

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 10:34:37

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	118 m ²
Site Reference	SAP VG 21-0282	Plot Reference	Plot 34
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	10.76 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	10.69 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	56.22 kWh _{PE} /m ²		
Dwelling primary energy	55.98 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	41.1 kWh/m ²		
Dwelling fabric energy efficiency	38.1 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)	131	0.19	
Ground floor: Ground Floor, Ground Floor	58.87	0.13	
Exposed roof: Roof (1)	58.87	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	10.47	East	0.7	1.3
Rear , Windows	10.7	West	0.7	1.3
Front Door, Door	2.14	East	N/A	1.3

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part 1 - Main Dwelling: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.024 (!)	MFF-150-E2-02
External wall	E3: Sill	Calculated by person with suitable expertise	0.021 (!)	E3-01
External wall	E4: Jamb	Calculated by person with suitable expertise	0.016 (!)	E4-01 RCD

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
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	2.02 kWp	
Orientation	West	
Pitch	45°	
Overshading	None or very little	
Manufacturer		
MCS certificate		
Technology type: Photovoltaic system (2)		
Peak power	1.65 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 34	Prop Type Ref	SAP VG 21-0282	
Property				

SAP Rating	95 A	DER	10.69	TER	10.76
Environmental	90 B	% DER < TER			0.65
CO ₂ Emissions (t/year)	1.21	DFEE	38.07	TFEE	41.13
Compliance Check	See BREL	% DFEE < TFEE			7.44
% DPER < TPER	0.43	DPER	55.98	TPER	56.22

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	214.88	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	30.80 m	58.87 m ²	2.39 m
1st Storey:	30.80 m	58.87 m ²	2.62 m
2nd Storey:	32.20 m	60.31 m ²	2.28 m

8.0 Living Area	14.85	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	154.31	131.00	0.00	None	23.31	Enter Gross Area

9.2 Internal Walls	Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
	Studs	Plasterboard on timber frame	9.00	201.96
	Block	Dense block, plasterboard on dabs	75.00	33.84

10.0 External Roofs	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area (m ²)	Shelter Code	Shelter Factor	Calculation Type	Openings
	Plane Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	58.87	58.87	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	58.87

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)
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Summary for Input Data

Ground Floor Ground Floor - Solid Lowest occupied Suspended concrete floor, carpeted 0.13 None 0.00 75.00 58.87

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1		Plasterboard ceiling, carpeted chipboard floor	9.00	58.87

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	10.47	0
Rear	Windows	External Wall	West	10.70	0
Front Door	Door	External Wall	East	2.14	0

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	16.18	0.02	0.02 MFF-150-E2-02	No
E3 Sill	Independently assessed	13.35	0.02	0.02 E3-01	No
E4 Jamb	Independently assessed	33.60	0.02	0.02 E4-01 RCD	No
E5 Ground floor (normal)	Independently assessed	30.80	0.09	0.09 Manufacturer Declaration	No
E10 Eaves (insulation at ceiling level)	Independently assessed	16.70	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	30.80	0.00	0.00 E6-01 RCD	No
E12 Gable (insulation at ceiling level)	Independently assessed	14.10	0.06	0.06 E12-01 RCD	No

Y-value 0.02 W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present No

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.15	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	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	5
Number of passive vents	0
Number of flueless gas fires	0

21.0 Fixed Cooling System

No

22.0 Pressure Testing

Designed AP ₅₀	4.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

Summary for Input Data

22.0 Lighting

No Fixed Lighting

No				
Name	Efficacy	Power	Capacity	Count
Lighting 1	85.00	10.00	850.00	16

24.0 Main Heating 1

Database	
Percentage of Heat	100.00 %
Database Ref. No.	18119
Fuel Type	Mains gas
SAP Code	0
In Winter	88.50
In Summer	87.00
Model Name	ecoTEC sustain 28
Manufacturer	Vaillant
System Type	Combi boiler
Controls SAP Code	2110
Delayed Start Stat	Yes
Burner Control	Modulating
HETAS approved System	No
Flue Type	Balanced
Fan Assisted Flue	Yes
Is MHS Pumped	Pump in heated space
Heating Pump Age	2013 or later
Heat Emitter	Radiators and Underfloor
Underfloor Heating	Yes - Pipes in thin screed
Flow Temperature	Unknown
Flow Temperature Value	45.00
Boiler Interlock	Yes
Combi boiler type	Standard Combi

25.0 Main Heating 2

None

26.0 Heat Networks

None

Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None								
Heat source 2	None								
Heat source 3	None								
Heat source 4	None								
Heat source 5	None								

27.0 Secondary Heating

None

28.0 Water Heating

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
2.02	West	45°	None Or Little	No	No	1.00		
1.65	East	30°	None Or Little	No	No	1.00		

34.0 Small-scale Hydro

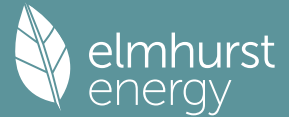
None	
Electricity Generated	0.00
Apportioned	0.00
Connected to dwelling's electricity meter	Yes
Electricity Generation	Annual

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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Property							
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Environmental	90 B	% DER < TER				0.65	
CO ₂ Emissions (t/year)	1.21	DFEE	38.07	TFEE	41.13		
Compliance Check	See BREL	% DFEE < TFEE				7.44	
% DPER < TPER	0.43	DPER	55.98	TPER	56.22		
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	58.8700 (1b)	x 2.3900 (2b)	= 140.6993 (1b) - (3b)
First floor	58.8700 (1c)	x 2.6200 (2c)	= 154.2394 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	117.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 294.9387 (5)

2. Ventilation rate

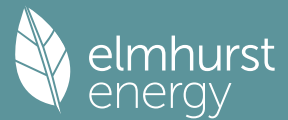
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) =	Air changes per hour 50.0000 / (5) = 0.1695 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3695 (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) = 0.3695 (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	0.4711	0.4619	0.4527	0.4065	0.3972	0.3511	0.3511	0.3418	0.3695	0.3972	0.4157	0.4342 (22b)
Effective ac	0.6110	0.6067	0.6025	0.5826	0.5789	0.5616	0.5616	0.5584	0.5683	0.5789	0.5864	0.5943 (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)			21.1700	1.2357	26.1606		(27)
Door			2.1400	1.3000	2.7820		(26a)
Ground Floor			58.8700	0.1300	7.6531	75.0000	4415.2500 (28a)
External Wall	154.3100	23.3100	131.0000	0.1900	24.8900	110.0000	14410.0000 (29a)
Plane Roof	58.8700		58.8700	0.0900	5.2983	9.0000	529.8300 (30)
Total net area of external elements A _{um} (A, m ²)			272.0500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	66.7840		(33)
Studs			201.9600			9.0000	1817.6400 (32c)
Block			33.8400			75.0000	2538.0000 (32c)
Internal Floor 1			58.8700			18.0000	1059.6600 (32d)
Internal Ceiling 1			58.8700			9.0000	529.8300 (32e)
Heat capacity C _m = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	25300.2100 (34)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							214.8820 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				16.1800	0.0240	0.3883	
E3 Sill				13.3500	0.0210	0.2803	
E4 Jamb				33.6000	0.0160	0.5376	

Full SAP Calculation Printout



E5 Ground floor (normal)	30.8000	0.0920	2.8336
E10 Eaves (insulation at ceiling level)	16.7000	0.0580	0.9686
E16 Corner (normal)	20.0400	0.0470	0.9419
E6 Intermediate floor within a dwelling	30.8000	0.0010	0.0308
E12 Gable (insulation at ceiling level)	14.1000	0.0570	0.8037
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.7849 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	73.5689 (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	59.4675	59.0480	58.6368	56.7056	56.3442	54.6622	54.6622	54.3507	55.3101	56.3442	57.0752	57.8394 (38)
Average = Sum(39)m / 12 =	133.0364	132.6169	132.2057	130.2745	129.9131	128.2311	128.2311	127.9196	128.8790	129.9131	130.6441	131.4083 (39)
												130.2727
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1299	1.1264	1.1229	1.1065	1.1034	1.0891	1.0891	1.0865	1.0946	1.1034	1.1096	1.1161 (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												2.8541 (42)
Hot water usage for mixer showers												71.7983 (42a)
Hot water usage for baths												31.0124 (42b)
Hot water usage for other uses												43.8593 (42c)
Average daily hot water use (litres/day)												135.1732 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	147.0513	143.9111	140.0871	134.2724	129.5504	124.4739	122.5231	126.3306	130.3462	135.6756	141.5799	146.6699 (44)
Energy content (annual)	232.8933	204.9275	215.3086	183.8122	174.3997	153.0552	148.1811	156.4237	160.7299	184.1106	201.7065	229.6496 (45)
Distribution loss (46)m = 0.15 x (45)m												2245.1980
Water storage loss:												
Total storage loss												
If cylinder contains dedicated solar storage												
Primary loss												0.0000 (57)
Combi loss												0.0000 (59)
Total heat required for water heating calculated for each month												
WWHRS	252.4334	222.5219	234.6712	202.3022	193.3491	171.2346	166.8657	175.1916	178.9868	203.1580	220.3773	249.1571 (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	252.4334	222.5219	234.6712	202.3022	193.3491	171.2346	166.8657	175.1916	178.9868	203.1580	220.3773	249.1571 (64)
12Total per year (kWh/year)												2470.2488 (64)
Electric shower(s)												2470 (64)
Heat gains from water heating, kWh/month												
	82.3220	72.5370	76.4308	65.7401	62.7253	55.4357	53.9414	56.7028	58.0069	65.9786	71.7351	81.2354 (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	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	145.4239	161.0050	145.4239	150.2714	145.4239	150.2714	145.4239	145.4239	150.2714	145.4239	150.2714	145.4239 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	282.2411	285.1699	277.7895	262.0774	242.2438	223.6029	211.1497	208.2209	215.6013	231.3134	251.1471	269.7879 (68)
Pumps, fans	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657 (71)
Total internal gains	110.6479	107.9419	102.7295	91.3056	84.3081	76.9940	72.5018	76.2135	80.5652	88.6810	99.6321	109.1873 (72)
	607.1251	622.9290	594.7550	572.4665	540.7879	516.6804	494.8875	495.6704	512.2500	534.2304	569.8627	593.2112 (73)

