.2744	241.0302	397.2100	580.5905	713.2305	730.9985	695.5701	596.2525	462.3128	286.0220	153.6733	101.4051	(83)
Total gains	716.3828	832.1357	969.5740	1117.6920	1215.1322	1197.9626	1143.5266	1047.1590	931.1503	790.0068	696.5811	678.3607	(84)

7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	21.0000 (85)
tau	48.8891	49.0738	49.2537	50.1311	50.2983	51.0914	51.0914	51.2410	50.7829	50.2983	49.9613	49.6137	
alpha	4.2593	4.2716	4.2837	4.3421	4.3532	4.4061	4.4061	4.4161	4.3855	4.3532	4.3308	4.3076	
util living area	0.9893	0.9790	0.9502	0.8713	0.7285	0.5465	0.4042	0.4569	0.7094	0.9243	0.9808	0.9914	(86)
MIT	19.8043	19.9794	20.2631	20.5968	20.8118	20.9046	20.9245	20.9210	20.8531	20.5417	20.1134	19.7813	(87)
Th 2	19.8754	19.8791	19.8828	19.9001	19.9033	19.9184	19.9184	19.9212	19.9126	19.9033	19.8967	19.8899	(88)
util rest of house	0.9862	0.9730	0.9363	0.8378	0.6677	0.4626	0.3072	0.3539	0.6249	0.8962	0.9744	0.9888	(89)
MIT 2	18.4953	18.7193	19.0753	19.4860	19.7182	19.8143	19.8266	19.8282	19.7719	19.4370	18.9050	18.4773	(90)
Living area fraction	18.7047	18.9208	19.2652	19.6636	19.8931	19.9886	20.0022	20.0029	19.9448	19.6136	19.0982	18.6858	(91)
MIT	18.7047	18.9208	19.2652	19.6636	19.8931	19.9886	20.0022	20.0029	19.9448	19.6136	19.0982	18.6858	(92)
Temperature adjustment	18.5547	18.7708	19.1152	19.5136	19.7431	19.8386	19.8522	19.8529	19.7948	19.4636	18.9482	-0.1500	
adjusted MIT	18.5547	18.7708	19.1152	19.5136	19.7431	19.8386	19.8522	19.8529	19.7948	19.4636	18.9482	18.5358	(93)

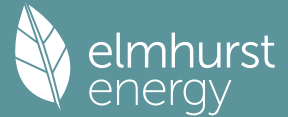
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9810	0.9651	0.9241	0.8241	0.6580	0.4561	0.3012	0.3472	0.6148	0.8820	0.9667	0.9845	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1583.2124	1534.7838	1390.6871	1149.6139	868.2853	556.7555	345.6390	365.9016	608.9112	956.8719	1287.7023	1568.9747	(97)
Space heating kWh	655.0370	491.6880	368.0347	164.5625	51.1554	0.0000	0.0000	0.0000	0.0000	193.5271	442.3284	670.4435	(98a)
Space heating requirement - total per year (kWh/year)												3036.7766	
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	655.0370	491.6880	368.0347	164.5625	51.1554	0.0000	0.0000	0.0000	0.0000	193.5271	442.3284	670.4435	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3036.7766	
Space heating per m2										(98c) / (4) =		34.3449	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													88.5000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
655.0370	491.6880	368.0347	164.5625	51.1554	0.0000	0.0000	0.0000	0.0000	0.0000	193.5271	442.3284	670.4435	(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)	740.1548	555.5796	415.8584	185.9464	57.8027	0.0000	0.0000	0.0000	0.0000	218.6747	499.8062	757.5632	(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)													

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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 (213)
	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	238.7114	210.4478	221.9858	191.4724	183.0740	162.2171	158.1352	165.9752	169.5166	192.3102	208.4928	235.6261 (64)
Efficiency of water heater (217)m	88.0943	88.0450	87.9296	87.6869	87.3232	87.0000	87.0000	87.0000	87.0000	87.7460	88.0139	87.0000 (216)
Fuel for water heating, kWh/month	270.9725	239.0230	252.4585	218.3591	209.6510	186.4564	181.7646	190.7761	194.8467	219.1671	236.8863	88.1050 (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	24.3640	19.5457	17.5988	12.8936	9.9594	8.1369	9.0853	11.8094	15.3392	20.1259	22.7322	25.0412 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-30.9425	-47.5571	-74.7039	-89.3512	-98.9541	-93.0596	-91.5220	-84.8716	-72.7612	-56.5888	-35.0525	-26.0817 (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	-14.4775	-34.6718	-80.7865	-138.7408	-197.9528	-204.5537	-199.7829	-159.9391	-105.0395	-52.8880	-20.1311	-11.0221 (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												3431.3860 (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												2667.7992 (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)												196.6316 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2021.4319 (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												4360.3849 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3431.3860	5.6000	192.1576 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2667.7992	5.6000	149.3968 (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	196.6316	26.0600	51.2422 (250)
Additional standing charges			99.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-801.4461	26.0600	-208.8569
PV Unit electricity exported	-1219.9857	5.8100	-70.8812
Total			-279.7380 (252)
Total energy cost			234.4701 (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	3431.3860	0.2100	720.5911 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2667.7992	0.2100	560.2378 (264)
Space and water heating			1280.8289 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	196.6316	0.1443	28.3800 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-801.4461	0.1333	-106.8705
PV Unit electricity exported	-1219.9857	0.1227	-149.6896
Total			-256.5601 (269)
Total CO2, kg/year			1064.5781 (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	3431.3860	1.1300	3877.4662 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2667.7992	1.1300	3014.6131 (278)
Space and water heating			6892.0793 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	196.6316	1.5338	301.6001 (282)
Energy saving/generation technologies			

