

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 10:34:56

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	89 m ²
Site Reference	SAP VG 21-0282	Plot Reference	Plot 18
Address			

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

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

1a Target emission rate and dwelling emission rate			
Fuel for main heating system	Mains gas		
Target carbon dioxide emission rate	12.23 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	12.19 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	63.92 kWh _{PE} /m ²		
Dwelling primary energy	63.92 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	41.8 kWh/m ²		
Dwelling fabric energy efficiency	38.2 kWh/m ²		OK

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.19	Walls (1) (0.19)	OK
Party walls	0.2	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)	59.55	0.19	
Exposed wall: Walls (2)	55.18	0.18	
Ground floor: Ground Floor, Ground Floor	44.62	0.13	
Exposed roof: Roof (1)	44.62	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	0.91	West	0.7	1.3
Front Door, Door	2.14	East	N/A	1.3
Side, Windows	3.75	North	0.7	1.3
Side, Windows	6.5	South	0.7	1.3

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

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
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
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.092	Manufacturer Declaration
External wall	E10: Eaves (insulation at ceiling level)	Calculated by person with suitable expertise	0.058	E10-01
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.047	E16-01 RCD
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.001 (!)	E6-01 RCD
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.057	E12-01 RCD

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

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

4 Space heating

Main heating system 1: Boiler with radiators or underfloor heating - Mains gas

Efficiency	88.5%
Emitter type	Both radiators and underfloor
Flow temperature	
System type	Combi boiler
Manufacturer	Vaillant
Model	ecoTEC sustain 28
Commissioning	

Secondary heating system: N/A

Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water

Cylinder/store - type: N/A

Capacity	N/A
Declared heat loss	N/A
Primary pipework insulated	N/A
Manufacturer	
Model	
Commissioning	

Waste water heat recovery system 1 - type: N/A

Efficiency	
Manufacturer	
Model	

6 Controls

Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services

Function	
Ecodesign class	
Manufacturer	
Model	

Water heating - type: Cylinder thermostat and HW separately timed

Manufacturer	
Model	

7 Lighting

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

8 Mechanical ventilation		
System type: N/A		
Maximum permitted specific fan power	N/A	
Specific fan power	N/A	N/A
Minimum permitted heat recovery efficiency	N/A	
Heat recovery efficiency	N/A	N/A
Manufacturer/Model		
Commissioning		
9 Local generation		
Technology type: Photovoltaic system (1)		
Peak power	2.43 kWp	
Orientation	West	
Pitch	45°	
Overshading	None or very little	
Manufacturer		
MCS certificate		
Technology type: Photovoltaic system (2)		
Peak power	0.25 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 18	Prop Type Ref	SAP VG 21-0282	
Property				

SAP Rating	93 A	DER	12.19	TER	12.23
Environmental	90 B	% DER < TER			0.33
CO ₂ Emissions (t/year)	1.04	DFEE	38.16	TFEE	41.84
Compliance Check	See BREL	% DFEE < TFEE			8.79
% DPER < TPER	-0.01	DPER	63.92	TPER	63.92

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	244.51	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	44.62 m ²	2.39 m
1st Storey:	30.80 m	44.62 m ²	2.62 m
2nd Storey:	32.20 m	60.31 m ²	2.28 m

8.0 Living Area	11.35	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	66.96	59.55	0.00	None	7.41	Enter Gross Area
	Render wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.18	110.00	71.54	55.18	0.00	None	16.36	Enter Gross Area

9.2 Internal Walls	Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
	Studs	Plasterboard on timber frame	9.00	189.84
	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	44.62	44.62	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	44.62

Summary for Input Data

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.13	None	0.00	75.00	44.62

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1		Plasterboard ceiling, carpeted chipboard floor	9.00	44.62

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	Render wall	East	10.47	0
Rear	Windows	External Wall	West	0.91	0
Front Door	Door	Render wall	East	2.14	0
Side	Windows	Render wall	North	3.75	0
Side	Windows	External Wall	South	6.50	0

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	16.63	0.02	0.02 MFF-150-E2-02	No
E3 Sill	Independently assessed	13.80	0.02	0.02 E3-01	No
E4 Jamb	Independently assessed	36.30	0.02	0.02 E4-01 RCD	No
E5 Ground floor (normal)	Independently assessed	27.70	0.09	0.09 Manufacturer Declaration	No
E10 Eaves (insulation at ceiling level)	Independently assessed	17.50	0.06	0.06 E10-01	No
E16 Corner (normal)	Independently assessed	20.04	0.05	0.05 E16-01 RCD	No
E6 Intermediate floor within a dwelling	Independently assessed	27.70	0.00	0.00 E6-01 RCD	No
E12 Gable (insulation at ceiling level)	Independently assessed	10.20	0.06	0.06 E12-01 RCD	No

Y-value W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present

19.1 Mechanical extract ventilation - Decentralised

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

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys

Number of open flues

Number of chimneys/flues attached to closed fire

Number of flues attached to solid fuel boiler

Number of flues attached to other heater

Number of blocked chimneys

Number of intermittent extract fans

Number of passive vents

Number of flueless gas fires

21.0 Fixed Cooling System

22.0 Pressure Testing

Summary for Input Data

Designed AP₅₀ m²/(h.m²) @ 50 Pa
 Property Tested?
 Test Method

22.0 Lighting

No Fixed Lighting

Name	Efficacy	Power	Capacity	Count
Lighting 1	85.00	10.00	850.00	16

24.0 Main Heating 1

Percentage of Heat %
 Database Ref. No.
 Fuel Type
 SAP Code
 In Winter
 In Summer
 Model Name
 Manufacturer
 System Type
 Controls SAP Code
 Delayed Start Stat
 Burner Control
 HETAS approved System
 Flue Type
 Fan Assisted Flue
 Is MHS Pumped
 Heating Pump Age
 Heat Emitter
 Underfloor Heating
 Flow Temperature
 Flow Temperature Value
 Boiler Interlock
 Combi boiler type