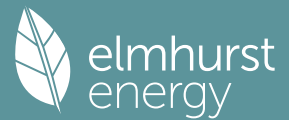
6. Solar gains

[Jan]						Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East						10.4700	19.6403	0.7300	0.7000	0.7700	72.8196 (76)	
West						10.7000	19.6403	0.7300	0.7000	0.7700	74.4192 (80)	
Solar gains	147.2388	288.0304	474.3450	691.8039	847.8316	867.9065	826.2824	709.7643	551.6828	341.7723	183.5895	121.0820 (83)
Total gains	754.3639	910.9594	1069.1000	1264.2704	1388.6195	1384.5869	1321.1699	1205.4348	1063.9328	876.0027	753.4521	714.2933 (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	52.8264	52.9935	53.1583	53.9464	54.0964	54.8060	54.8060	54.9395	54.5305	54.0964	53.7937	53.4809
alpha	4.5218	4.5329	4.5439	4.5964	4.6064	4.6537	4.6537	4.6626	4.6354	4.6064	4.5862	4.5654
util living area	0.9950	0.9878	0.9676	0.8987	0.7602	0.5704	0.4224	0.4792	0.7419	0.9476	0.9896	0.9961 (86)
MIT	19.7969	19.9783	20.2502	20.5916	20.8145	20.9095	20.9287	20.9252	20.8556	20.5288	20.1035	19.7749 (87)
Th 2	19.9765	19.9794	19.9822	19.9956	19.9981	20.0097	20.0097	20.0119	20.0052	19.9981	19.9930	19.9877 (88)
util rest of house	0.9935	0.9844	0.9583	0.8716	0.7050	0.4908	0.3297	0.3806	0.6645	0.9275	0.9860	0.9949 (89)
MIT 2	18.5664	18.7993	19.1437	19.5675	19.8133	19.9103	19.9227	19.9235	19.8657	19.5054	18.9707	18.5469 (90)
Living area fraction	18.5664	18.7993	19.1437	19.5675	19.8133	19.9103	19.9227	19.9235	19.8657	19.5054	18.9707	18.5469 (90)
MIT	18.7216	18.9480	19.2832	19.6967	19.9395	20.0363	20.0496	20.0498	19.9906	19.6345	19.1136	18.7018 (92)
Temperature adjustment	18.5716	18.7980	19.1332	19.5467	19.7895	19.8863	19.8996	19.8998	19.8406	19.4845	18.9636	-0.1500
adjusted MIT	18.5716	18.7980	19.1332	19.5467	19.7895	19.8863	19.8996	19.8998	19.8406	19.4845	18.9636	18.5518 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9907	0.9788	0.9482	0.8571	0.6923	0.4804	0.3192	0.3691	0.6502	0.9140	0.9809	0.9926 (94)
Useful gains	747.3212	891.6831	1013.7545	1083.6501	961.3400	665.1816	421.6703	444.9074	691.8023	800.6879	739.0289	708.9955 (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	1898.6361	1843.1053	1670.1834	1386.9899	1050.9385	677.8676	423.1097	447.6952	739.8374	1154.2121	1549.9082	1885.9488 (97)
Space heating kWh	856.5782	639.3557	488.3831	218.4046	66.6613	0.0000	0.0000	0.0000	0.0000	263.0220	583.8330	875.6533 (98a)
Space heating requirement - total per year (kWh/year)												3991.8913
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	856.5782	639.3557	488.3831	218.4046	66.6613	0.0000	0.0000	0.0000	0.0000	263.0220	583.8330	875.6533 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3991.8913
Space heating per m2										(98c) / (4) =		33.9043 (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	856.5782	639.3557	488.3831	218.4046	66.6613	0.0000	0.0000	0.0000	0.0000	263.0220	583.8330	875.6533 (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)	967.8850	722.4358	551.8453	246.7849	75.3235	0.0000	0.0000	0.0000	0.0000	297.2000	659.6983	989.4387 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	252.4334	222.5219	234.6712	202.3022	193.3491	171.2346	166.8657	175.1916	178.9868	203.1580	220.3773	249.1571 (64)
Efficiency of water heater (217)m	88.1540	88.1078	88.0075	87.7723	87.3797	87.0000	87.0000	87.0000	87.0000	87.8400	88.0838	88.1633 (217)
Fuel for water heating, kWh/month	286.3549	252.5564	266.6490	230.4852	221.2747	196.8213	191.7996	201.3696	205.7320	231.2819	250.1904	282.6086 (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	29.5986	23.7451	21.3798	15.6638	12.0992	9.8851	11.0373	14.3466	18.6349	24.4500	27.6162	30.4212 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-38.5403	-59.0314	-92.3295	-109.7438	-120.7902	-113.2526	-111.3417	-103.6173	-89.3413	-69.9810	-43.5736	-32.4954 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-18.7644	-45.0195	-105.2128	-181.1379	-258.7904	-267.6158	-261.2926	-208.9392	-136.9083	-68.7591	-26.1091	-14.2771 (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												4510.6116 (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												2817.1236 (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)												238.8777 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2576.8639 (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 0.0000 (237)
Total delivered energy for all uses 5075.7490 (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	4510.6116	0.2100	947.2284 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2817.1236	0.2100	591.5960 (264)
Space and water heating			1538.8244 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	238.8777	0.1443	34.4774 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-984.0378	0.1335	-131.3389
PV Unit electricity exported	-1592.8261	0.1226	-195.3531
Total			-326.6920 (269)
Total CO2, kg/year			1258.5391 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.6900 (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	4510.6116	1.1300	5096.9911 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2817.1236	1.1300	3183.3497 (278)
Space and water heating			8280.3408 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	238.8777	1.5338	366.3986 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-984.0378	1.4932	-1469.3911
PV Unit electricity exported	-1592.8261	0.4500	-716.8353
Total			-2186.2264 (283)
Total Primary energy kWh/year			6590.6138 (286)
Dwelling Primary energy Rate (DPER)			55.9800 (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	58.8700 (1b)	x 2.3900 (2b)	= 140.6993 (1b) - (3b)
First floor	58.8700 (1c)	x 2.6200 (2c)	= 154.2394 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	117.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 294.9387 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1356 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3856 (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) = 0.3856 (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	0.4917 0.4820 0.4724 0.4242 0.4145 0.3663 0.3663 0.3567 0.3856 0.4145 0.4338 0.4531 (22b)
Effective ac	0.6209 0.6162 0.6116 0.5900 0.5859 0.5671 0.5671 0.5636 0.5744 0.5859 0.5941 0.6027 (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)			21.1700	1.1450	24.2405		(27)
Ground Floor			58.8700	0.1300	7.6531		(28a)
External Wall	154.3100	23.3100	131.0000	0.1800	23.5800		(29a)
Plane Roof	58.8700		58.8700	0.1100	6.4757		(30)
Total net area of external elements Aum(A, m2)			272.0500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		64.0893		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			214.8820 (35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	16.1800	0.0500	0.8090
E3 Sill	13.3500	0.0500	0.6675
E4 Jamb	33.6000	0.0500	1.6800
E5 Ground floor (normal)	30.8000	0.1600	4.9280
E10 Eaves (insulation at ceiling level)	16.7000	0.0600	1.0020
E16 Corner (normal)	20.0400	0.0900	1.8036
E6 Intermediate floor within a dwelling	30.8000	0.0000	0.0000
E12 Gable (insulation at ceiling level)	14.1000	0.0600	0.8460
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.7361 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 75.8254 (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	60.4290	59.9722	59.5244	57.4212	57.0277	55.1960	55.1960	54.8567	55.9015	57.0277	57.8238	58.6560 (38)
Average = Sum(39)m / 12 =	136.2543	135.7975	135.3498	133.2466	132.8531	131.0213	131.0213	130.6821	131.7269	132.8531	133.6491	134.4814 (39)
												133.2447
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1572	1.1534	1.1496	1.1317	1.1284	1.1128	1.1128	1.1099	1.1188	1.1284	1.1351	1.1422 (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													2.8541 (42)
Hot water usage for mixer showers													
72.0744	70.9913	69.4129	66.3930	64.1645	61.6791	60.2665	61.8329	63.5500	66.2184	69.3032	71.7983	(42a)	
Hot water usage for baths													
31.1176	30.6554	30.0046	28.8047	27.9062	26.9099	26.3718	27.0180	27.7216	28.7877	30.0124	31.0124	(42b)	
Hot water usage for other uses													
43.8593	42.2644	40.6695	39.0746	37.4797	35.8849	35.8849	37.4797	39.0746	40.6695	42.2644	43.8593	(42c)	
Average daily hot water use (litres/day)												135.1732 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.0513	143.9111	140.0871	134.2724	129.5504	124.4739	122.5231	126.3306	130.3462	135.6756	141.5799	146.6699 (44)	
Energy content (annual)	232.8933	204.9275	215.3086	183.8122	174.3997	153.0552	148.1811	156.4237	160.7299	184.1106	201.7065	229.6496 (45)	
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2245.1980	
34.9340	30.7391	32.2963	27.5718	26.1600	22.9583	22.2272	23.4636	24.1095	27.6166	30.2560	34.4474	(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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)	
Total heat required for water heating calculated for each month													
283.8522	250.9549	266.2675	233.1272	225.3587	202.3703	199.1400	207.3826	210.0450	235.0695	251.0216	280.6085	(62)	
WWHRS	-32.9494	-29.1407	-30.5145	-25.2672	-23.5481	-20.1503	-18.8877	-20.0852	-20.8483	-24.5778	-27.8437	-32.3392 (63a)	
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
Output from w/h	250.9027	221.8142	235.7530	207.8600	201.8105	182.2200	180.2523	187.2975	189.1967	210.4917	223.1779	248.2693 (64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2539.0459 (64)	
Electric shower(s)												2539 (64)	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
												0.0000 (64a)	
Heat gains from water heating, kWh/month													
90.1767	79.6452	84.3298	73.4463	70.7276	63.2196	62.0099	64.7506	65.7715	73.9565	79.3962	89.0982	(65)	

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	145.4239	161.0050	145.4239	150.2714	145.4239	150.2714	145.4239	145.4239	150.2714	145.4239	150.2714	145.4239 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	282.2411	285.1699	277.7895	262.0774	242.2438	223.6029	211.1497	208.2209	215.6013	231.3134	251.1471	269.7879 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657 (71)
Water heating gains (Table 5)	121.2053	118.5197	113.3466	102.0088	95.0640	87.8050	83.3467	87.0304	91.3493	99.4039	110.2725	119.7557 (72)
Total internal gains	617.6824	633.5068	605.3721	583.1697	551.5438	527.4914	505.7324	506.4873	523.0341	544.9533	580.5030	603.7796 (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				
East													10.4700	19.6403	0.6300		0.7000		0.7700		62.8443 (76)
West													10.7000	19.6403	0.6300		0.7000		0.7700		64.2248 (80)
Solar gains	127.0691	248.5741	409.3662	597.0362	731.6903	749.0152	713.0930	612.5364	476.1098	294.9542	158.4402	104.4955 (83)									
Total gains	744.7516	882.0809	1014.7383	1180.2059	1283.2341	1276.5066	1218.8254	1119.0237	999.1439	839.9075	738.9433	708.2751 (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	51.5788	51.7523	51.9235	52.7431	52.8993	53.6389	53.6389	53.7781	53.3516	52.8993	52.5842	52.2588									
alpha	4.4386	4.4502	4.4616	4.5162	4.5266	4.5759	4.5759	4.5852	4.5568	4.5266	4.5056	4.4839									
util living area	0.9953	0.9894	0.9738	0.9202	0.8032	0.6205	0.4648	0.5223	0.7792	0.9560	0.9905	0.9962 (86)									
MIT	19.4310	19.6556	20.0020	20.4590	20.7893	20.9520	20.9896	20.9828	20.8656	20.4046	19.8434	19.4062 (87)									
Th 2	19.9544	19.9575	19.9606	19.9750	19.9777	19.9904	19.9904	19.9927	19.9855	19.9777	19.9723	19.9665 (88)									
util rest of house	0.9939	0.9864	0.9661	0.8970	0.7508	0.5362	0.3622	0.4150	0.7035	0.9383	0.9872	0.9951 (89)									
MIT 2	18.1266	18.4147	18.8544	19.4248	19.7978	19.9615	19.9867	19.9860	19.8898	19.3735	18.6660	18.1033 (90)									
Living area fraction	fLA = Living area / (4) =												0.1261 (91)								
MIT	18.2912	18.5712	18.9992	19.5552	19.9229	20.0864	20.1132	20.1117	20.0129	19.5035	18.8145	18.2676 (92)									
Temperature adjustment													0.0000								
adjusted MIT	18.2912	18.5712	18.9992	19.5552	19.9229	20.0864	20.1132	20.1117	20.0129	19.5035	18.8145	18.2676 (93)									
8. Space heating requirement																					
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec									
Utilisation	0.9905	0.9805	0.9564	0.8854	0.7476	0.5446	0.3749	0.4281	0.7058	0.9275	0.9818	0.9923 (94)									
Useful gains	737.7096	864.9057	970.5098	1044.9828	959.4049	695.1875	456.9619	479.0470	705.2253	779.0430	725.4820	702.8388 (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	1906.3553	1856.5178	1691.7596	1419.7740	1092.4336	718.8368	460.3025	485.0510	778.8872	1182.8621	1565.6381	1891.8294 (97)									
Space heating kWh	869.4724	666.3634	536.6098	269.8496	98.9734	0.0000	0.0000	0.0000	0.0000	300.4414	604.9124	884.6090 (98a)									
Space heating requirement - total per year (kWh/year)													4231.2313								
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	869.4724	666.3634	536.6098	269.8496	98.9734	0.0000	0.0000	0.0000	0.0000	300.4414	604.9124	884.6090 (98c)									
Space heating requirement after solar contribution - total per year (kWh/year)													4231.2313								
Space heating per m2													(98c) / (4) = 35.9371 (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	869.4724	666.3634	536.6098	269.8496	98.9734	0.0000	0.0000	0.0000	0.0000	300.4414	604.9124	884.6090 (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)	940.9874	721.1725	580.7466	292.0451	107.1140	0.0000	0.0000	0.0000	0.0000	325.1530	654.6671	957.3690 (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	250.9027	221.8142	235.7530	207.8600	201.8105	182.2200	180.2523	187.2975	189.1967	210.4917	223.1779	248.2693 (64)									
Water heating requirement	80.3000	86.5841	86.0858	84.9417	82.9401	80.3000	80.3000	80.3000	80.3000	85.1433	86.4060	86.8613 (216)									
Efficiency of water heater (217)m	86.8177	86.5841	86.0858	84.9417	82.9401	80.3000	80.3000	80.3000	80.3000	85.1433	86.4060	86.8613 (217)									
Fuel for water heating, kWh/month	288.9994	256.1833	273.8581	244.7091	243.3207	226.9240	224.4736	233.2471	235.6124	247.2204	258.2899	285.8226 (219)									
Space cooling fuel requirement	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)									
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)									
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)									
Lighting	30.2162	24.2406	21.8259	15.9906	12.3516	10.0914	11.2676	14.6460	19.0237	24.9601	28.1924	31.0560 (232)									
Electricity generated by PVs (Appendix M) (negative quantity)	-52.8976	-73.4844	-104.0795	-115.2166	-122.6828	-113.8838	-112.3881	-106.8004	-96.7933	-83.0845	-57.7301	-45.8547 (233a)									
(233a)m	-52.8976	-73.4844	-104.0795	-115.2166	-122.6828	-113.8838	-112.3881	-106.8004	-96.7933	-83.0845	-57.7301	-45.8547 (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)									
(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)	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)									
(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)	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)									
(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)	-33.2997	-69.6312	-137.6637	-205.7444	-271.1190	-272.1464	-269.0240	-228.2747	-167.9206	-99.3345	-44.3715	-26.3717 (233b)									
(233b)m	-33.2997	-69.6312	-137.6637	-205.7444	-271.1190	-272.1464	-269.0240	-228.2747	-167.9206	-99.3345	-44.3715	-26.3717 (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)									
(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)	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)									
(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)	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)									
(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													4579.2547 (211)								
Space heating fuel - main system 2													0.0000 (213)								
Space heating fuel - secondary													0.0000 (215)								
Efficiency of water heater													80.3000								

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Water heating fuel used	3018.6608 (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)	243.8621 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2909.7972 (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	5017.9804 (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	4579.2547	0.2100	961.6435 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3018.6608	0.2100	633.9188 (264)
Space and water heating			1595.5622 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	243.8621	0.1443	35.1968 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1084.8959	0.1349	-146.3767
PV Unit electricity exported	-1824.9014	0.1260	-230.0018
Total			-376.3785 (269)
Total CO2, kg/year			1266.3099 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.7600 (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	4579.2547	1.1300	5174.5578 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3018.6608	1.1300	3411.0867 (278)
Space and water heating			8585.6445 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	243.8621	1.5338	374.0439 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1084.8959	1.4987	-1625.8998
PV Unit electricity exported	-1824.9014	0.4626	-844.2752
Total			-2470.1750 (283)
Total Primary energy kWh/year			6619.6141 (286)
Target Primary Energy Rate (TPER)			56.2200 (287)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 34			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	95 A	DER	10.69	TER	10.76		
Environmental	90 B	% DER < TER				0.65	
CO ₂ Emissions (t/year)	1.21	DFEE	38.07	TFEE	41.13		
Compliance Check	See BREL	% DFEE < TFEE				7.44	
% DPER < TPER	0.43	DPER	55.98	TPER	56.22		
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	58.8700 (1b)	x 2.3900 (2b)	= 140.6993 (1b) - (3b)
First floor	58.8700 (1c)	x 2.6200 (2c)	= 154.2394 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	117.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 294.9387 (5)

2. Ventilation rate

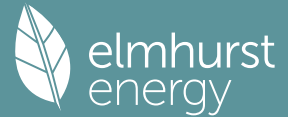
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 40.0000 / (5) = 0.1356 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3356 (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) = 0.3356 (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	0.4279	0.4195	0.4111	0.3692	0.3608	0.3188	0.3188	0.3104	0.3356	0.3608	0.3776	0.3944 (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	0.5916	0.5880	0.5845	0.5681	0.5651	0.5508	0.5508	0.5482	0.5563	0.5651	0.5713	0.5778 (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)			21.1700	1.2357	26.1606		(27)
Door			2.1400	1.3000	2.7820		(26a)
Ground Floor			58.8700	0.1300	7.6531	75.0000	4415.2500 (28a)
External Wall	154.3100	23.3100	131.0000	0.1900	24.8900	110.0000	14410.0000 (29a)
Plane Roof	58.8700		58.8700	0.0900	5.2983	9.0000	529.8300 (30)
Total net area of external elements Aum(A, m ²)			272.0500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	66.7840		(33)
Studs			201.9600			9.0000	1817.6400 (32c)
Block			33.8400			75.0000	2538.0000 (32c)
Internal Floor 1			58.8700			18.0000	1059.6600 (32d)
Internal Ceiling 1			58.8700			9.0000	529.8300 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	25300.2100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							214.8820 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				16.1800	0.0240	0.3883	