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PV Unit electricity used in dwelling	-801.4461	1.4928	-1196.3719
PV Unit electricity exported	-1219.9857	0.4502	-549.2798
Total			-1745.6516 (283)
Total Primary energy kWh/year			5578.1285 (286)

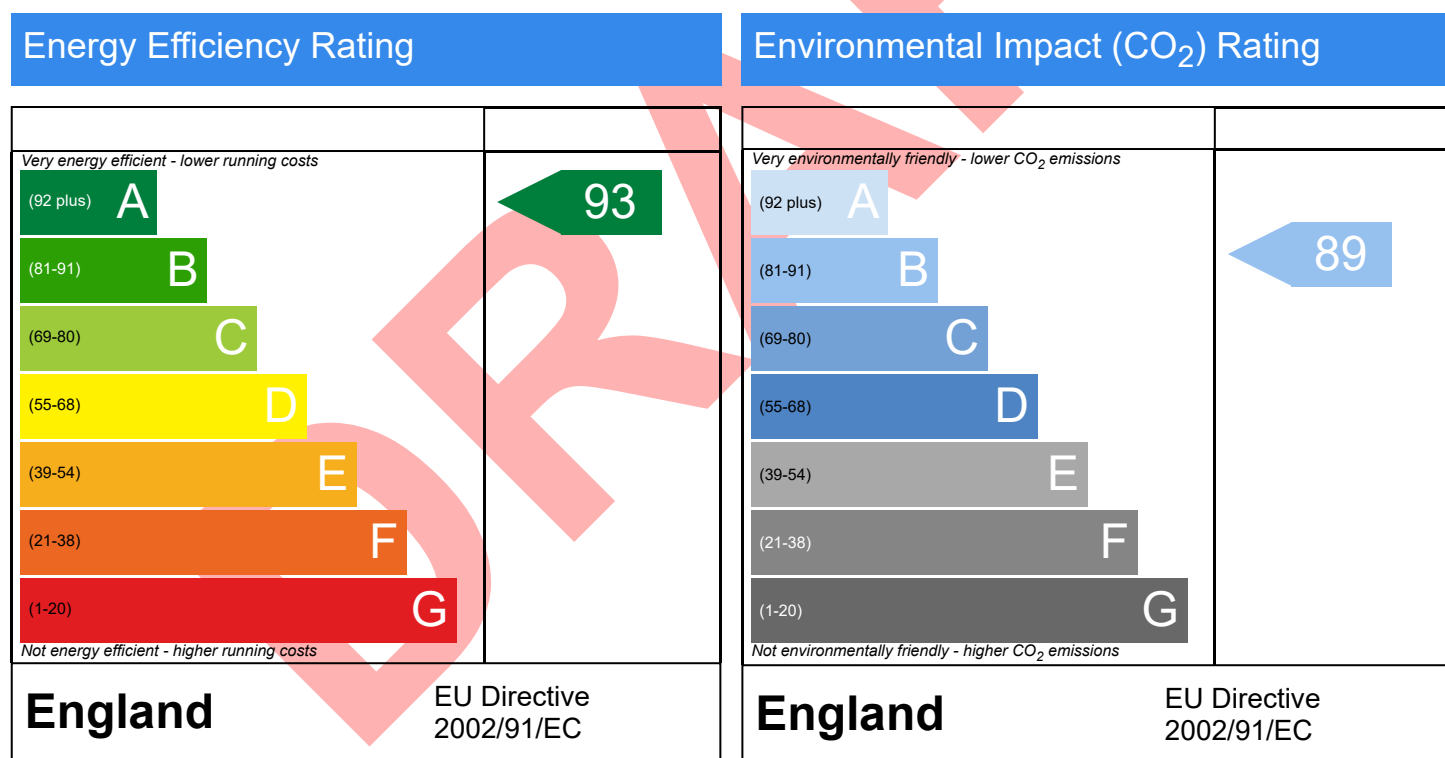
Predicted Energy Assessment



Dwelling type: House, Detached
Date of assessment: 15/11/2024
Produced by: Victoria Gartside
Total floor area: 88.42 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.