25.0 Main Heating 2

26.0 Heat Networks

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

28.0 Water Heating

Water Heating
 SAP Code
 Flue Gas Heat Recovery System
 Waste Water Heat Recovery Instantaneous System 1
 Waste Water Heat Recovery Instantaneous System 2
 Waste Water Heat Recovery Storage System
 Solar Panel
 Water use <= 125 litres/person/day

Summary for Input Data

Immersion Heater	Single
Summer Immersion	No
Cold Water Source	From mains
Bath Count	1
Supplementary Immersion	No
Immersion Only Heating Hot Water	No

28.1 Showers

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

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder

Cylinder Stat	None				
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

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

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
2.43	West	45°	None Or Little	No	No	1.00		
0.25	East	30°	None Or Little	No	No	1.00		

34.0 Small-scale Hydro

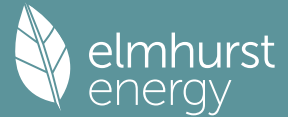
Electricity Generated	None				
Apportioned	0.00				kWh/Year
Connected to dwelling's electricity meter	0.00				
Electricity Generation	Yes				
	Annual				

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

Recommendations

Lower cost measures	None
Further measures to achieve even higher standards	None

Full SAP Calculation Printout



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Property							
SAP Rating	93 A	DER	12.19	TER	12.23		
Environmental	90 B	% DER < TER				0.33	
CO ₂ Emissions (t/year)	1.04	DFEE	38.16	TFEE	41.84		
Compliance Check	See BREL	% DFEE < TFEE				8.79	
% DPER < TPER	-0.01	DPER	63.92	TPER	63.92		
Assessor Details	Miss Victoria Gartside				Assessor ID	AL30-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	44.6200 (1b)	x 2.3900 (2b)	= 106.6418 (1b) - (3b)
First floor	44.6200 (1c)	x 2.6200 (2c)	= 116.9044 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 223.5462 (5)

2. Ventilation rate

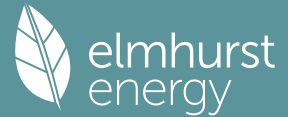
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	5 * 10 = 50.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	50.0000 / (5) = 0.2237 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.4237 (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) = 0.4237 (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	0.5402	0.5296	0.5190	0.4660	0.4554	0.4025	0.4025	0.3919	0.4237	0.4554	0.4766	0.4978 (22b)
Effective ac	0.6459	0.6402	0.6347	0.6086	0.6037	0.5810	0.5810	0.5768	0.5897	0.6037	0.6136	0.6239 (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)			21.6300	1.2357	26.7291		(27)
Door			2.1400	1.3000	2.7820		(26a)
Ground Floor			44.6200	0.1300	5.8006	75.0000	3346.5000 (28a)
External Wall	66.9600	7.4100	59.5500	0.1900	11.3145	110.0000	6550.5000 (29a)
Render wall	71.5400	16.3600	55.1800	0.1800	9.9324	110.0000	6069.8000 (29a)
Plane Roof	44.6200		44.6200	0.0900	4.0158	9.0000	401.5800 (30)
Total net area of external elements Aum(A, m ²)			227.7400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	60.5744		(33)
Studs			189.8400			9.0000	1708.5600 (32c)
Block			33.8400			75.0000	2538.0000 (32c)
Internal Floor 1			44.6200			18.0000	803.1600 (32d)
Internal Ceiling 1			44.6200			9.0000	401.5800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	21819.6800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							244.5056 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				16.6300	0.0240	0.3991	
E3 Sill				13.8000	0.0210	0.2898	

Full SAP Calculation Printout



E4 Jamb	36.3000	0.0160	0.5808
E5 Ground floor (normal)	27.7000	0.0920	2.5484
E10 Eaves (insulation at ceiling level)	17.5000	0.0580	1.0150
E16 Corner (normal)	20.0400	0.0470	0.9419
E6 Intermediate floor within a dwelling	27.7000	0.0010	0.0277
E12 Gable (insulation at ceiling level)	10.2000	0.0570	0.5814
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.3841 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	66.9585 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	47.6478	47.2299	46.8203	44.8961	44.5361	42.8603	42.8603	42.5499	43.5058	44.5361	45.2644	46.0258 (38)
Average = Sum(39)m / 12 =	114.6063	114.1884	113.7787	111.8546	111.4946	109.8188	109.8188	109.5084	110.4643	111.4946	112.2229	112.9843 (39)
												111.8529
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2842	1.2796	1.2750	1.2534	1.2494	1.2306	1.2306	1.2271	1.2378	1.2494	1.2575	1.2661 (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												2.6152 (42)
Hot water usage for mixer showers												
Hot water usage for baths	68.0676	67.0447	65.5541	62.7021	60.5974	58.2503	56.9161	58.3955	60.0171	62.5372	65.4504	67.8068 (42a)
Hot water usage for other uses	29.3945	28.9580	28.3432	27.2097	26.3610	25.4199	24.9115	25.5220	26.1866	27.1937	28.3505	29.2952 (42b)
Average daily hot water use (litres/day)	41.4120	39.9061	38.4002	36.8943	35.3884	33.8825	33.8825	35.3884	36.8943	38.4002	39.9061	41.4120 (42c)
												127.6567 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	138.8742	135.9088	132.2975	126.8062	122.3468	117.5527	115.7102	119.3059	123.0980	128.1311	133.7071	138.5140 (44)
Energy content (annual)	219.9427	193.5323	203.3364	173.5913	164.7023	144.5447	139.9415	147.7256	151.7922	173.8727	190.4902	216.8794 (45)
Distribution loss	(46)m = 0.15 x (45)m											2120.3514
Water storage loss:	32.9914	29.0298	30.5005	26.0387	24.7054	21.6817	20.9912	22.1588	22.7688	26.0809	28.5735	32.5319 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	19.4094	17.4793	19.2416	18.3868	18.8514	18.0934	18.6014	18.6800	18.1666	18.9441	18.5575	19.3784 (61)
Total heat required for water heating calculated for each month	239.3521	211.0116	222.5781	191.9781	183.5538	162.6381	158.5428	166.4056	169.9588	192.8167	209.0477	236.2579 (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	239.3521	211.0116	222.5781	191.9781	183.5538	162.6381	158.5428	166.4056	169.9588	192.8167	209.0477	236.2579 (64)
12Total per year (kWh/year)												2344.1411 (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	77.9833	68.7193	72.4198	62.3158	59.4764	52.5845	51.1809	53.7887	55.0126	62.5487	67.9774	76.9570 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.8785	132.7226	119.8785	123.8745	119.8785	123.8745	119.8785	119.8785	123.8745	119.8785	123.8745	119.8785 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	237.6726	240.1389	233.9239	220.6929	203.9912	188.2939	177.8071	175.3408	181.5558	194.7868	211.4885	227.1858 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070 (71)
Water heating gains (Table 5)	104.8163	102.2609	97.3384	86.5497	79.9414	73.0340	68.7915	72.2967	76.4063	84.0708	94.4130	103.4369 (72)
Total internal gains	527.5950	540.3500	516.3684	496.3447	469.0387	447.4300	428.7048	429.7437	444.0642	463.9637	495.0036	515.7288 (73)