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E3 Sill	13.3500	0.0210	0.2803
E4 Jamb	33.6000	0.0160	0.5376
E5 Ground floor (normal)	30.8000	0.0920	2.8336
E10 Eaves (insulation at ceiling level)	16.7000	0.0580	0.9686
E16 Corner (normal)	20.0400	0.0470	0.9419
E6 Intermediate floor within a dwelling	30.8000	0.0010	0.0308
E12 Gable (insulation at ceiling level)	14.1000	0.0570	0.8037
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.7849 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	73.5689 (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	57.5761	57.2300	56.8909	55.2977	54.9997	53.6121	53.6121	53.3552	54.1466	54.9997	55.6027	56.2331
	131.1450	130.7989	130.4598	128.8666	128.5686	127.1810	127.1810	126.9241	127.7155	128.5686	129.1716	129.8019
Average = Sum(39)m / 12 =												128.8652
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1139	1.1109	1.1080	1.0945	1.0920	1.0802	1.0802	1.0780	1.0847	1.0920	1.0971	1.1024
HLP (average)												1.0945
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8541 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	31.1176	30.6554	30.0046	28.8047	27.9062	26.9099	26.3718	27.0180	27.7216	28.7877	30.0124	31.0124 (42b)
Hot water usage for other uses	43.8593	42.2644	40.6695	39.0746	37.4797	35.8849	35.8849	37.4797	39.0746	40.6695	42.2644	43.8593 (42c)
Average daily hot water use (litres/day)												68.7230 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	74.9769	72.9198	70.6742	67.8793	65.3860	62.7948	62.2566	64.4977	66.7963	69.4572	72.2767	74.8717 (44)
Energy conte	118.7450	103.8369	108.6235	92.9234	88.0221	77.2135	75.2940	79.8617	82.3665	94.2528	102.9715	117.2309 (45)
Energy content (annual)										Total = Sum(45)m =		1141.3417
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	100.9333	88.2613	92.3300	78.9849	74.8188	65.6315	63.9999	67.8824	70.0115	80.1149	87.5258	99.6463 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	100.9333	88.2613	92.3300	78.9849	74.8188	65.6315	63.9999	67.8824	70.0115	80.1149	87.5258	99.6463 (64)
										Total per year (kWh/year) = Sum(64)m =		970.1405 (64)
12Total per year (kWh/year)												970 (64)
Electric shower(s)	57.7196	51.4286	56.1581	53.5910	54.5966	52.0799	53.8158	54.5966	53.5910	56.1581	55.1021	57.7196 (64a)
												656.5570 (64a)
Heat gains from water heating, kWh/month	39.6632	34.9225	37.1220	33.1440	32.3538	29.4278	29.4539	30.6198	30.9006	34.0682	35.6570	39.3415 (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	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	145.4239	161.0050	145.4239	150.2714	145.4239	150.2714	145.4239	145.4239	150.2714	145.4239	150.2714	145.4239 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	282.2411	285.1699	277.7895	262.0774	242.2438	223.6029	211.1497	208.2209	215.6013	231.3134	251.1471	269.7879 (68)
Pumps, fans	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657 (71)
Total internal gains	53.3108	51.9680	49.8952	46.0333	43.4863	40.8720	39.5886	41.1556	42.9175	45.7906	49.5236	52.8783 (72)
	546.7879	563.9551	538.9207	524.1942	496.9661	480.5584	461.9743	460.6125	474.6024	488.3401	516.7541	533.9022 (73)

6. Solar gains

[Jan]		Area	Solar flux	g	FF	Access	Gains
		m2	Table 6a	Specific data	Specific data	factor	W
			W/m2	or Table 6b	or Table 6c	Table 6d	
East		10.4700	19.6403	0.7300	0.7000	0.7700	72.8196 (76)
West		10.7000	19.6403	0.7300	0.7000	0.7700	74.4192 (80)
Solar gains	147.2388	288.0304	474.3450	691.8039	847.8316	867.9065	826.2824
Total gains	694.0267	851.9854	1013.2657	1215.9980	1344.7977	1348.4649	1288.2567
							709.7643
							551.6828
							341.7723
							183.5895
							121.0820 (83)
							654.9843 (84)

7. Mean internal temperature (heating season)

Full SAP Calculation Printout



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	53.5883	53.7301	53.8698	54.5357	54.6622	55.2585	55.2585	55.3704	55.0273	54.6622	54.4070	54.1428
alpha	4.5726	4.5820	4.5913	4.6357	4.6441	4.6839	4.6839	4.6914	4.6685	4.6441	4.6271	4.6095
util living area	0.9964	0.9905	0.9727	0.9078	0.7713	0.5798	0.4294	0.4891	0.7557	0.9556	0.9921	0.9973 (86)
MIT	19.4537	19.6971	20.0640	20.5282	20.8358	20.9666	20.9933	20.9881	20.8903	20.4362	19.8604	19.4202 (87)
Th 2	19.9895	19.9919	19.9943	20.0053	20.0074	20.0170	20.0170	20.0188	20.0133	20.0074	20.0032	19.9988 (88)
util rest of house	0.9954	0.9878	0.9648	0.8824	0.7172	0.4999	0.3360	0.3895	0.6795	0.9380	0.9894	0.9965 (89)
MIT 2	18.5792	18.8228	19.1855	19.6343	19.9000	20.0016	20.0152	20.0152	19.9533	19.5608	18.9949	18.5529 (90)
Living area fraction									fLA = Living area / (4) =			0.1261 (91)
MIT	18.6895	18.9330	19.2963	19.7471	20.0180	20.1233	20.1386	20.1379	20.0715	19.6712	19.1041	18.6623 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6895	18.9330	19.2963	19.7471	20.0180	20.1233	20.1386	20.1379	20.0715	19.6712	19.1041	18.6623 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9935	0.9839	0.9577	0.8747	0.7178	0.5089	0.3477	0.4019	0.6845	0.9304	0.9860	0.9949 (94)
Useful gains	689.4823	838.2387	970.4044	1063.6087	965.2988	686.1991	447.9088	470.3281	702.4818	772.2979	690.5232	651.6486 (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	1887.1159	1835.5048	1669.4049	1397.8248	1069.4360	702.4645	450.0385	474.4326	762.6510	1166.2722	1550.5866	1877.2300 (97)
Space heating kWh	891.0394	670.1628	520.0564	240.6356	77.4781	0.0000	0.0000	0.0000	0.0000	293.1168	619.2456	911.8325 (98a)
Space heating requirement - total per year (kWh/year)												4223.5674
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	891.0394	670.1628	520.0564	240.6356	77.4781	0.0000	0.0000	0.0000	0.0000	293.1168	619.2456	911.8325 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4223.5674
Space heating per m2										(98c) / (4) =		35.8720 (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	1195.5015	941.1395	964.6228	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9058	0.9489	0.9242	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1082.8616	893.0257	891.5120	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1513.8297	1446.3326	1311.4608	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	310.2970	411.6603	312.4418	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	77.5743	102.9151	78.1105	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												258.5998 (107)
Energy for space heating												35.8720 (99)
Energy for space cooling												2.1964 (108)
Total												38.0683 (109)
Fabric Energy Efficiency (DFEE)												38.1 (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	58.8700 (1b)	x 2.3900 (2b)	= 140.6993 (1b) - (3b)
First floor	58.8700 (1c)	x 2.6200 (2c)	= 154.2394 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	117.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	294.9387 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c) = 40.0000 / (5) = 0.1356 (8)
Pressure test	Yes

Full SAP Calculation Printout



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

Blower Door
5.0000 (17)
0.3856 (18)
0 (19)

Shelter factor
Infiltration rate adjusted to include shelter factor

(20) = 1 - [0.075 x (19)] = 1.0000 (20)
(21) = (18) x (20) = 0.3856 (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	0.4917	0.4820	0.4724	0.4242	0.4145	0.3663	0.3663	0.3567	0.3856	0.4145	0.4338	0.4531	(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	0.6209	0.6162	0.6116	0.5900	0.5859	0.5671	0.5671	0.5636	0.5744	0.5859	0.5941	0.6027	(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)			21.1700	1.1450	24.2405			(27)
Ground Floor			58.8700	0.1300	7.6531			(28a)
External Wall	154.3100	23.3100	131.0000	0.1800	23.5800			(29a)
Plane Roof	58.8700		58.8700	0.1100	6.4757			(30)
Total net area of external elements Aum(A, m2)			272.0500					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	64.0893		(33)

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

214.8820 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element	16.1800	0.0500	0.8090	
E2 Other lintels (including other steel lintels)	13.3500	0.0500	0.6675	
E3 Sill	33.6000	0.0500	1.6800	
E4 Jamb	30.8000	0.1600	4.9280	
E5 Ground floor (normal)	16.7000	0.0600	1.0020	
E10 Eaves (insulation at ceiling level)	20.0400	0.0900	1.8036	
E16 Corner (normal)	30.8000	0.0000	0.0000	
E6 Intermediate floor within a dwelling	14.1000	0.0600	0.8460	
E12 Gable (insulation at ceiling level)				

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

11.7361 (36)

Point Thermal Bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 75.8254 (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	60.4290	59.9722	59.5244	57.4212	57.0277	55.1960	55.1960	54.8567	55.9015	57.0277	57.8238	58.6560	(38)
Heat transfer coeff	136.2543	135.7975	135.3498	133.2466	132.8531	131.0213	131.0213	130.6821	131.7269	132.8531	133.6491	134.4814	(39)
Average = Sum(39)m / 12 =													133.2447

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1572	1.1534	1.1496	1.1317	1.1284	1.1128	1.1128	1.1099	1.1188	1.1284	1.1351	1.1422	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

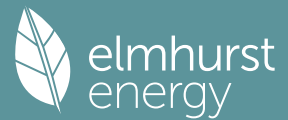
Assumed occupancy													2.8541 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	31.1176	30.6554	30.0046	28.8047	27.9062	26.9099	26.3718	27.0180	27.7216	28.7877	30.0124	31.0124	(42b)
Hot water usage for other uses	43.8593	42.2644	40.6695	39.0746	37.4797	35.8849	35.8849	37.4797	39.0746	40.6695	42.2644	43.8593	(42c)
Average daily hot water use (litres/day)													68.7230 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	74.9769	72.9198	70.6742	67.8793	65.3860	62.7948	62.2566	64.4977	66.7963	69.4572	72.2767	74.8717	(44)
Energy conte	118.7450	103.8369	108.6235	92.9234	88.0221	77.2135	75.2940	79.8617	82.3665	94.2528	102.9715	117.2309	(45)
Energy content (annual)										Total = Sum(45)m =			1141.3417
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	100.9333	88.2613	92.3300	78.9849	74.8188	65.6315	63.9999	67.8824	70.0115	80.1149	87.5258	99.6463	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	100.9333	88.2613	92.3300	78.9849	74.8188	65.6315	63.9999	67.8824	70.0115	80.1149	87.5258	99.6463	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =			970.1405 (64)
Electric shower(s)	57.7196	51.4286	56.1581	53.5910	54.5966	52.0799	53.8158	54.5966	53.5910	56.1581	55.1021	57.7196	(64a)
Heat gains from water heating, kWh/month	39.6632	34.9225	37.1220	33.1440	32.3538	29.4278	29.4539	30.6198	30.9006	34.0682	35.6570	39.3415	(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)
(66)m	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	145.4239	161.0050	145.4239	150.2714	145.4239	150.2714	145.4239	145.4239	150.2714	145.4239	150.2714	145.4239	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	282.2411	285.1699	277.7895	262.0774	242.2438	223.6029	211.1497	208.2209	215.6013	231.3134	251.1471	269.7879	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	(71)
Water heating gains (Table 5)	53.3108	51.9680	49.8952	46.0333	43.4863	40.8720	39.5886	41.1556	42.9175	45.7906	49.5236	52.8783	(72)
Total internal gains	546.7879	563.9551	538.9207	524.1942	496.9661	480.5584	461.9743	460.6125	474.6024	488.3401	516.7541	533.9022	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
East				10.4700	19.6403	0.6300	0.7000	0.7700	62.8443 (76)			
West				10.7000	19.6403	0.6300	0.7000	0.7700	64.2248 (80)			
Solar gains	127.0691	248.5741	409.3662	597.0362	731.6903	749.0152	713.0930	476.1098	294.9542	158.4402	104.4955 (83)	
Total gains	673.8570	812.5292	948.2869	1121.2304	1228.6564	1229.5736	1175.0674	1073.1489	950.7122	783.2942	675.1944	638.3977 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)														
tau	51.5788	51.7523	51.9235	52.7431	52.8993	53.6389	53.6389	53.7781	53.3516	52.8993	52.5842	52.2588		
alpha	4.4386	4.4502	4.4616	4.5162	4.5266	4.5759	4.5759	4.5852	4.5568	4.5266	4.5056	4.4839		
util living area	0.9968	0.9923	0.9795	0.9317	0.8213	0.6393	0.4808	0.5422	0.8011	0.9653	0.9933	0.9975	(86)	
MIT	19.3599	19.5875	19.9412	20.4165	20.7671	20.9458	20.9881	20.9801	20.8482	20.3565	19.7805	19.3356	(87)	
Th 2	19.9544	19.9575	19.9606	19.9750	19.9777	19.9904	19.9904	19.9927	19.9855	19.9777	19.9723	19.9665	(88)	
util rest of house	0.9959	0.9900	0.9732	0.9110	0.7709	0.5541	0.3753	0.4319	0.7279	0.9508	0.9910	0.9968	(89)	
MIT 2	18.4593	18.6880	19.0397	19.5080	19.8208	19.9647	19.9871	19.9865	19.8997	19.4622	18.8923	18.4442	(90)	
Living area fraction									fLA = Living area / (4) =			0.1261	(91)	
MIT	18.5729	18.8015	19.1534	19.6226	19.9402	20.0884	20.1133	20.1118	20.0193	19.5750	19.0043	18.5567	(92)	
Temperature adjustment												0.0000		
adjusted MIT	18.5729	18.8015	19.1534	19.6226	19.9402	20.0884	20.1133	20.1118	20.0193	19.5750	19.0043	18.5567	(93)	

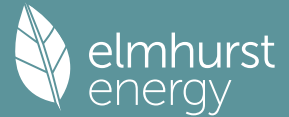
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9941	0.9865	0.9668	0.9023	0.7689	0.5629	0.3884	0.4454	0.7306	0.9432	0.9878	0.9953	(94)
Useful gains	669.8565	801.5505	916.7570	1011.6957	944.6582	692.1018	456.4545	478.0143	694.6352	738.8200	666.9476	635.4008	(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	1944.7452	1887.7834	1712.6371	1428.7460	1094.7348	719.1019	460.3188	485.0697	779.7315	1192.3563	1590.9983	1930.7028	(97)
Space heating kWh	948.5172	729.9485	592.1348	300.2762	111.6570	0.0000	0.0000	0.0000	0.0000	337.4310	665.3165	963.7047	(98a)
Space heating requirement - total per year (kWh/year)												4648.9859	
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	948.5172	729.9485	592.1348	300.2762	111.6570	0.0000	0.0000	0.0000	0.0000	337.4310	665.3165	963.7047	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4648.9859	
Space heating per m ²										(98c) / (4) =		39.4852	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8627	0.9201	0.8885	0.0000	0.0000	0.0000	0.0000	(100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1062.4638	892.1056	882.4036	0.0000	0.0000	0.0000	0.0000	(101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1374.8659	1314.0333	1197.8176	0.0000	0.0000	0.0000	0.0000	(102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	224.9295	313.9142	234.6681	0.0000	0.0000	0.0000	0.0000	(103)
Cooled fraction									fc = cooled area / (4) =				(104)
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	56.2324	78.4786	58.6670	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling requirement												0.0000	(107)
Energy for space heating												193.3779	(108)
Energy for space cooling												39.4852	(109)
Total												1.6424	(110)
Fabric Energy Efficiency (TFEE)												41.1276	(111)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 34			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	95 A	DER	10.69	TER	10.76		
Environmental	90 B	% DER < TER				0.65	
CO ₂ Emissions (t/year)	1.21	DFEE	38.07	TFEE	41.13		
Compliance Check	See BREL	% DFEE < TFEE				7.44	
% DPER < TPER	0.43	DPER	55.98	TPER	56.22		
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	58.8700 (1b)	x 2.3900 (2b)	= 140.6993 (1b) - (3b)
First floor	58.8700 (1c)	x 2.6200 (2c)	= 154.2394 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	117.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 294.9387 (5)