6. Solar gains												
[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d			Gains W
North				3.7500	10.6334	0.7300	0.7000		0.7700			14.1207 (74)
East				10.4700	19.6403	0.7300	0.7000		0.7700			72.8196 (76)
South				6.5000	46.7521	0.7300	0.7000		0.7700			107.6139 (78)
West				0.9100	19.6403	0.7300	0.7000		0.7700			6.3291 (80)
Solar gains	200.8833	358.0609	525.3438	699.2735	819.3843	827.2222	791.9601	701.6591	586.2115	405.9389	243.6680	169.8481 (83)
Total gains	728.4783	898.4109	1041.7122	1195.6182	1288.4230	1274.6522	1220.6648	1131.4028	1030.2757	869.9026	738.6716	685.5769 (84)

7. Mean internal temperature (heating season)

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Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	52.8856	53.0791	53.2703	54.1866	54.3616	55.1911	55.1911	55.3475	54.8686	54.3616	54.0088	53.6448
alpha	4.5257	4.5386	4.5514	4.6124	4.6241	4.6794	4.6794	4.6898	4.6579	4.6241	4.6006	4.5763
util living area	0.9921	0.9798	0.9507	0.8687	0.7232	0.5356	0.3927	0.4396	0.6820	0.9175	0.9828	0.9939 (86)
MIT	19.8660	20.0739	20.3411	20.6497	20.8384	20.9157	20.9304	20.9283	20.8798	20.6077	20.1831	19.8403 (87)
Th 2	19.8532	19.8569	19.8605	19.8775	19.8807	19.8956	19.8956	19.8984	19.8899	19.8807	19.8742	19.8675 (88)
util rest of house	0.9896	0.9736	0.9358	0.8326	0.6591	0.4499	0.2958	0.3372	0.5934	0.8854	0.9765	0.9920 (89)
MIT 2	18.5469	18.8121	19.1462	19.5231	19.7221	19.8013	19.8097	19.8118	19.7719	19.4893	18.9664	18.5253 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.7147	18.9726	19.2982	19.6664	19.8641	19.9430	19.9523	19.9538	19.9128	19.6315	19.1211	18.6925 (92)
Temperature adjustment												
adjusted MIT	18.5647	18.8226	19.1482	19.5164	19.7141	19.7930	19.8023	19.8038	19.7628	19.4815	18.9711	18.5425 (93)

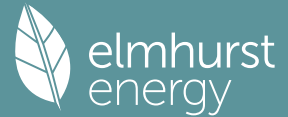
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9855	0.9659	0.9239	0.8190	0.6487	0.4416	0.2875	0.3282	0.5823	0.8710	0.9693	0.9886 (94)
Useful gains	717.9467	867.8132	962.4406	979.2250	835.7390	562.9044	350.9276	371.3778	599.9721	757.6863	716.0100	677.7943 (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	1634.8203	1589.7997	1439.0949	1187.4946	893.5273	570.2926	351.6687	372.7493	625.5415	990.2396	1332.2104	1620.4809 (97)
Space heating kWh	682.1539	485.1749	354.6308	149.9541	42.9945	0.0000	0.0000	0.0000	0.0000	173.0197	443.6643	701.3588 (98a)
Space heating requirement - total per year (kWh/year)	3032.9510											
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	0.0000											
Space heating kWh	682.1539	485.1749	354.6308	149.9541	42.9945	0.0000	0.0000	0.0000	0.0000	173.0197	443.6643	701.3588 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	3032.9510											
Space heating per m2	(98c) / (4) = 33.9865 (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	682.1539	485.1749	354.6308	149.9541	42.9945	0.0000	0.0000	0.0000	0.0000	173.0197	443.6643	701.3588 (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)	770.7954	548.2203	400.7128	169.4396	48.5814	0.0000	0.0000	0.0000	0.0000	195.5024	501.3156	792.4958 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	239.3521	211.0116	222.5781	191.9781	183.5538	162.6381	158.5428	166.4056	169.9588	192.8167	209.0477	236.2579 (64)
Efficiency of water heater (217)m	88.1054	88.0399	87.9155	87.6515	87.2807	87.0000	87.0000	87.0000	87.0000	87.7030	88.0140	88.1172 (216)
Fuel for water heating, kWh/month	271.6655	239.6772	253.1727	219.0242	210.3027	186.9404	182.2331	191.2708	195.3549	219.8519	237.5164	268.1178 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	24.3993	19.5740	17.6242	12.9123	9.9738	8.1487	9.0984	11.8265	15.3614	20.1550	22.7651	25.0774 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-28.7736	-44.5482	-70.5624	-85.2018	-95.0902	-89.7000	-88.1991	-81.4061	-69.2505	-53.2818	-32.6993	-24.2214 (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)	-12.6872	-30.4510	-71.0977	-122.3788	-174.9265	-180.8812	-176.6792	-141.3180	-92.6617	-46.5271	-17.6620	-9.6561 (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	3427.0633 (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	2675.1276 (219)											
Space cooling fuel	0.0000 (221)											
Electricity for pumps and fans:												
central heating pump	41.0000 (230c)											
main heating flue fan	45.0000 (230e)											
Total electricity for the above, kWh/year	86.0000 (231)											
Electricity for lighting (calculated in Appendix L)	196.9161 (232)											
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation	-1839.8610 (233)											
Wind generation	0.0000 (234)											
Hydro-electric generation (Appendix N)	0.0000 (235a)											

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Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4545.2460 (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	3427.0633	0.2100	719.6833 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2675.1276	0.2100	561.7768 (264)
Space and water heating			1281.4601 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	196.9161	0.1443	28.4211 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-762.9345	0.1332	-101.6018
PV Unit electricity exported	-1076.9265	0.1226	-132.0751
Total			-233.6769 (269)
Total CO2, kg/year			1088.1336 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.1900 (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	3427.0633	1.1300	3872.5815 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2675.1276	1.1300	3022.8942 (278)
Space and water heating			6895.4757 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	196.9161	1.5338	302.0365 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-762.9345	1.4921	-1138.3822
PV Unit electricity exported	-1076.9265	0.4500	-484.6400
Total			-1623.0222 (283)
Total Primary energy kWh/year			5704.5908 (286)
Dwelling Primary energy Rate (DPER)			63.9200 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	44.6200 (1b)	x 2.3900 (2b)	= 106.6418 (1b) - (3b)
First floor	44.6200 (1c)	x 2.6200 (2c)	= 116.9044 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 223.5462 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1342 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3842 (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) = 0.3842 (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	0.4899	0.4803	0.4706	0.4226	0.4130	0.3650	0.3650	0.3554	0.3842	0.4130	0.4322	0.4514 (22b)
Effective ac	0.6200	0.6153	0.6108	0.5893	0.5853	0.5666	0.5666	0.5631	0.5738	0.5853	0.5934	0.6019 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Semi-glazed door			2.1400	1.0000	2.1400			(26a)
TER Opening Type (Uw = 1.20)			20.1700	1.1450	23.0954			(27)
Ground Floor			44.6200	0.1300	5.8006			(28a)
External Wall	66.9600	6.9100	60.0500	0.1800	10.8090			(29a)
Render wall	71.5400	15.4000	56.1400	0.1800	10.1052			(29a)
Plane Roof	44.6200		44.6200	0.1100	4.9082			(30)
Total net area of external elements Aum(A, m2)			227.7400					(31)
Fabric heat loss, W/K = Sum (A x U)					56.8584			(33)

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

244.5056 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element	16.6300	0.0500	0.8315	
E2 Other lintels (including other steel lintels)	13.8000	0.0500	0.6900	
E3 Sill	36.3000	0.0500	1.8150	
E4 Jamb	27.7000	0.1600	4.4320	
E5 Ground floor (normal)	17.5000	0.0600	1.0500	
E10 Eaves (insulation at ceiling level)	20.0400	0.0900	1.8036	
E16 Corner (normal)	27.7000	0.0000	0.0000	
E6 Intermediate floor within a dwelling	10.2000	0.0600	0.6120	
E12 Gable (insulation at ceiling level)				11.2341 (36)

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

Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	68.0925	(37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	45.7360	45.3923	45.0554	43.4731	43.1771	41.7989	41.7989	41.5437	42.3297	43.1771	43.7760	44.4021	(38)
Average = Sum(39)m / 12 =	113.8285	113.4848	113.1480	111.5656	111.2696	109.8914	109.8914	109.6362	110.4223	111.2696	111.8685	112.4946	(39)
												111.5642	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2755	1.2717	1.2679	1.2502	1.2469	1.2314	1.2314	1.2286	1.2374	1.2469	1.2536	1.2606	(40)
HLP (average)												1.2502	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