2. Ventilation rate

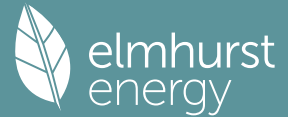
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1695 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3695 (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) = 0.3695 (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	0.4711	0.4619	0.4527	0.4065	0.3972	0.3511	0.3511	0.3418	0.3695	0.3972	0.4157	0.4342 (22b)
Effective ac	0.6110	0.6067	0.6025	0.5826	0.5789	0.5616	0.5616	0.5584	0.5683	0.5789	0.5864	0.5943 (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)			21.1700	1.2357	26.1606		(27)
Door			2.1400	1.3000	2.7820		(26a)
Ground Floor			58.8700	0.1300	7.6531	75.0000	4415.2500 (28a)
External Wall	154.3100	23.3100	131.0000	0.1900	24.8900	110.0000	14410.0000 (29a)
Plane Roof	58.8700		58.8700	0.0900	5.2983	9.0000	529.8300 (30)
Total net area of external elements A _{um} (A, m ²)			272.0500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	66.7840		(33)
Studs			201.9600			9.0000	1817.6400 (32c)
Block			33.8400			75.0000	2538.0000 (32c)
Internal Floor 1			58.8700			18.0000	1059.6600 (32d)
Internal Ceiling 1			58.8700			9.0000	529.8300 (32e)
Heat capacity C _m = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	25300.2100 (34)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							214.8820 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				16.1800	0.0240	0.3883	
E3 Sill				13.3500	0.0210	0.2803	
E4 Jamb				33.6000	0.0160	0.5376	

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E5 Ground floor (normal)	30.8000	0.0920	2.8336
E10 Eaves (insulation at ceiling level)	16.7000	0.0580	0.9686
E16 Corner (normal)	20.0400	0.0470	0.9419
E6 Intermediate floor within a dwelling	30.8000	0.0010	0.0308
E12 Gable (insulation at ceiling level)	14.1000	0.0570	0.8037
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.7849 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	73.5689 (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	59.4675	59.0480	58.6368	56.7056	56.3442	54.6622	54.6622	54.3507	55.3101	56.3442	57.0752	57.8394 (38)
Average = Sum(39)m / 12 =	133.0364	132.6169	132.2057	130.2745	129.9131	128.2311	128.2311	127.9196	128.8790	129.9131	130.6441	131.4083 (39)
												130.2727
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1299	1.1264	1.1229	1.1065	1.1034	1.0891	1.0891	1.0865	1.0946	1.1034	1.1096	1.1161 (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												2.8541 (42)
Hot water usage for mixer showers												
	72.0744	70.9913	69.4129	66.3930	64.1645	61.6791	60.2665	61.8329	63.5500	66.2184	69.3032	71.7983 (42a)
Hot water usage for baths												
	31.1176	30.6554	30.0046	28.8047	27.9062	26.9099	26.3718	27.0180	27.7216	28.7877	30.0124	31.0124 (42b)
Hot water usage for other uses												
	43.8593	42.2644	40.6695	39.0746	37.4797	35.8849	35.8849	37.4797	39.0746	40.6695	42.2644	43.8593 (42c)
Average daily hot water use (litres/day)												135.1732 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	147.0513	143.9111	140.0871	134.2724	129.5504	124.4739	122.5231	126.3306	130.3462	135.6756	141.5799	146.6699 (44)
Energy conte	232.8933	204.9275	215.3086	183.8122	174.3997	153.0552	148.1811	156.4237	160.7299	184.1106	201.7065	229.6496 (45)
Energy content (annual)										Total = Sum(45)m =		2245.1980
Distribution loss (46)m = 0.15 x (45)m												
	34.9340	30.7391	32.2963	27.5718	26.1600	22.9583	22.2272	23.4636	24.1095	27.6166	30.2560	34.4474 (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	19.5402	17.5944	19.3626	18.4900	18.9494	18.1794	18.6846	18.7678	18.2569	19.0475	18.6707	19.5074 (61)
Total heat required for water heating calculated for each month												
	252.4334	222.5219	234.6712	202.3022	193.3491	171.2346	166.8657	175.1916	178.9868	203.1580	220.3773	249.1571 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h												
	252.4334	222.5219	234.6712	202.3022	193.3491	171.2346	166.8657	175.1916	178.9868	203.1580	220.3773	249.1571 (64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				2470.2488 (64)
Electric shower(s)												2470 (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												
	82.3220	72.5370	76.4308	65.7401	62.7253	55.4357	53.9414	56.7028	58.0069	65.9786	71.7351	81.2354 (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	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	145.4239	161.0050	145.4239	150.2714	145.4239	150.2714	145.4239	145.4239	150.2714	145.4239	150.2714	145.4239 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	282.2411	285.1699	277.7895	262.0774	242.2438	223.6029	211.1497	208.2209	215.6013	231.3134	251.1471	269.7879 (68)
Pumps, fans	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707 (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)	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657 (71)
Total internal gains	110.6479	107.9419	102.7295	91.3056	84.3081	76.9940	72.5018	76.2135	80.5652	88.6810	99.6321	109.1873 (72)
	607.1251	622.9290	594.7550	572.4665	540.7879	516.6804	494.8875	495.6704	512.2500	534.2304	569.8627	593.2112 (73)

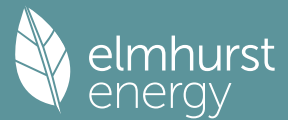
6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W		
East					10.4700	19.6403	0.7300	0.7000	0.7700	72.8196 (76)		
West					10.7000	19.6403	0.7300	0.7000	0.7700	74.4192 (80)		
Solar gains	147.2388	288.0304	474.3450	691.8039	847.8316	867.9065	826.2824	709.7643	551.6828	341.7723	183.5895	121.0820 (83)
Total gains	754.3639	910.9594	1069.1000	1264.2704	1388.6195	1384.5869	1321.1699	1205.4348	1063.9328	876.0027	753.4521	714.2933 (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	52.8264	52.9935	53.1583	53.9464	54.0964	54.8060	54.8060	54.9395	54.5305	54.0964	53.7937	53.4809
alpha	4.5218	4.5329	4.5439	4.5964	4.6064	4.6537	4.6537	4.6626	4.6354	4.6064	4.5862	4.5654
util living area	0.9950	0.9878	0.9676	0.8987	0.7602	0.5704	0.4224	0.4792	0.7419	0.9476	0.9896	0.9961 (86)
MIT	19.7969	19.9783	20.2502	20.5916	20.8145	20.9095	20.9287	20.9252	20.8556	20.5288	20.1035	19.7749 (87)
Th 2	19.9765	19.9794	19.9822	19.9956	19.9981	20.0097	20.0097	20.0119	20.0052	19.9981	19.9930	19.9877 (88)
util rest of house	0.9935	0.9844	0.9583	0.8716	0.7050	0.4908	0.3297	0.3806	0.6645	0.9275	0.9860	0.9949 (89)
MIT 2	18.5664	18.7993	19.1437	19.5675	19.8133	19.9103	19.9227	19.9235	19.8657	19.5054	18.9707	18.5469 (90)
Living area fraction	18.5664	18.7993	19.1437	19.5675	19.8133	19.9103	19.9227	19.9235	19.8657	19.5054	18.9707	0.1261 (91)
MIT	18.7216	18.9480	19.2832	19.6967	19.9395	20.0363	20.0496	20.0498	19.9906	19.6345	19.1136	18.7018 (92)
Temperature adjustment	18.5716	18.7980	19.1332	19.5467	19.7895	19.8863	19.8996	19.8998	19.8406	19.4845	18.9636	-0.1500
adjusted MIT	18.5716	18.7980	19.1332	19.5467	19.7895	19.8863	19.8996	19.8998	19.8406	19.4845	18.9636	18.5518 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9907	0.9788	0.9482	0.8571	0.6923	0.4804	0.3192	0.3691	0.6502	0.9140	0.9809	0.9926 (94)
Useful gains	747.3212	891.6831	1013.7545	1083.6501	961.3400	665.1816	421.6703	444.9074	691.8023	800.6879	739.0289	708.9955 (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	1898.6361	1843.1053	1670.1834	1386.9899	1050.9385	677.8676	423.1097	447.6952	739.8374	1154.2121	1549.9082	1885.9488 (97)
Space heating kWh	856.5782	639.3557	488.3831	218.4046	66.6613	0.0000	0.0000	0.0000	0.0000	263.0220	583.8330	875.6533 (98a)
Space heating requirement - total per year (kWh/year)												3991.8913
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	856.5782	639.3557	488.3831	218.4046	66.6613	0.0000	0.0000	0.0000	0.0000	263.0220	583.8330	875.6533 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3991.8913
Space heating per m2										(98c) / (4) =		33.9043 (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	856.5782	639.3557	488.3831	218.4046	66.6613	0.0000	0.0000	0.0000	0.0000	263.0220	583.8330	875.6533 (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)	967.8850	722.4358	551.8453	246.7849	75.3235	0.0000	0.0000	0.0000	0.0000	297.2000	659.6983	989.4387 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	252.4334	222.5219	234.6712	202.3022	193.3491	171.2346	166.8657	175.1916	178.9868	203.1580	220.3773	249.1571 (64)
Efficiency of water heater (217)m	88.1540	88.1078	88.0075	87.7723	87.3797	87.0000	87.0000	87.0000	87.0000	87.8400	88.0838	88.1633 (217)
Fuel for water heating, kWh/month	286.3549	252.5564	266.6490	230.4852	221.2747	196.8213	191.7996	201.3696	205.7320	231.2819	250.1904	282.6086 (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	29.5986	23.7451	21.3798	15.6638	12.0992	9.8851	11.0373	14.3466	18.6349	24.4500	27.6162	30.4212 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-38.5403	-59.0314	-92.3295	-109.7438	-120.7902	-113.2526	-111.3417	-103.6173	-89.3413	-69.9810	-43.5736	-32.4954 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-18.7644	-45.0195	-105.2128	-181.1379	-258.7904	-267.6158	-261.2926	-208.9392	-136.9083	-68.7591	-26.1091	-14.2771 (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												4510.6116 (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												2817.1236 (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)												238.8777 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2576.8639 (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 0.0000 (237)
Total delivered energy for all uses 5075.7490 (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	4510.6116	0.2100	947.2284 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2817.1236	0.2100	591.5960 (264)
Space and water heating			1538.8244 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	238.8777	0.1443	34.4774 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-984.0378	0.1335	-131.3389
PV Unit electricity exported	-1592.8261	0.1226	-195.3531
Total			-326.6920 (269)
Total CO2, kg/year			1258.5391 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.6900 (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	4510.6116	1.1300	5096.9911 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2817.1236	1.1300	3183.3497 (278)
Space and water heating			8280.3408 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	238.8777	1.5338	366.3986 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-984.0378	1.4932	-1469.3911
PV Unit electricity exported	-1592.8261	0.4500	-716.8353
Total			-2186.2264 (283)
Total Primary energy kWh/year			6590.6138 (286)
Dwelling Primary energy Rate (DPER)			55.9800 (287)

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

1. Overall dwelling characteristics

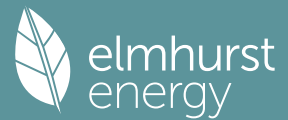
	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	58.8700 (1b)	x 2.3900 (2b)	= 140.6993 (1b) - (3b)
First floor	58.8700 (1c)	x 2.6200 (2c)	= 154.2394 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	117.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 294.9387 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1356 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3856 (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) = 0.3856 (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	0.4917 0.4820 0.4724 0.4242 0.4145 0.3663 0.3663 0.3567 0.3856 0.4145 0.4338 0.4531 (22b)
Effective ac	0.6209 0.6162 0.6116 0.5900 0.5859 0.5671 0.5671 0.5636 0.5744 0.5859 0.5941 0.6027 (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)			21.1700	1.1450	24.2405		(27)
Ground Floor			58.8700	0.1300	7.6531		(28a)
External Wall	154.3100	23.3100	131.0000	0.1800	23.5800		(29a)
Plane Roof	58.8700		58.8700	0.1100	6.4757		(30)
Total net area of external elements Aum(A, m2)			272.0500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		64.0893		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			214.8820 (35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	16.1800	0.0500	0.8090
E3 Sill	13.3500	0.0500	0.6675
E4 Jamb	33.6000	0.0500	1.6800
E5 Ground floor (normal)	30.8000	0.1600	4.9280
E10 Eaves (insulation at ceiling level)	16.7000	0.0600	1.0020
E16 Corner (normal)	20.0400	0.0900	1.8036
E6 Intermediate floor within a dwelling	30.8000	0.0000	0.0000
E12 Gable (insulation at ceiling level)	14.1000	0.0600	0.8460
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.7361 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 75.8254 (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	60.4290	59.9722	59.5244	57.4212	57.0277	55.1960	55.1960	54.8567	55.9015	57.0277	57.8238	58.6560 (38)
Average = Sum(39)m / 12 =	136.2543	135.7975	135.3498	133.2466	132.8531	131.0213	131.0213	130.6821	131.7269	132.8531	133.6491	134.4814 (39)
												133.2447
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1572	1.1534	1.1496	1.1317	1.1284	1.1128	1.1128	1.1099	1.1188	1.1284	1.1351	1.1422 (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													2.8541 (42)
Hot water usage for mixer showers													
72.0744	70.9913	69.4129	66.3930	64.1645	61.6791	60.2665	61.8329	63.5500	66.2184	69.3032	71.7983	(42a)	
Hot water usage for baths													
31.1176	30.6554	30.0046	28.8047	27.9062	26.9099	26.3718	27.0180	27.7216	28.7877	30.0124	31.0124	(42b)	
Hot water usage for other uses													
43.8593	42.2644	40.6695	39.0746	37.4797	35.8849	35.8849	37.4797	39.0746	40.6695	42.2644	43.8593	(42c)	
Average daily hot water use (litres/day)												135.1732 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.0513	143.9111	140.0871	134.2724	129.5504	124.4739	122.5231	126.3306	130.3462	135.6756	141.5799	146.6699 (44)	
Energy content (annual)	232.8933	204.9275	215.3086	183.8122	174.3997	153.0552	148.1811	156.4237	160.7299	184.1106	201.7065	229.6496 (45)	
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2245.1980	
34.9340	30.7391	32.2963	27.5718	26.1600	22.9583	22.2272	23.4636	24.1095	27.6166	30.2560	34.4474	(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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)	
Total heat required for water heating calculated for each month													
283.8522	250.9549	266.2675	233.1272	225.3587	202.3703	199.1400	207.3826	210.0450	235.0695	251.0216	280.6085	(62)	
WWHRS	-32.9494	-29.1407	-30.5145	-25.2672	-23.5481	-20.1503	-18.8877	-20.0852	-20.8483	-24.5778	-27.8437	-32.3392 (63a)	
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
Output from w/h	250.9027	221.8142	235.7530	207.8600	201.8105	182.2200	180.2523	187.2975	189.1967	210.4917	223.1779	248.2693 (64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2539.0459 (64)	
Electric shower(s)												2539 (64)	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
												0.0000 (64a)	
Heat gains from water heating, kWh/month													
90.1767	79.6452	84.3298	73.4463	70.7276	63.2196	62.0099	64.7506	65.7715	73.9565	79.3962	89.0982	(65)	