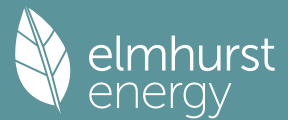
Assumed occupancy													2.6152 (42)
Hot water usage for mixer showers	68.0676	67.0447	65.5541	62.7021	60.5974	58.2503	56.9161	58.3955	60.0171	62.5372	65.4504	67.8068	(42a)
Hot water usage for baths	29.3945	28.9580	28.3432	27.2097	26.3610	25.4199	24.9115	25.5220	26.1866	27.1937	28.3505	29.2952	(42b)
Hot water usage for other uses	41.4120	39.9061	38.4002	36.8943	35.3884	33.8825	33.8825	35.3884	36.8943	38.4002	39.9061	41.4120	(42c)
Average daily hot water use (litres/day)												127.6567	(43)
Daily hot water use	138.8742	135.9088	132.2975	126.8062	122.3468	117.5527	115.7102	119.3059	123.0980	128.1311	133.7071	138.5140	(44)
Energy conte	219.9427	193.5323	203.3364	173.5913	164.7023	144.5447	139.9415	147.7256	151.7922	173.8727	190.4902	216.8794	(45)
Energy content (annual)										Total = Sum(45)m =		2120.3514	
Distribution loss (46)m = 0.15 x (45)m	32.9914	29.0298	30.5005	26.0387	24.7054	21.6817	20.9912	22.1588	22.7688	26.0809	28.5735	32.5319	(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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	270.9016	239.5597	254.2953	222.9064	215.6612	193.8598	190.9004	198.6845	201.1073	224.8316	239.8053	267.8383	(62)
WWHRS	-31.1177	-27.5207	-28.8181	-23.8625	-22.2390	-19.0301	-17.8377	-18.9686	-19.6893	-23.2115	-26.2958	-30.5414	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	239.7839	212.0390	225.4772	199.0438	193.4222	174.8297	173.0627	179.7159	181.4180	201.6201	213.5095	237.2969	(64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				2431.2189	(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	85.8707	75.8563	80.3491	70.0479	67.5033	60.3899	59.2703	61.8585	62.7997	70.5524	75.6668	84.8521	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.8567	132.6985	119.8567	123.8520	119.8567	123.8520	119.8567	119.8567	123.8520	119.8567	123.8520	119.8567	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	237.6726	240.1389	233.9239	220.6929	203.9912	188.2939	177.8071	175.3408	181.5558	194.7868	211.4885	227.1858	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	(71)
Water heating gains (Table 5)	115.4176	112.8815	107.9961	97.2887	90.7302	83.8748	79.6643	83.1431	87.2218	94.8285	105.0927	114.0486	(72)
Total internal gains	538.1745	550.9465	527.0043	507.0612	479.8057	458.2483	439.5558	440.5683	454.8572	474.6996	505.6609	526.3187	(73)

6. Solar gains

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[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c				Access factor Table 6d	Gains W	
North				3.5000	10.6334	0.6300	0.7000				0.7700	11.3740 (74)	
East				9.7600	19.6403	0.6300	0.7000				0.7700	58.5826 (76)	
South				6.0600	46.7521	0.6300	0.7000				0.7700	86.5855 (78)	
West				0.8500	19.6403	0.6300	0.7000				0.7700	5.1020 (80)	
Solar gains	161.6441	288.1216	422.7358	562.7062	659.3715	665.6843	637.3057	564.6303	471.7188	326.6493	196.0718	136.6709	(83)
Total gains	699.8186	839.0681	949.7401	1069.7674	1139.1772	1123.9326	1076.8616	1005.1986	926.5760	801.3489	701.7327	662.9896	(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	53.2469	53.4082	53.5672	54.3270	54.4715	55.1547	55.1547	55.2830	54.8895	54.4715	54.1799	53.8783	
alpha	4.5498	4.5605	4.5711	4.6218	4.6314	4.6770	4.6770	4.6855	4.6593	4.6314	4.6120	4.5919	
util living area	0.9933	0.9842	0.9637	0.9029	0.7808	0.5976	0.4431	0.4916	0.7346	0.9358	0.9859	0.9947	(86)
MIT	19.5594	19.8030	20.1322	20.5391	20.8254	20.9620	20.9923	20.9878	20.9022	20.5109	19.9647	19.5261	(87)
Th 2	19.8600	19.8631	19.8661	19.8801	19.8827	19.8950	19.8950	19.8972	19.8902	19.8827	19.8774	19.8718	(88)
util rest of house	0.9911	0.9793	0.9521	0.8729	0.7200	0.5059	0.3349	0.3788	0.6468	0.9090	0.9805	0.9930	(89)
MIT 2	18.2081	18.5186	18.9325	19.4317	19.7435	19.8745	19.8927	19.8932	19.8283	19.4136	18.7364	18.1738	(90)
Living area fraction	fLA = Living area / (4) =												
MIT	18.3800	18.6820	19.0851	19.5725	19.8811	20.0128	20.0325	20.0324	19.9649	19.5531	18.8926	18.3458	(92)
Temperature adjustment	0.0000												
adjusted MIT	18.3800	18.6820	19.0851	19.5725	19.8811	20.0128	20.0325	20.0324	19.9649	19.5531	18.8926	18.3458	(93)
8. Space heating requirement													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9869	0.9720	0.9416	0.8631	0.7199	0.5162	0.3486	0.3930	0.6533	0.8990	0.9738	0.9895	(94)
Useful gains	690.6388	815.6101	894.2668	923.3450	820.0630	580.1475	375.3879	395.0874	605.3021	720.3834	683.3302	655.9971	(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	1602.7061	1564.0472	1423.9768	1190.6862	910.3103	594.8225	377.2063	398.2442	647.6178	996.2110	1319.2226	1591.3264	(97)
Space heating kWh	678.5780	502.9497	394.1042	192.4857	67.1440	0.0000	0.0000	0.0000	0.0000	205.2157	457.8425	695.8850	(98a)
Space heating requirement - total per year (kWh/year)													3194.2048
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	678.5780	502.9497	394.1042	192.4857	67.1440	0.0000	0.0000	0.0000	0.0000	205.2157	457.8425	695.8850	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)													3194.2048
Space heating per m2	(98c) / (4) =												35.7934 (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	678.5780	502.9497	394.1042	192.4857	67.1440	0.0000	0.0000	0.0000	0.0000	205.2157	457.8425	695.8850	(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)	734.3918	544.3179	426.5197	208.3178	72.6667	0.0000	0.0000	0.0000	0.0000	222.0950	495.5005	753.1223	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	239.7839	212.0390	225.4772	199.0438	193.4222	174.8297	173.0627	179.7159	181.4180	201.6201	213.5095	237.2969	(64)
Efficiency of water heater (217)m	86.4817	86.1633	85.5651	84.3097	82.3529	80.3000	80.3000	80.3000	80.3000	84.4194	85.9718	80.3000	(216)
Fuel for water heating, kWh/month	277.2656	246.0896	263.5154	236.0866	234.8700	217.7207	215.5201	223.8056	225.9253	238.8316	248.3484	274.1951	(219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.9039	19.9788	17.9887	13.1793	10.1801	8.3172	9.2866	12.0711	15.6791	20.5719	23.2359	25.5960	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-41.2241	-57.8560	-82.7938	-92.6615	-99.5485	-92.7656	-91.5854	-86.6149	-77.8255	-65.9147	-45.2138	-35.6687	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-24.1084	-50.6173	-100.4333	-150.6081	-198.9301	-199.8225	-197.5026	-167.3524	-122.8121	-72.3483	-32.1731	-19.0747	(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)													

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(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												3456.9317	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2902.1738	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												200.9884	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2205.4553	(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												4440.6386	(238)

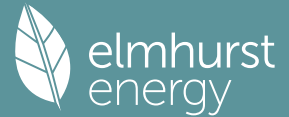
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3456.9317	0.2100	725.9556	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2902.1738	0.2100	609.4565	(264)
Space and water heating			1335.4122	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	200.9884	0.1443	29.0088	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-869.6725	0.1347	-117.1340	
PV Unit electricity exported	-1335.7828	0.1259	-168.2269	
Total			-285.3610	(269)
Total CO2, kg/year			1090.9893	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.2300	(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	3456.9317	1.1300	3906.3328	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2902.1738	1.1300	3279.4564	(278)
Space and water heating			7185.7892	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	200.9884	1.5338	308.2828	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-869.6725	1.4978	-1302.5851	
PV Unit electricity exported	-1335.7828	0.4623	-617.5108	
Total			-1920.0959	(283)
Total Primary energy kWh/year			5704.0769	(286)
Target Primary Energy Rate (TPER)			63.9200	(287)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 18			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	93 A		DER	12.19		TER	12.23
Environmental	90 B		% DER < TER				0.33
CO ₂ Emissions (t/year)	1.04		DFEE	38.16		TFEE	41.84
Compliance Check	See BREL		% DFEE < TFEE				8.79
% DPER < TPER	-0.01		DPER	63.92		TPER	63.92
Assessor Details	Miss Victoria Gartside					Assessor ID	AL30-0001
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	44.6200 (1b)	x 2.3900 (2b)	= 106.6418 (1b) - (3b)
First floor	44.6200 (1c)	x 2.6200 (2c)	= 116.9044 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	223.5462 (5)

2. Ventilation rate

			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		3 * 10 =	30.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1342	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			4.0000	(17)
Infiltration rate			0.3342	(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) =	0.3342	(21)

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
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
	0.4261	0.4178	0.4094	0.3676	0.3593	0.3175	0.3175	0.3091	0.3342	0.3593	0.3760	0.3927
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	0.5908	0.5873	0.5838	0.5676	0.5645	0.5504	0.5504	0.5478	0.5558	0.5645	0.5707	0.5771
												(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)			21.6300	1.2357	26.7291			(27)
Door			2.1400	1.3000	2.7820			(26a)
Ground Floor			44.6200	0.1300	5.8006	75.0000	3346.5000	(28a)
External Wall	66.9600	7.4100	59.5500	0.1900	11.3145	110.0000	6550.5000	(29a)
Render wall	71.5400	16.3600	55.1800	0.1800	9.9324	110.0000	6069.8000	(29a)
Plane Roof	44.6200		44.6200	0.0900	4.0158	9.0000	401.5800	(30)
Total net area of external elements Aum(A, m2)			227.7400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	60.5744			(33)
Studs			189.8400			9.0000	1708.5600	(32c)
Block			33.8400			75.0000	2538.0000	(32c)
Internal Floor 1			44.6200			18.0000	803.1600	(32d)
Internal Ceiling 1			44.6200			9.0000	401.5800	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			21819.6800	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							244.5056	(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value		Total	

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E2 Other lintels (including other steel lintels)	16.6300	0.0240	0.3991	
E3 Sill	13.8000	0.0210	0.2898	
E4 Jamb	36.3000	0.0160	0.5808	
E5 Ground floor (normal)	27.7000	0.0920	2.5484	
E10 Eaves (insulation at ceiling level)	17.5000	0.0580	1.0150	
E16 Corner (normal)	20.0400	0.0470	0.9419	
E6 Intermediate floor within a dwelling	27.7000	0.0010	0.0277	
E12 Gable (insulation at ceiling level)	10.2000	0.0570	0.5814	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				6.3841 (36)
Point Thermal bridges				0.0000
Total fabric heat loss		(33) + (36) + (36a) =		66.9585 (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	43.5822	43.3221	43.0672	41.8700	41.6459	40.6031	40.6031	40.4100	41.0048	41.6459	42.0991	42.5729 (38)
Average = Sum(39)m / 12 =	110.5407	110.2806	110.0257	108.8284	108.6044	107.5616	107.5616	107.3685	107.9633	108.6044	109.0576	109.5314 (39)
												108.8274