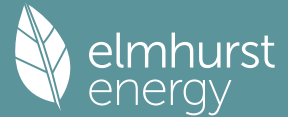
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	145.4239	161.0050	145.4239	150.2714	145.4239	150.2714	145.4239	145.4239	150.2714	145.4239	150.2714	145.4239 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	282.2411	285.1699	277.7895	262.0774	242.2438	223.6029	211.1497	208.2209	215.6013	231.3134	251.1471	269.7879 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657 (71)
Water heating gains (Table 5)	121.2053	118.5197	113.3466	102.0088	95.0640	87.8050	83.3467	87.0304	91.3493	99.4039	110.2725	119.7557 (72)
Total internal gains	617.6824	633.5068	605.3721	583.1697	551.5438	527.4914	505.7324	506.4873	523.0341	544.9533	580.5030	603.7796 (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				
East													10.4700	19.6403	0.6300		0.7000		0.7700		62.8443 (76)
West													10.7000	19.6403	0.6300		0.7000		0.7700		64.2248 (80)
Solar gains	127.0691	248.5741	409.3662	597.0362	731.6903	749.0152	713.0930	612.5364	476.1098	294.9542	158.4402	104.4955 (83)									
Total gains	744.7516	882.0809	1014.7383	1180.2059	1283.2341	1276.5066	1218.8254	1119.0237	999.1439	839.9075	738.9433	708.2751 (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	51.5788	51.7523	51.9235	52.7431	52.8993	53.6389	53.6389	53.7781	53.3516	52.8993	52.5842	52.2588									
alpha	4.4386	4.4502	4.4616	4.5162	4.5266	4.5759	4.5759	4.5852	4.5568	4.5266	4.5056	4.4839									
util living area	0.9953	0.9894	0.9738	0.9202	0.8032	0.6205	0.4648	0.5223	0.7792	0.9560	0.9905	0.9962 (86)									
MIT	19.4310	19.6556	20.0020	20.4590	20.7893	20.9520	20.9896	20.9828	20.8656	20.4046	19.8434	19.4062 (87)									
Th 2	19.9544	19.9575	19.9606	19.9750	19.9777	19.9904	19.9904	19.9927	19.9855	19.9777	19.9723	19.9665 (88)									
util rest of house	0.9939	0.9864	0.9661	0.8970	0.7508	0.5362	0.3622	0.4150	0.7035	0.9383	0.9872	0.9951 (89)									
MIT 2	18.1266	18.4147	18.8544	19.4248	19.7978	19.9615	19.9867	19.9860	19.8898	19.3735	18.6660	18.1033 (90)									
Living area fraction	fLA = Living area / (4) =																				
MIT	18.2912	18.5712	18.9992	19.5552	19.9229	20.0864	20.1132	20.1117	20.0129	19.5035	18.8145	18.2676 (92)									
Temperature adjustment	0.0000																				
adjusted MIT	18.2912	18.5712	18.9992	19.5552	19.9229	20.0864	20.1132	20.1117	20.0129	19.5035	18.8145	18.2676 (93)									
8. Space heating requirement																					
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec									
Utilisation	0.9905	0.9805	0.9564	0.8854	0.7476	0.5446	0.3749	0.4281	0.7058	0.9275	0.9818	0.9923 (94)									
Useful gains	737.7096	864.9057	970.5098	1044.9828	959.4049	695.1875	456.9619	479.0470	705.2253	779.0430	725.4820	702.8388 (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	1906.3553	1856.5178	1691.7596	1419.7740	1092.4336	718.8368	460.3025	485.0510	778.8872	1182.8621	1565.6381	1891.8294 (97)									
Space heating kWh	869.4724	666.3634	536.6098	269.8496	98.9734	0.0000	0.0000	0.0000	0.0000	300.4414	604.9124	884.6090 (98a)									
Space heating requirement - total per year (kWh/year)	4231.2313																				
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	869.4724	666.3634	536.6098	269.8496	98.9734	0.0000	0.0000	0.0000	0.0000	300.4414	604.9124	884.6090 (98c)									
Space heating requirement after solar contribution - total per year (kWh/year)	4231.2313																				
Space heating per m2	(98c) / (4) =												35.9371 (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	869.4724	666.3634	536.6098	269.8496	98.9734	0.0000	0.0000	0.0000	0.0000	300.4414	604.9124	884.6090 (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)	940.9874	721.1725	580.7466	292.0451	107.1140	0.0000	0.0000	0.0000	0.0000	325.1530	654.6671	957.3690 (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	250.9027	221.8142	235.7530	207.8600	201.8105	182.2200	180.2523	187.2975	189.1967	210.4917	223.1779	248.2693 (64)									
Water heating requirement	80.3000	86.8177	86.5841	86.0858	84.9417	82.9401	80.3000	80.3000	80.3000	85.1433	86.4060	86.8613 (216)									
Efficiency of water heater (217)m	86.8177	86.5841	86.0858	84.9417	82.9401	80.3000	80.3000	80.3000	80.3000	85.1433	86.4060	86.8613 (217)									
Fuel for water heating, kWh/month	288.9994	256.1833	273.8581	244.7091	243.3207	226.9240	224.4736	233.2471	235.6124	247.2204	258.2899	285.8226 (219)									
Space cooling fuel requirement	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)									
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)									
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)									
Lighting	30.2162	24.2406	21.8259	15.9906	12.3516	10.0914	11.2676	14.6460	19.0237	24.9601	28.1924	31.0560 (232)									
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-52.8976	-73.4844	-104.0795	-115.2166	-122.6828	-113.8838	-112.3881	-106.8004	-96.7933	-83.0845	-57.7301	-45.8547 (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	-33.2997	-69.6312	-137.6637	-205.7444	-271.1190	-272.1464	-269.0240	-228.2747	-167.9206	-99.3345	-44.3715	-26.3717 (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	4579.2547 (211)																				
Space heating fuel - main system 2	0.0000 (213)																				
Space heating fuel - secondary	0.0000 (215)																				
Efficiency of water heater	80.3000																				

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Water heating fuel used	3018.6608 (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)	243.8621 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2909.7972 (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	5017.9804 (238)

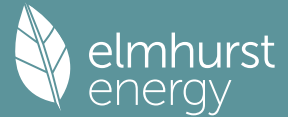
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4579.2547	0.2100	961.6435 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3018.6608	0.2100	633.9188 (264)
Space and water heating			1595.5622 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	243.8621	0.1443	35.1968 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1084.8959	0.1349	-146.3767
PV Unit electricity exported	-1824.9014	0.1260	-230.0018
Total			-376.3785 (269)
Total CO2, kg/year			1266.3099 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.7600 (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	4579.2547	1.1300	5174.5578 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3018.6608	1.1300	3411.0867 (278)
Space and water heating			8585.6445 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	243.8621	1.5338	374.0439 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1084.8959	1.4987	-1625.8998
PV Unit electricity exported	-1824.9014	0.4626	-844.2752
Total			-2470.1750 (283)
Total Primary energy kWh/year			6619.6141 (286)
Target Primary Energy Rate (TPER)			56.2200 (287)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 34			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	95 A	DER	10.69	TER	10.76		
Environmental	90 B	% DER < TER				0.65	
CO ₂ Emissions (t/year)	1.21	DFEE	38.07	TFEE	41.13		
Compliance Check	See BREL	% DFEE < TFEE				7.44	
% DPER < TPER	0.43	DPER	55.98	TPER	56.22		
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	58.8700 (1b)	x 2.3900 (2b)	= 140.6993 (1b) - (3b)
First floor	58.8700 (1c)	x 2.6200 (2c)	= 154.2394 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	117.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 294.9387 (5)

2. Ventilation rate

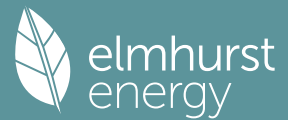
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1695 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3695 (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) = 0.3695 (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	0.4711	0.4619	0.4527	0.4065	0.3972	0.3511	0.3511	0.3418	0.3695	0.3972	0.4157	0.4342 (22b)
Effective ac	0.6110	0.6067	0.6025	0.5826	0.5789	0.5616	0.5616	0.5584	0.5683	0.5789	0.5864	0.5943 (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)			21.1700	1.2357	26.1606		(27)
Door			2.1400	1.3000	2.7820		(26a)
Ground Floor			58.8700	0.1300	7.6531	75.0000	4415.2500 (28a)
External Wall	154.3100	23.3100	131.0000	0.1900	24.8900	110.0000	14410.0000 (29a)
Plane Roof	58.8700		58.8700	0.0900	5.2983	9.0000	529.8300 (30)
Total net area of external elements A _{um} (A, m ²)			272.0500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	66.7840		(33)
Studs			201.9600			9.0000	1817.6400 (32c)
Block			33.8400			75.0000	2538.0000 (32c)
Internal Floor 1			58.8700			18.0000	1059.6600 (32d)
Internal Ceiling 1			58.8700			9.0000	529.8300 (32e)
Heat capacity C _m = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	25300.2100 (34)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							214.8820 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				16.1800	0.0240	0.3883	
E3 Sill				13.3500	0.0210	0.2803	
E4 Jamb				33.6000	0.0160	0.5376	

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E5 Ground floor (normal)	30.8000	0.0920	2.8336
E10 Eaves (insulation at ceiling level)	16.7000	0.0580	0.9686
E16 Corner (normal)	20.0400	0.0470	0.9419
E6 Intermediate floor within a dwelling	30.8000	0.0010	0.0308
E12 Gable (insulation at ceiling level)	14.1000	0.0570	0.8037
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.7849 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	73.5689 (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	59.4675	59.0480	58.6368	56.7056	56.3442	54.6622	54.6622	54.3507	55.3101	56.3442	57.0752	57.8394 (38)
Average = Sum(39)m / 12 =	133.0364	132.6169	132.2057	130.2745	129.9131	128.2311	128.2311	127.9196	128.8790	129.9131	130.6441	131.4083 (39)
												130.2727
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1299	1.1264	1.1229	1.1065	1.1034	1.0891	1.0891	1.0865	1.0946	1.1034	1.1096	1.1161 (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													2.8541 (42)
Hot water usage for mixer showers	72.0744	70.9913	69.4129	66.3930	64.1645	61.6791	60.2665	61.8329	63.5500	66.2184	69.3032	71.7983 (42a)	
Hot water usage for baths	31.1176	30.6554	30.0046	28.8047	27.9062	26.9099	26.3718	27.0180	27.7216	28.7877	30.0124	31.0124 (42b)	
Hot water usage for other uses	43.8593	42.2644	40.6695	39.0746	37.4797	35.8849	35.8849	37.4797	39.0746	40.6695	42.2644	43.8593 (42c)	
Average daily hot water use (litres/day)												135.1732 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	147.0513	143.9111	140.0871	134.2724	129.5504	124.4739	122.5231	126.3306	130.3462	135.6756	141.5799	146.6699 (44)	
Energy content (annual)	232.8933	204.9275	215.3086	183.8122	174.3997	153.0552	148.1811	156.4237	160.7299	184.1106	201.7065	229.6496 (45)	
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2245.1980	
	34.9340	30.7391	32.2963	27.5718	26.1600	22.9583	22.2272	23.4636	24.1095	27.6166	30.2560	34.4474 (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	19.5402	17.5944	19.3626	18.4900	18.9494	18.1794	18.6846	18.7678	18.2569	19.0475	18.6707	19.5074 (61)	
Total heat required for water heating calculated for each month	252.4334	222.5219	234.6712	202.3022	193.3491	171.2346	166.8657	175.1916	178.9868	203.1580	220.3773	249.1571 (62)	
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)	
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
Output from w/h	252.4334	222.5219	234.6712	202.3022	193.3491	171.2346	166.8657	175.1916	178.9868	203.1580	220.3773	249.1571 (64)	
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
												Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)	
Heat gains from water heating, kWh/month	82.3220	72.5370	76.4308	65.7401	62.7253	55.4357	53.9414	56.7028	58.0069	65.9786	71.7351	81.2354 (65)	

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.8156	30.0347	24.4259	18.4920	13.8230	11.6699	12.6098	16.3907	21.9995	27.9334	32.6024	34.7555 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	421.2554	425.6267	414.6112	391.1603	361.5578	333.7357	315.1488	310.7775	321.7930	345.2439	374.8464	402.6685 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657 (71)
Water heating gains (Table 5)	110.6479	107.9419	102.7295	91.3056	84.3081	76.9940	72.5018	76.2135	80.5652	88.6810	99.6321	109.1873 (72)
Total internal gains	680.7808	678.6652	656.8284	616.0198	574.7508	534.4615	512.3222	515.4435	536.4196	576.9201	622.1427	661.6731 (73)