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2387	1.2358	1.2329	1.2195	1.2170	1.2053	1.2053	1.2031	1.2098	1.2170	1.2221	1.2274 (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												2.6152 (42)
Hot water usage for mixer showers												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	29.3945	28.9580	28.3432	27.2097	26.3610	25.4199	24.9115	25.5220	26.1866	27.1937	28.3505	29.2952 (42b)
Hot water usage for other uses	41.4120	39.9061	38.4002	36.8943	35.3884	33.8825	33.8825	35.3884	36.8943	38.4002	39.9061	41.4120 (42c)
Average daily hot water use (litres/day)												64.9006 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	70.8065	68.8641	66.7434	64.1041	61.7494	59.3024	58.7941	60.9104	63.0810	65.5939	68.2566	70.7072 (44)
Energy conte	112.1402	98.0615	102.5822	87.7553	83.1266	72.9192	71.1063	75.4198	77.7851	89.0103	97.2441	110.7103 (45)
Energy content (annual)										Total = Sum(45)m =		1077.8609
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												
	95.3192	83.3523	87.1949	74.5920	70.6576	61.9813	60.4404	64.1068	66.1174	75.6587	82.6575	94.1038 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	95.3192	83.3523	87.1949	74.5920	70.6576	61.9813	60.4404	64.1068	66.1174	75.6587	82.6575	94.1038 (64)
												916 (64)
12Total per year (kWh/year)												
Electric shower(s)	54.5108	48.5696	53.0361	50.6117	51.5614	49.1846	50.8241	51.5614	50.6117	53.0361	52.0389	54.5108 (64a)
												620.0575 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												
Heat gains from water heating, kWh/month	37.4575	32.9805	35.0577	31.3009	30.5548	27.7915	27.8161	28.9171	29.1823	32.1737	33.6741	37.1536 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.8785	132.7226	119.8785	123.8745	119.8785	123.8745	119.8785	119.8785	123.8745	119.8785	123.8745	119.8785 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	237.6726	240.1389	233.9239	220.6929	203.9912	188.2939	177.8071	175.3408	181.5558	194.7868	211.4885	227.1858 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070 (71)
Water heating gains (Table 5)	50.3461	49.0781	47.1206	43.4735	41.0682	38.5993	37.3873	38.8670	40.5309	43.2442	46.7696	49.9377 (72)
Total internal gains	470.1248	484.1672	463.1506	450.2685	427.1655	412.9953	397.3005	396.3140	408.1889	420.1372	444.3602	459.2297 (73)

6. Solar gains												
[Jan]												
	Area											
	m2											
	Solar flux											
	Table 6a											
	W/m2											
	Specific data											
	or Table 6b											
	g											
	Specific data											
	or Table 6c											
	FF											
	Access											
	factor											
	Table 6d											
	Gains											
	W											
North	3.7500											14.1207 (74)
East	10.4700											72.8196 (76)
South	6.5000											107.6139 (78)
West	0.9100											6.3291 (80)
Solar gains	200.8833	358.0609	525.3438	699.2735	819.3843	827.2222	791.9601	701.6591	586.2115	405.9389	243.6680	169.8481 (83)
Total gains	671.0081	842.2281	988.4945	1149.5420	1246.5498	1240.2175	1189.2606	1097.9731	994.4003	826.0761	688.0282	629.0777 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	54.8307	54.9600	55.0873	55.6934	55.8082	56.3493	56.3493	56.4506	56.1396	55.8082	55.5763	55.3359	
alpha	4.6554	4.6640	4.6725	4.7129	4.7205	4.7566	4.7566	4.7634	4.7426	4.7205	4.7051	4.6891	
util living area	0.9943	0.9835	0.9565	0.8760	0.7289	0.5395	0.3949	0.4443	0.6901	0.9263	0.9866	0.9957 (86)	
MIT	19.5822	19.8603	20.2176	20.6260	20.8775	20.9767	20.9957	20.9926	20.9291	20.5602	19.9902	19.5372 (87)	
Th 2	19.8892	19.8915	19.8938	19.9044	19.9064	19.9158	19.9158	19.9175	19.9122	19.9064	19.9024	19.8982 (88)	
util rest of house	0.9924	0.9784	0.9431	0.8414	0.6660	0.4547	0.2992	0.3426	0.6028	0.8970	0.9815	0.9943 (89)	
MIT 2	18.6175	18.8937	19.2420	19.6264	19.8327	19.9063	19.9148	19.9156	19.8782	19.5808	19.0327	18.5798 (90)	
Living area fraction	fLA = Living area / (4) =												0.1272 (91)
MIT	18.7402	19.0166	19.3661	19.7535	19.9656	20.0424	20.0522	20.0526	20.0119	19.7053	19.1545	18.7015 (92)	
Temperature adjustment													0.0000
adjusted MIT	18.7402	19.0166	19.3661	19.7535	19.9656	20.0424	20.0522	20.0526	20.0119	19.7053	19.1545	18.7015 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9897	0.9730	0.9352	0.8360	0.6696	0.4649	0.3114	0.3555	0.6114	0.8904	0.9768	0.9921 (94)
Useful gains	664.0741	819.5042	924.4469	960.9744	834.7224	576.5842	370.3220	390.2994	607.9778	735.5491	672.0448	624.1143 (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	1596.2320	1556.7871	1415.5970	1181.1739	897.6764	585.3945	371.3294	392.1742	638.2648	988.8807	1314.6362	1588.3726 (97)
Space heating kWh	693.5255	495.4541	365.4157	158.5436	46.8377	0.0000	0.0000	0.0000	0.0000	188.4787	462.6658	717.4081 (98a)
Space heating requirement - total per year (kWh/year)	3128.3292											
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	693.5255	495.4541	365.4157	158.5436	46.8377	0.0000	0.0000	0.0000	0.0000	188.4787	462.6658	717.4081 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	3128.3292											
Space heating per m2	(98c) / (4) = 35.0552 (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	1011.0794	795.9561	816.0008	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9306	0.9646	0.9490	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	940.9303	767.8148	774.3573	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1402.6166	1345.3820	1241.0324	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	332.4142	429.7100	347.2062	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	83.1035	107.4275	86.8016	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												277.3326 (107)
Energy for space heating												35.0552 (99)
Energy for space cooling												3.1077 (108)
Total												38.1630 (109)
Fabric Energy Efficiency (DFEE)												38.2 (109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	44.6200 (1b)	x 2.3900 (2b)	= 106.6418 (1b) - (3b)	
First floor	44.6200 (1c)	x 2.6200 (2c)	= 116.9044 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.2400			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 223.5462 (5)	