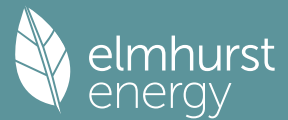
6. Solar gains

[Jan]												
					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	Gains W
East					10.4700	19.6403	0.7300		0.7000		0.7700	72.8196 (76)
West					10.7000	19.6403	0.7300		0.7000		0.7700	74.4192 (80)
Solar gains	147.2388	288.0304	474.3450	691.8039	847.8316	867.9065	826.2824	709.7643	551.6828	341.7723	183.5895	121.0820 (83)
Total gains	828.0196	966.6956	1131.1734	1307.8236	1422.5824	1402.3680	1338.6046	1225.2078	1088.1024	918.6924	805.7322	782.7552 (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	52.8264	52.9935	53.1583	53.9464	54.0964	54.8060	54.8060	54.9395	54.5305	54.0964	53.7937	53.4809
alpha	4.5218	4.5329	4.5439	4.5964	4.6064	4.6537	4.6537	4.6626	4.6354	4.6064	4.5862	4.5654
util living area	0.9927	0.9847	0.9606	0.8886	0.7487	0.5641	0.4171	0.4720	0.7310	0.9388	0.9865	0.9943 (86)
MIT	19.8520	20.0185	20.2905	20.6117	20.8219	20.9105	20.9289	20.9257	20.8603	20.5539	20.1416	19.8266 (87)
Th 2	19.9765	19.9794	19.9822	19.9956	19.9981	20.0097	20.0097	20.0119	20.0052	19.9981	19.9930	19.9877 (88)
util rest of house	0.9907	0.9805	0.9497	0.8598	0.6929	0.4850	0.3254	0.3746	0.6532	0.9162	0.9820	0.9927 (89)
MIT 2	18.6364	18.8499	19.1929	19.5899	19.8201	19.9109	19.9228	19.9237	19.8694	19.5345	19.0187	18.6128 (90)
Living area fraction	18.7898	18.9973	19.3313	19.7188	19.9464	20.0370	20.0497	20.0501	19.9944	19.6631	19.1603	0.1261 (91)
MIT	18.7898	18.9973	19.3313	19.7188	19.9464	20.0370	20.0497	20.0501	19.9944	19.6631	19.1603	18.7659 (92)
Temperature adjustment	18.6398	18.8473	19.1813	19.5688	19.7964	19.8870	19.8997	19.9001	19.8444	19.5131	19.0103	-0.1500
adjusted MIT	18.6398	18.8473	19.1813	19.5688	19.7964	19.8870	19.8997	19.9001	19.8444	19.5131	19.0103	18.6159 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9869	0.9741	0.9387	0.8454	0.6806	0.4748	0.3151	0.3633	0.6392	0.9021	0.9758	0.9895 (94)
Useful gains	817.1511	941.6388	1061.7769	1105.5795	968.2293	665.8664	421.7612	445.1179	695.5108	828.7614	786.2481	774.5719 (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	1907.7086	1849.6451	1676.5463	1389.8739	1051.8308	677.9591	423.1239	447.7268	740.3290	1157.9233	1556.0150	1894.3686 (97)
Space heating kWh	811.3747	610.1802	457.3884	204.6920	62.1995	0.0000	0.0000	0.0000	0.0000	244.8964	554.2322	833.1287 (98a)
Space heating requirement - total per year (kWh/year)												3778.0920
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	811.3747	610.1802	457.3884	204.6920	62.1995	0.0000	0.0000	0.0000	0.0000	244.8964	554.2322	833.1287 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3778.0920
Space heating per m2										(98c) / (4) =		32.0884 (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	811.3747	610.1802	457.3884	204.6920	62.1995	0.0000	0.0000	0.0000	0.0000	244.8964	554.2322	833.1287 (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)	916.8076	689.4691	516.8230	231.2904	70.2819	0.0000	0.0000	0.0000	0.0000	276.7191	626.2511	941.3884 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)

Water heating	
Water heating requirement	252.4334
Efficiency of water heater (217)m	88.1394
Fuel for water heating, kWh/month	286.4025
Space cooling fuel requirement	222.5219
(221)m	234.6712
Pumps and Fa	202.3022
Lighting	193.3491
Electricity generated by PVs (Appendix M) (negative quantity)	171.2346
(233a)m	166.8657
Electricity generated by wind turbines (Appendix M) (negative quantity)	175.1916
(234a)m	178.9868
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	203.1580
(235a)m	220.3773
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	249.1571
(235c)m	87.0000
Electricity generated by PVs (Appendix M) (negative quantity)	88.1501
(233b)m	282.6509
Electricity generated by wind turbines (Appendix M) (negative quantity)	221.2346
(234b)m	196.8213
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	191.7996
(235b)m	201.3696
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	205.7320
(235d)m	231.3517
Annual totals kWh/year	250.2353
Space heating fuel - main system 1	282.6509
Space heating fuel - main system 2	0.0000
Space heating fuel - secondary	0.0000
Efficiency of water heater	0.0000
Water heating fuel used	0.0000
Space cooling fuel	0.0000

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)	238.8777 (232)

Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2576.8639 (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)

Space heating fuel - main system 1	4269.0306 (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	2817.5466 (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)	238.8777 (232)

Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2576.8639 (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

4834.5909 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4269.0306	3.6400	155.3927 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2817.5466	3.6400	102.5587 (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	238.8777	16.4900	39.3909 (250)
Additional standing charges			92.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-984.0378	16.4900	-162.2678
PV Unit electricity exported	-1592.8261	5.5900	-89.0390
Total			-251.3068 (252)
Total energy cost			152.2169 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.3367 (257)
SAP value		94.5417
SAP rating (Section 12)		95 (258)
SAP band		A

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4269.0306	0.2100	896.4964 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2817.5466	0.2100	591.6848 (264)
Space and water heating			1488.1812 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	238.8777	0.1443	34.4774 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-984.0378	0.1335	-131.3389
PV Unit electricity exported	-1592.8261	0.1226	-195.3531
Total			-326.6920 (269)
Total CO2, kg/year			1207.8959 (272)
CO2 emissions per m2			10.2600 (273)
EI value			90.0542
EI rating			90 (274)
EI band			B

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

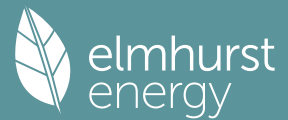
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	58.8700 (1b)	x 2.3900 (2b)	= 140.6993 (1b) - (3b)
First floor	58.8700 (1c)	x 2.6200 (2c)	= 154.2394 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	117.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	294.9387 (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) = 0.1695 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3695 (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) = 0.3695 (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	0.4711	0.4619	0.4527	0.4065	0.3972	0.3511	0.3511	0.3418	0.3695	0.3972	0.4157	0.4342	(22b)
	0.6110	0.6067	0.6025	0.5826	0.5789	0.5616	0.5616	0.5584	0.5683	0.5789	0.5864	0.5943	(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)			21.1700	1.2357	26.1606			(27)
Door			2.1400	1.3000	2.7820			(26a)
Ground Floor			58.8700	0.1300	7.6531	75.0000	4415.2500	(28a)
External Wall	154.3100	23.3100	131.0000	0.1900	24.8900	110.0000	14410.0000	(29a)
Plane Roof	58.8700		58.8700	0.0900	5.2983	9.0000	529.8300	(30)
Total net area of external elements Aum (A, m2)			272.0500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	66.7840			(33)
Studs			201.9600			9.0000	1817.6400	(32c)
Block			33.8400			75.0000	2538.0000	(32c)
Internal Floor 1			58.8700			18.0000	1059.6600	(32d)
Internal Ceiling 1			58.8700			9.0000	529.8300	(32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
(28)...(30) + (32) + (32a)...(32e) = 25300.2100 (34)
214.8820 (35)

List of Thermal Bridges	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	16.1800	0.0240	0.3883	
E3 Sill	13.3500	0.0210	0.2803	
E4 Jamb	33.6000	0.0160	0.5376	
E5 Ground floor (normal)	30.8000	0.0920	2.8336	
E10 Eaves (insulation at ceiling level)	16.7000	0.0580	0.9686	
E16 Corner (normal)	20.0400	0.0470	0.9419	
E6 Intermediate floor within a dwelling	30.8000	0.0010	0.0308	
E12 Gable (insulation at ceiling level)	14.1000	0.0570	0.8037	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				6.7849 (36)
Point Thermal bridges				0.0000 (36a)
Total fabric heat loss				(33) + (36) + (36a) = 73.5689 (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	59.4675	59.0480	58.6368	56.7056	56.3442	54.6622	54.6622	54.3507	55.3101	56.3442	57.0752	57.8394	(38)
Average = Sum(39)m / 12 =	133.0364	132.6169	132.2057	130.2745	129.9131	128.2311	128.2311	127.9196	128.8790	129.9131	130.6441	131.4083	(39)
												130.2727	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1299	1.1264	1.1229	1.1065	1.1034	1.0891	1.0891	1.0865	1.0946	1.1034	1.1096	1.1161	(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													2.8541 (42)
Hot water usage for mixer showers													
72.0744	70.9913	69.4129	66.3930	64.1645	61.6791	60.2665	61.8329	63.5500	66.2184	69.3032	71.7983		(42a)
Hot water usage for baths													
31.1176	30.6554	30.0046	28.8047	27.9062	26.9099	26.3718	27.0180	27.7216	28.7877	30.0124	31.0124		(42b)
Hot water usage for other uses													
43.8593	42.2644	40.6695	39.0746	37.4797	35.8849	35.8849	37.4797	39.0746	40.6695	42.2644	43.8593		(42c)
Average daily hot water use (litres/day)												135.1732	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
147.0513	143.9111	140.0871	134.2724	129.5504	124.4739	122.5231	126.3306	130.3462	135.6756	141.5799	146.6699		(44)
Energy conte	232.8933	204.9275	215.3086	183.8122	174.3997	153.0552	148.1811	156.4237	160.7299	184.1106	201.7065	229.6496	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
34.9340	30.7391	32.2963	27.5718	26.1600	22.9583	22.2272	23.4636	24.1095	27.6166	30.2560	34.4474		(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	19.5402	17.5944	19.3626	18.4900	18.9494	18.1794	18.6846	18.7678	18.2569	19.0475	18.6707	19.5074	(61)
Total heat required for water heating calculated for each month													
252.4334	222.5219	234.6712	202.3022	193.3491	171.2346	166.8657	175.1916	178.9868	203.1580	220.3773	249.1571		(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	252.4334	222.5219	234.6712	202.3022	193.3491	171.2346	166.8657	175.1916	178.9868	203.1580	220.3773	249.1571	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	82.3220	72.5370	76.4308	65.7401	62.7253	55.4357	53.9414	56.7028	58.0069	65.9786	71.7351	81.2354	(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	
171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
33.8156	30.0347	24.4259	18.4920	13.8230	11.6699	12.6098	16.3907	21.9995	27.9334	32.6024	34.7555		(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
421.2554	425.6267	414.6112	391.1603	361.5578	333.7357	315.1488	310.7775	321.7930	345.2439	374.8464	402.6685		(68)

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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5											
	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790 (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 (70)
Losses e.g. evaporation (negative values) (Table 5)											
	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657 (71)
Water heating gains (Table 5)	110.6479	107.9419	102.7295	91.3056	84.3081	76.9940	72.5018	76.2135	80.5652	88.6810	109.1873 (72)
Total internal gains	680.7808	678.6652	656.8284	616.0198	574.7508	534.4615	512.3222	515.4435	536.4196	576.9201	622.1427 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
East				10.4700	19.6403	0.7300		0.7000		0.7700		72.8196 (76)
West				10.7000	19.6403	0.7300		0.7000		0.7700		74.4192 (80)
Solar gains	147.2388	288.0304	474.3450	691.8039	847.8316	867.9065	826.2824	709.7643	551.6828	341.7723	183.5895	121.0820 (83)
Total gains	828.0196	966.6956	1131.1734	1307.8236	1422.5824	1402.3680	1338.6046	1225.2078	1088.1024	918.6924	805.7322	782.7552 (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)											21.0000 (85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
tau	52.8264	52.9935	53.1583	53.9464	54.0964	54.8060	54.8060	54.9395	54.5305	54.0964	53.7937
alpha	4.5218	4.5329	4.5439	4.5964	4.6064	4.6537	4.6537	4.6626	4.6354	4.6064	4.5862
util living area	0.9927	0.9847	0.9606	0.8886	0.7487	0.5641	0.4171	0.4720	0.7310	0.9388	0.9865
MIT	19.8520	20.0185	20.2905	20.6117	20.8219	20.9105	20.9289	20.9257	20.8603	20.5539	20.1416
Th 2	19.9765	19.9794	19.9822	19.9956	19.9981	20.0097	20.0097	20.0119	20.0052	19.9981	19.9930
util rest of house	0.9907	0.9805	0.9497	0.8598	0.6929	0.4850	0.3254	0.3746	0.6532	0.9162	0.9820
MIT 2	18.6364	18.8499	19.1929	19.5899	19.8201	19.9109	19.9228	19.9237	19.8694	19.5345	19.0187
Living area fraction	18.7898	18.9973	19.3313	19.7188	19.9464	20.0370	20.0497	20.0501	19.9944	19.6631	19.1603
MIT	18.7898	18.9973	19.3313	19.7188	19.9464	20.0370	20.0497	20.0501	19.9944	19.6631	19.1603
Temperature adjustment	18.6398	18.8473	19.1813	19.5688	19.7964	19.8870	19.8997	19.9001	19.8444	19.5131	19.0103
adjusted MIT	18.6398	18.8473	19.1813	19.5688	19.7964	19.8870	19.8997	19.9001	19.8444	19.5131	19.0103

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9869	0.9741	0.9387	0.8454	0.6806	0.4748	0.3151	0.3633	0.6392	0.9021	0.9758	0.9895
Useful gains	817.1511	941.6388	1061.7769	1105.5795	968.2293	665.8664	421.7612	445.1179	695.5108	828.7614	786.2481	774.5719
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	1907.7086	1849.6451	1676.5463	1389.8739	1051.8308	677.9591	423.1239	447.7268	740.3290	1157.9233	1556.0150	1894.3686
Space heating kWh	811.3747	610.1802	457.3884	204.6920	62.1995	0.0000	0.0000	0.0000	0.0000	244.8964	554.2322	833.1287
Space heating requirement - total per year (kWh/year)												3778.0920
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
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	811.3747	610.1802	457.3884	204.6920	62.1995	0.0000	0.0000	0.0000	0.0000	244.8964	554.2322	833.1287
Space heating requirement after solar contribution - total per year (kWh/year)												3778.0920
Space heating per m2										(98c) / (4) =		32.0884

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	811.3747	610.1802	457.3884	204.6920	62.1995	0.0000	0.0000	0.0000	0.0000	244.8964	554.2322	833.1287 (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)	916.8076	689.4691	516.8230	231.2904	70.2819	0.0000	0.0000	0.0000	0.0000	276.7191	626.2511	941.3884 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	252.4334	222.5219	234.6712	202.3022	193.3491	171.2346	166.8657	175.1916	178.9868	203.1580	220.3773	249.1571 (64)
Efficiency of water heater	88.1394	88.0941	87.9856	87.7480	87.3604	87.0000	87.0000	87.0000	87.0000	87.8135	88.0680	87.0000 (216)
(217)m	88.1394	88.0941	87.9856	87.7480	87.3604	87.0000	87.0000	87.0000	87.0000	87.8135	88.0680	88.1501 (217)
Fuel for water heating, kWh/month	286.4025	252.5956	266.7155	230.5491	221.3236	196.8213	191.7996	201.3696	205.7320	231.3517	250.2353	282.6509 (219)
Space cooling fuel requirement	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)
(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	29.5986	23.7451	21.3798	15.6638	12.0992	9.8851	11.0373	14.3466	18.6349	24.4500	27.6162	30.4212 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-38.5403	-59.0314	-92.3295	-109.7438	-120.7902	-113.2526	-111.3417	-103.6173	-89.3413	-69.9810	-43.5736	-32.4954 (233a)
(233a)m	-38.5403	-59.0314	-92.3295	-109.7438	-120.7902	-113.2526	-111.3417	-103.6173	-89.3413	-69.9810	-43.5736	-32.4954 (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	-18.7644	-45.0195	-105.2128	-181.1379	-258.7904	-267.6158	-261.2926	-208.9392	-136.9083	-68.7591	-26.1091	-14.2771	(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												4269.0306	(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												2817.5466	(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)												238.8777	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2576.8639	(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												4834.5909	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4269.0306	5.6000	239.0657	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2817.5466	5.6000	157.7826	(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	238.8777	26.0600	62.2515	(250)
Additional standing charges			99.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-984.0378	26.0600	-256.4403	
PV Unit electricity exported	-1592.8261	5.8100	-92.5432	
Total			-348.9835	(252)
Total energy cost			231.5280	(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	4269.0306	0.2100	896.4964	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2817.5466	0.2100	591.6848	(264)
Space and water heating			1488.1812	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	238.8777	0.1443	34.4774	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-984.0378	0.1335	-131.3389	
PV Unit electricity exported	-1592.8261	0.1226	-195.3531	
Total			-326.6920	(269)
Total CO2, kg/year			1207.8959	(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	4269.0306	1.1300	4824.0045	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2817.5466	1.1300	3183.8276	(278)
Space and water heating			8007.8322	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	238.8777	1.5338	366.3986	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-984.0378	1.4932	-1469.3911	
PV Unit electricity exported	-1592.8261	0.4500	-716.8353	
Total			-2186.2264	(283)
Total Primary energy kWh/year			6318.1052	(286)

SAP 10 EPC IMPROVEMENTS

Plot 34

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

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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 + 0.5 -£ 21 -136 kg (11.3%)

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

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

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

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

	Current	Potential	Saving
Electricity	£85	£85	£0
Mains gas	£496	£496	£0
Space heating	£360	£360	£0
Water heating	£158	£158	£0
Lighting	£62	£62	£0
Generated (PV)	-£349	-£349	£0
Total cost of fuels	£232	£232	£0
Total cost of uses	£231	£231	£0
Delivered energy	41 kWh/m²	41 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.2 tonnes	1.2 tonnes	0.0 tonnes
CO2 emissions per m²	10 kg/m²	10 kg/m²	0 kg/m²
Primary energy	54 kWh/m²	54 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	58.8700 (1b)	x 2.3900 (2b)	= 140.6993 (1b) - (3b)
First floor	58.8700 (1c)	x 2.6200 (2c)	= 154.2394 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	117.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 294.9387 (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) = 0.1695 (8)

Pressure test Yes

Pressure Test Method Blower Door

Measured/design AP50 4.0000 (17)

Infiltration rate 0.3695 (18)

Number of sides sheltered 0 (19)

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

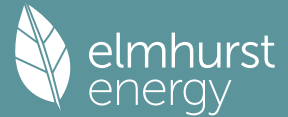
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3695 (21)

	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	0.4711	0.4619	0.4527	0.4065	0.3972	0.3511	0.3511	0.3418	0.3695	0.3972	0.4157	0.4342 (22b)
Effective ac	0.6110	0.6067	0.6025	0.5826	0.5789	0.5616	0.5616	0.5584	0.5683	0.5789	0.5864	0.5943 (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)			21.1700	1.2357	26.1606		(27)

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Door			2.1400	1.3000	2.7820			(26a)
Ground Floor			58.8700	0.1300	7.6531	75.0000	4415.2500	(28a)
External Wall	154.3100	23.3100	131.0000	0.1900	24.8900	110.0000	14410.0000	(29a)
Plane Roof	58.8700		58.8700	0.0900	5.2983	9.0000	529.8300	(30)
Total net area of external elements Aum(A, m2)			272.0500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	66.7840				(33)
Studs			201.9600			9.0000	1817.6400	(32c)
Block			33.8400			75.0000	2538.0000	(32c)
Internal Floor 1			58.8700			18.0000	1059.6600	(32d)
Internal Ceiling 1			58.8700			9.0000	529.8300	(32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
(28)...(30) + (32) + (32a)...(32e) = 25300.2100 (34)
List of Thermal Bridges
214.8820 (35)

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	16.1800	0.0240	0.3883
E3 Sill	13.3500	0.0210	0.2803
E4 Jamb	33.6000	0.0160	0.5376
E5 Ground floor (normal)	30.8000	0.0920	2.8336
E10 Eaves (insulation at ceiling level)	16.7000	0.0580	0.9686
E16 Corner (normal)	20.0400	0.0470	0.9419
E6 Intermediate floor within a dwelling	30.8000	0.0010	0.0308
E12 Gable (insulation at ceiling level)	14.1000	0.0570	0.8037

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Point Thermal bridges
(36a) = 6.7849 (36)
Total fabric heat loss
(33) + (36) + (36a) = 73.5689 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
(38)m
Jan 59.4675 Feb 59.0480 Mar 58.6368 Apr 56.7056 May 56.3442 Jun 54.6622 Jul 54.6622 Aug 54.3507 Sep 55.3101 Oct 56.3442 Nov 57.0752 Dec 57.8394 (38)
Heat transfer coeff
133.0364 132.6169 132.2057 130.2745 129.9131 128.2311 128.2311 127.9196 128.8790 129.9131 130.6441 131.4083 (39)
Average = Sum(39)m / 12 = 130.2727

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1299	1.1264	1.1229	1.1065	1.1034	1.0891	1.0891	1.0865	1.0946	1.1034	1.1096	1.1161	(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													2.8541 (42)
Hot water usage for mixer showers													
72.0744	70.9913	69.4129	66.3930	64.1645	61.6791	60.2665	61.8329	63.5500	66.2184	69.3032	71.7983	(42a)	
Hot water usage for baths													
31.1176	30.6554	30.0046	28.8047	27.9062	26.9099	26.3718	27.0180	27.7216	28.7877	30.0124	31.0124	(42b)	
Hot water usage for other uses													
43.8593	42.2644	40.6695	39.0746	37.4797	35.8849	35.8849	37.4797	39.0746	40.6695	42.2644	43.8593	(42c)	
Average daily hot water use (litres/day)													135.1732 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.0513	143.9111	140.0871	134.2724	129.5504	124.4739	122.5231	126.3306	130.3462	135.6756	141.5799	146.6699	(44)
Energy content (annual)	232.8933	204.9275	215.3086	183.8122	174.3997	153.0552	148.1811	156.4237	160.7299	184.1106	201.7065	229.6496	(45)
Distribution loss (46)m = 0.15 x (45)m													Total = Sum(45)m = 2245.1980
34.9340	30.7391	32.2963	27.5718	26.1600	22.9583	22.2272	23.4636	24.1095	27.6166	30.2560	34.4474	(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	19.5402	17.5944	19.3626	18.4900	18.9494	18.1794	18.6846	18.7678	18.2569	19.0475	18.6707	19.5074	(61)
Total heat required for water heating calculated for each month													
252.4334	222.5219	234.6712	202.3022	193.3491	171.2346	166.8657	175.1916	178.9868	203.1580	220.3773	249.1571	(62)	
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	252.4334	222.5219	234.6712	202.3022	193.3491	171.2346	166.8657	175.1916	178.9868	203.1580	220.3773	249.1571	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
													0.0000 (64a)
Heat gains from water heating, kWh/month	82.3220	72.5370	76.4308	65.7401	62.7253	55.4357	53.9414	56.7028	58.0069	65.9786	71.7351	81.2354	(65)

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

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.8156	30.0347	24.4259	18.4920	13.8230	11.6699	12.6098	16.3907	21.9995	27.9334	32.6024	34.7555	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	421.2554	425.6267	414.6112	391.1603	361.5578	333.7357	315.1488	310.7775	321.7930	345.2439	374.8464	402.6685	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	(71)
Water heating gains (Table 5)	110.6479	107.9419	102.7295	91.3056	84.3081	76.9940	72.5018	76.2135	80.5652	88.6810	99.6321	109.1873	(72)
Total internal gains	680.7808	678.6652	656.8284	616.0198	574.7508	534.4615	512.3222	515.4435	536.4196	576.9201	622.1427	661.6731	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
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	m2				Table 6a W/m2	Specific data or Table 6b		Specific data or Table 6c		factor Table 6d	W	
East	10.4700				19.6403	0.7300		0.7000		0.7700	72.8196 (76)	
West	10.7000				19.6403	0.7300		0.7000		0.7700	74.4192 (80)	

Solar gains	147.2388	288.0304	474.3450	691.8039	847.8316	867.9065	826.2824	709.7643	551.6828	341.7723	183.5895	121.0820 (83)
Total gains	828.0196	966.6956	1131.1734	1307.8236	1422.5824	1402.3680	1338.6046	1225.2078	1088.1024	918.6924	805.7322	782.7552 (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	52.8264	52.9935	53.1583	53.9464	54.0964	54.8060	54.8060	54.9395	54.5305	54.0964	53.7937	53.4809
alpha	4.5218	4.5329	4.5439	4.5964	4.6064	4.6537	4.6537	4.6626	4.6354	4.6064	4.5862	4.5654
util living area	0.9927	0.9847	0.9606	0.8886	0.7487	0.5641	0.4171	0.4720	0.7310	0.9388	0.9865	0.9943 (86)
MIT	19.8520	20.0185	20.2905	20.6117	20.8219	20.9105	20.9289	20.9257	20.8603	20.5539	20.1416	19.8266 (87)
Th 2	19.9765	19.9794	19.9822	19.9956	19.9981	20.0097	20.0097	20.0119	20.0052	19.9981	19.9930	19.9877 (88)
util rest of house	0.9907	0.9805	0.9497	0.8598	0.6929	0.4850	0.3254	0.3746	0.6532	0.9162	0.9820	0.9927 (89)
MIT 2	18.6364	18.8499	19.1929	19.5899	19.8201	19.9109	19.9228	19.9237	19.8694	19.5345	19.0187	18.6128 (90)
Living area fraction	18.7898	18.9973	19.3313	19.7188	19.9464	20.0370	20.0497	20.0501	19.9944	19.6631	19.1603	18.7659 (92)
MIT	18.7898	18.9973	19.3313	19.7188	19.9464	20.0370	20.0497	20.0501	19.9944	19.6631	19.1603	18.7659 (92)
Temperature adjustment	18.6398	18.8473	19.1813	19.5688	19.7964	19.8870	19.8997	19.9001	19.8444	19.5131	19.0103	-0.1500
adjusted MIT	18.6398	18.8473	19.1813	19.5688	19.7964	19.8870	19.8997	19.9001	19.8444	19.5131	19.0103	18.6159 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9869	0.9741	0.9387	0.8454	0.6806	0.4748	0.3151	0.3633	0.6392	0.9021	0.9758	0.9895 (94)
Useful gains	817.1511	941.6388	1061.7769	1105.5795	968.2293	665.8664	421.7612	445.1179	695.5108	828.7614	786.2481	774.5719 (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	1907.7086	1849.6451	1676.5463	1389.8739	1051.8308	677.9591	423.1239	447.7268	740.3290	1157.9233	1556.0150	1894.3686 (97)
Space heating kWh	811.3747	610.1802	457.3884	204.6920	62.1995	0.0000	0.0000	0.0000	0.0000	244.8964	554.2322	833.1287 (98a)
Space heating requirement - total per year (kWh/year)												3778.0920
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	811.3747	610.1802	457.3884	204.6920	62.1995	0.0000	0.0000	0.0000	0.0000	244.8964	554.2322	833.1287 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3778.0920
Space heating per m2										(98c) / (4) =		32.0884 (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	811.3747	610.1802	457.3884	204.6920	62.1995	0.0000	0.0000	0.0000	0.0000	244.8964	554.2322	833.1287 (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)	916.8076	689.4691	516.8230	231.2904	70.2819	0.0000	0.0000	0.0000	0.0000	276.7191	626.2511	941.3884 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	252.4334	222.5219	234.6712	202.3022	193.3491	171.2346	166.8657	175.1916	178.9868	203.1580	220.3773	249.1571 (64)
Efficiency of water heater (217)m	88.1394	88.0941	87.9856	87.7480	87.3604	87.0000	87.0000	87.0000	87.0000	87.8135	88.0680	88.1501 (217)
Fuel for water heating, kWh/month	286.4025	252.5956	266.7155	230.5491	221.3236	196.8213	191.7996	201.3696	205.7320	231.3517	250.2353	282.6509 (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	29.5986	23.7451	21.3798	15.6638	12.0992	9.8851	11.0373	14.3466	18.6349	24.4500	27.6162	30.4212 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-38.5403	-59.0314	-92.3295	-109.7438	-120.7902	-113.2526	-111.3417	-103.6173	-89.3413	-69.9810	-43.5736	-32.4954 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-18.7644	-45.0195	-105.2128	-181.1379	-258.7904	-267.6158	-261.2926	-208.9392	-136.9083	-68.7591	-26.1091	-14.2771 (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												4269.0306 (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	2817.5466	(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)	238.8777	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2576.8639	(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	4834.5909	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4269.0306	3.6400	155.3927	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2817.5466	3.6400	102.5587	(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	238.8777	16.4900	39.3909	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-984.0378	16.4900	-162.2678	
PV Unit electricity exported	-1592.8261	5.5900	-89.0390	
Total			-251.3068	(252)
Total energy cost			152.2169	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.3367	(257)
SAP value		94.5417	
SAP rating (Section 12)		95	(258)
SAP band		A	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4269.0306	0.2100	896.4964	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2817.5466	0.2100	591.6848	(264)
Space and water heating			1488.1812	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	238.8777	0.1443	34.4774	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-984.0378	0.1335	-131.3389	
PV Unit electricity exported	-1592.8261	0.1226	-195.3531	
Total			-326.6920	(269)
Total CO2, kg/year			1207.8959	(272)
CO2 emissions per m2			10.2600	(273)
EI value			90.0542	
EI rating			90	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

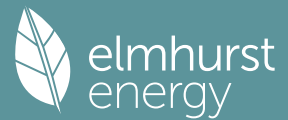
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	58.8700 (1b)	x 2.3900 (2b)	= 140.6993 (1b) - (3b)	
First floor	58.8700 (1c)	x 2.6200 (2c)	= 154.2394 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	117.7400			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n) =	294.9387	(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
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

0 * 20 = 0.0000 (6d)
0 * 35 = 0.0000 (6e)
0 * 20 = 0.0000 (6f)
5 * 10 = 50.0000 (7a)
0 * 10 = 0.0000 (7b)
0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 50.0000
Pressure test
Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered

Air changes per hour
(5) = 0.1695 (8)
Yes
Blower Door
4.0000 (17)
0.3695 (18)
0 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3695 (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	0.4711	0.4619	0.4527	0.4065	0.3972	0.3511	0.3511	0.3418	0.3695	0.3972	0.4157	0.4342	(22b)
Effective ac	0.6110	0.6067	0.6025	0.5826	0.5789	0.5616	0.5616	0.5584	0.5683	0.5789	0.5864	0.5943	(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)			21.1700	1.2357	26.1606			(27)
Door			2.1400	1.3000	2.7820			(26a)
Ground Floor			58.8700	0.1300	7.6531	75.0000	4415.2500	(28a)
External Wall	154.3100	23.3100	131.0000	0.1900	24.8900	110.0000	14410.0000	(29a)
Plane Roof	58.8700		58.8700	0.0900	5.2983	9.0000	529.8300	(30)
Total net area of external elements Aum(A, m2)			272.0500					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 66.7840			(33)
Studs			201.9600			9.0000	1817.6400	(32c)
Block			33.8400			75.0000	2538.0000	(32c)
Internal Floor 1			58.8700			18.0000	1059.6600	(32d)
Internal Ceiling 1			58.8700			9.0000	529.8300	(32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
List of Thermal Bridges

(28)...(30) + (32) + (32a)...(32e) = 25300.2100 (34)
214.8820 (35)

	Length	Psi-value	Total	
K1 Element	16.1800	0.0240	0.3883	
E2 Other lintels (including other steel lintels)	13.3500	0.0210	0.2803	
E3 Sill	33.6000	0.0160	0.5376	
E4 Jamb	30.8000	0.0920	2.8336	
E5 Ground floor (normal)	16.7000	0.0580	0.9686	
E10 Eaves (insulation at ceiling level)	20.0400	0.0470	0.9419	
E16 Corner (normal)	30.8000	0.0010	0.0308	
E6 Intermediate floor within a dwelling	14.1000	0.0570	0.8037	
E12 Gable (insulation at ceiling level)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.7849	(36)
Point Thermal bridges			(36a) = 0.0000	
Total fabric heat loss			(33) + (36) + (36a) = 73.5689	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	59.4675	59.0480	58.6368	56.7056	56.3442	54.6622	54.6622	54.3507	55.3101	56.3442	57.0752	57.8394	(38)
Heat transfer coeff	133.0364	132.6169	132.2057	130.2745	129.9131	128.2311	128.2311	127.9196	128.8790	129.9131	130.6441	131.4083	(39)
Average = Sum(39)m / 12 =												130.2727	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1299	1.1264	1.1229	1.1065	1.1034	1.0891	1.0891	1.0865	1.0946	1.1034	1.1096	1.1161	(40)
HLP (average)												1.1064	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8541 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	72.0744	70.9913	69.4129	66.3930	64.1645	61.6791	60.2665	61.8329	63.5500	66.2184	69.3032	71.7983	(42a)
Hot water usage for baths	31.1176	30.6554	30.0046	28.8047	27.9062	26.9099	26.3718	27.0180	27.7216	28.7877	30.0124	31.0124	(42b)
Hot water usage for other uses	43.8593	42.2644	40.6695	39.0746	37.4797	35.8849	35.8849	37.4797	39.0746	40.6695	42.2644	43.8593	(42c)
Average daily hot water use (litres/day)												135.1732	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.0513	143.9111	140.0871	134.2724	129.5504	124.4739	122.5231	126.3306	130.3462	135.6756	141.5799	146.6699	(44)
Energy conte	232.8933	204.9275	215.3086	183.8122	174.3997	153.0552	148.1811	156.4237	160.7299	184.1106	201.7065	229.6496	(45)
Energy content (annual)										Total = Sum(45)m =		2245.1980	
Distribution loss (46)m = 0.15 x (45)m	34.9340	30.7391	32.2963	27.5718	26.1600	22.9583	22.2272	23.4636	24.1095	27.6166	30.2560	34.4474	(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	19.5402	17.5944	19.3626	18.4900	18.9494	18.1794	18.6846	18.7678	18.2569	19.0475	18.6707	19.5074	(61)
Total heat required for water heating calculated for each month	252.4334	222.5219	234.6712	202.3022	193.3491	171.2346	166.8657	175.1916	178.9868	203.1580	220.3773	249.1571	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	252.4334	222.5219	234.6712	202.3022	193.3491	171.2346	166.8657	175.1916	178.9868	203.1580	220.3773	249.1571	(64)
Total per year (kWh/year) = Sum(64)m =												2470.2488	(64)

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Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	82.3220	72.5370	76.4308	65.7401	62.7253	55.4357	53.9414	56.7028	58.0069	65.9786	71.7351	81.2354 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.8156	30.0347	24.4259	18.4920	13.8230	11.6699	12.6098	16.3907	21.9995	27.9334	32.6024	34.7555	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	421.2554	425.6267	414.6112	391.1603	361.5578	333.7357	315.1488	310.7775	321.7930	345.2439	374.8464	402.6685	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	(71)
Water heating gains (Table 5)	110.6479	107.9419	102.7295	91.3056	84.3081	76.9940	72.5018	76.2135	80.5652	88.6810	99.6321	109.1873	(72)
Total internal gains	680.7808	678.6652	656.8284	616.0198	574.7508	534.4615	512.3222	515.4435	536.4196	576.9201	622.1427	661.6731	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d					Gains W
East					10.4700	19.6403	0.7300	0.7000	0.7700					72.8196 (76)
West					10.7000	19.6403	0.7300	0.7000	0.7700					74.4192 (80)
Solar gains	147.2388	288.0304	474.3450	691.8039	847.8316	867.9065	826.2824	709.7643	551.6828	341.7723	183.5895			121.0820 (83)
Total gains	828.0196	966.6956	1131.1734	1307.8236	1422.5824	1402.3680	1338.6046	1225.2078	1088.1024	918.6924	805.7322			782.7552 (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	52.8264	52.9935	53.1583	53.9464	54.0964	54.8060	54.8060	54.9395	54.5305	54.0964	53.7937	53.4809	
alpha	4.5218	4.5329	4.5439	4.5964	4.6064	4.6537	4.6537	4.6626	4.6354	4.6064	4.5862	4.5654	
util living area	0.9927	0.9847	0.9606	0.8886	0.7487	0.5641	0.4171	0.4720	0.7310	0.9388	0.9865	0.9943	(86)
MIT	19.8520	20.0185	20.2905	20.6117	20.8219	20.9105	20.9289	20.9257	20.8603	20.5539	20.1416	19.8266	(87)
Th 2	19.9765	19.9794	19.9822	19.9956	19.9981	20.0097	20.0097	20.0119	20.0052	19.9981	19.9930	19.9877	(88)
util rest of house	0.9907	0.9805	0.9497	0.8598	0.6929	0.4850	0.3254	0.3746	0.6532	0.9162	0.9820	0.9927	(89)
MIT 2	18.6364	18.8499	19.1929	19.5899	19.8201	19.9109	19.9228	19.9237	19.8694	19.5345	19.0187	18.6128	(90)
Living area fraction	18.7898	18.9973	19.3313	19.7188	19.9464	20.0370	20.0497	20.0501	19.9944	19.6631	19.1603	18.7659	(91)
MIT	18.7898	18.9973	19.3313	19.7188	19.9464	20.0370	20.0497	20.0501	19.9944	19.6631	19.1603	18.7659	(92)
Temperature adjustment	18.6398	18.8473	19.1813	19.5688	19.7964	19.8870	19.8997	19.9001	19.8444	19.5131	19.0103	-0.1500	
adjusted MIT	18.6398	18.8473	19.1813	19.5688	19.7964	19.8870	19.8997	19.9001	19.8444	19.5131	19.0103	18.6159	(93)

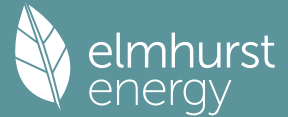
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9869	0.9741	0.9387	0.8454	0.6806	0.4748	0.3151	0.3633	0.6392	0.9021	0.9758	0.9895	(94)
Useful gains	817.1511	941.6388	1061.7769	1105.5795	968.2293	665.8664	421.7612	445.1179	695.5108	828.7614	786.2481	774.5719	(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	1907.7086	1849.6451	1676.5463	1389.8739	1051.8308	677.9591	423.1239	447.7268	740.3290	1157.9233	1556.0150	1894.3686	(97)
Space heating kWh	811.3747	610.1802	457.3884	204.6920	62.1995	0.0000	0.0000	0.0000	0.0000	244.8964	554.2322	833.1287	(98a)
Space heating requirement - total per year (kWh/year)												3778.0920	
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	811.3747	610.1802	457.3884	204.6920	62.1995	0.0000	0.0000	0.0000	0.0000	244.8964	554.2322	833.1287	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3778.0920	
Space heating per m ²										(98c) / (4) =		32.0884	(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	
	811.3747	610.1802	457.3884	204.6920	62.1995	0.0000	0.0000	0.0000	0.0000	244.8964	554.2322	833.1287	(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)	916.8076	689.4691	516.8230	231.2904	70.2819	0.0000	0.0000	0.0000	0.0000	276.7191	626.2511	941.3884	(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	252.4334	222.5219	234.6712	202.3022	193.3491	171.2346	166.8657	175.1916	178.9868	203.1580	220.3773	249.1571 (64)
Efficiency of water heater (217)m	88.1394	88.0941	87.9856	87.7480	87.3604	87.0000	87.0000	87.0000	87.0000	87.8135	88.0680	87.0000 (216)
Fuel for water heating, kWh/month	286.4025	252.5956	266.7155	230.5491	221.3236	196.8213	191.7996	201.3696	205.7320	231.3517	250.2353	88.1501 (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	29.5986	23.7451	21.3798	15.6638	12.0992	9.8851	11.0373	14.3466	18.6349	24.4500	27.6162	30.4212 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-38.5403	-59.0314	-92.3295	-109.7438	-120.7902	-113.2526	-111.3417	-103.6173	-89.3413	-69.9810	-43.5736	-32.4954 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-18.7644	-45.0195	-105.2128	-181.1379	-258.7904	-267.6158	-261.2926	-208.9392	-136.9083	-68.7591	-26.1091	-14.2771 (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												4269.0306 (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												2817.5466 (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)												238.8777 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2576.8639 (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												4834.5909 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4269.0306	5.6000	239.0657 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2817.5466	5.6000	157.7826 (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	238.8777	26.0600	62.2515 (250)
Additional standing charges			99.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-984.0378	26.0600	-256.4403
PV Unit electricity exported	-1592.8261	5.8100	-92.5432
Total			-348.9835 (252)
Total energy cost			231.5280 (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	4269.0306	0.2100	896.4964 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2817.5466	0.2100	591.6848 (264)
Space and water heating			1488.1812 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	238.8777	0.1443	34.4774 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-984.0378	0.1335	-131.3389
PV Unit electricity exported	-1592.8261	0.1226	-195.3531
Total			-326.6920 (269)
Total CO2, kg/year			1207.8959 (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	4269.0306	1.1300	4824.0045 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2817.5466	1.1300	3183.8276 (278)
Space and water heating			8007.8322 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	238.8777	1.5338	366.3986 (282)
Energy saving/generation technologies			

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PV Unit electricity used in dwelling	-984.0378	1.4932	-1469.3911
PV Unit electricity exported	-1592.8261	0.4500	-716.8353
Total			-2186.2264 (283)
Total Primary energy kWh/year			6318.1052 (286)

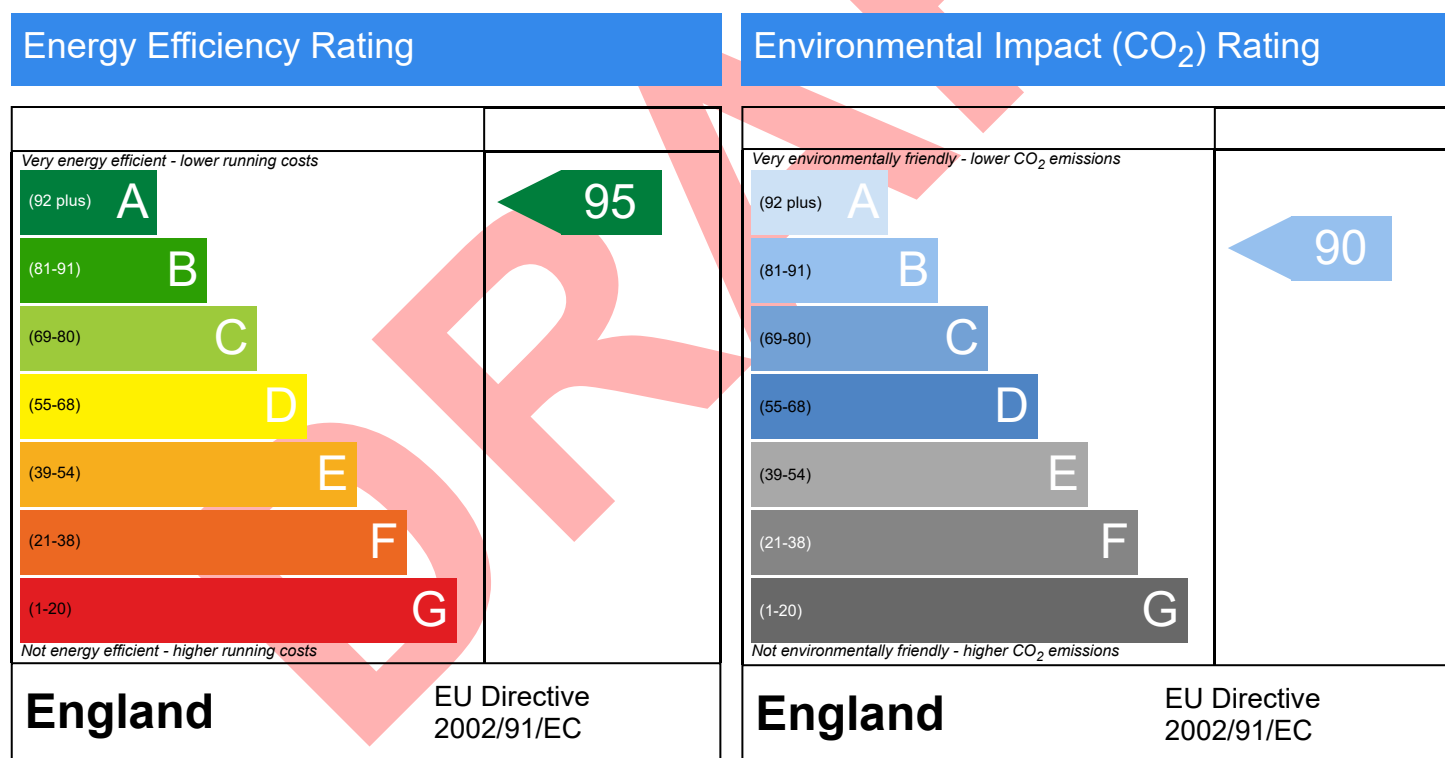
Predicted Energy Assessment



Dwelling type: House, Detached
Date of assessment: 15/11/2024
Produced by: Victoria Gartside
Total floor area: 117.74 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.