2. Ventilation rate

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

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Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 30.0000 / (5) = 0.1342 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 5.0000 (17)
Infiltration rate 0.3842 (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) = 0.3842 (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	0.4899	0.4803	0.4706	0.4226	0.4130	0.3650	0.3650	0.3554	0.3842	0.4130	0.4322	0.4514	(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	0.6200	0.6153	0.6108	0.5893	0.5853	0.5666	0.5666	0.5631	0.5738	0.5853	0.5934	0.6019	(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)			20.1700	1.1450	23.0954			(27)
Ground Floor			44.6200	0.1300	5.8006			(28a)
External Wall	66.9600	6.9100	60.0500	0.1800	10.8090			(29a)
Render wall	71.5400	15.4000	56.1400	0.1800	10.1052			(29a)
Plane Roof	44.6200		44.6200	0.1100	4.9082			(30)
Total net area of external elements Aum(A, m2)			227.7400					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 56.8584			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 244.5056 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	16.6300	0.0500	0.8315	
E3 Sill	13.8000	0.0500	0.6900	
E4 Jamb	36.3000	0.0500	1.8150	
E5 Ground floor (normal)	27.7000	0.1600	4.4320	
E10 Eaves (insulation at ceiling level)	17.5000	0.0600	1.0500	
E16 Corner (normal)	20.0400	0.0900	1.8036	
E6 Intermediate floor within a dwelling	27.7000	0.0000	0.0000	
E12 Gable (insulation at ceiling level)	10.2000	0.0600	0.6120	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.2341	(36)
Point Thermal Bridges			0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	68.0925	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	45.7360	45.3923	45.0554	43.4731	43.1771	41.7989	41.7989	41.5437	42.3297	43.1771	43.7760	44.4021	(38)
Heat transfer coeff	113.8285	113.4848	113.1480	111.5656	111.2696	109.8914	109.8914	109.6362	110.4223	111.2696	111.8685	112.4946	(39)
Average = Sum(39)m / 12 =												111.5642	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2755	1.2717	1.2679	1.2502	1.2469	1.2314	1.2314	1.2286	1.2374	1.2469	1.2536	1.2606	(40)
HLP (average)												1.2502	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6152 (42)

Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.3945	28.9580	28.3432	27.2097	26.3610	25.4199	24.9115	25.5220	26.1866	27.1937	28.3505	29.2952	(42b)
Hot water usage for other uses	41.4120	39.9061	38.4002	36.8943	35.3884	33.8825	33.8825	35.3884	36.8943	38.4002	39.9061	41.4120	(42c)
Average daily hot water use (litres/day)												64.9006	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.8065	68.8641	66.7434	64.1041	61.7494	59.3024	58.7941	60.9104	63.0810	65.5939	68.2566	70.7072	(44)
Energy conte	112.1402	98.0615	102.5822	87.7553	83.1266	72.9192	71.1063	75.4198	77.7851	89.0103	97.2441	110.7103	(45)
Energy content (annual)										Total = Sum(45)m =		1077.8609	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Total heat required for water heating calculated for each month													
95.3192	83.3523	87.1949	74.5920	70.6576	61.9813	60.4404	64.1068	66.1174	75.6587	82.6575	94.1038	(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	(64a)
Output from w/h	95.3192	83.3523	87.1949	74.5920	70.6576	61.9813	60.4404	64.1068	66.1174	75.6587	82.6575	94.1038	(64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				916.1818	(64)
Electric shower(s)												916	(64)
54.5108	48.5696	53.0361	50.6117	51.5614	49.1846	50.8241	51.5614	50.6117	53.0361	52.0389	54.5108	(64a)	
Heat gains from water heating, kWh/month	37.4575	32.9805	35.0577	31.3009	30.5548	27.7915	27.8161	28.9171	29.1823	32.1737	33.6741	37.1536	(65)

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.8567	132.6985	119.8567	123.8520	119.8567	123.8520	119.8567	119.8567	123.8520	119.8567	123.8520	119.8567 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	237.6726	240.1389	233.9239	220.6929	203.9912	188.2939	177.8071	175.3408	181.5558	194.7868	211.4885	227.1858 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070 (71)
Water heating gains (Table 5)	50.3461	49.0781	47.1206	43.4735	41.0682	38.5993	37.3873	38.8670	40.5309	43.2442	46.7696	49.9377 (72)
Total internal gains	470.1030	484.1431	463.1289	450.2460	427.1437	412.9728	397.2787	396.2922	408.1663	420.1154	444.3377	459.2079 (73)

6. Solar gains

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

North						3.5000	10.6334	0.6300	0.7000	0.7700		11.3740 (74)
East						9.7600	19.6403	0.6300	0.7000	0.7700		58.5826 (76)
South						6.0600	46.7521	0.6300	0.7000	0.7700		86.5855 (78)
West						0.8500	19.6403	0.6300	0.7000	0.7700		5.1020 (80)

Solar gains	161.6441	288.1216	422.7358	562.7062	659.3715	665.6843	637.3057	564.6303	471.7188	326.6493	196.0718	136.6709 (83)
Total gains	631.7471	772.2647	885.8646	1012.9522	1086.5152	1078.6570	1034.5845	960.9226	879.8852	746.7647	640.4095	595.8788 (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	53.2469	53.4082	53.5672	54.3270	54.4715	55.1547	55.1547	55.2830	54.8895	54.4715	54.1799	53.8783
alpha	4.5498	4.5605	4.5711	4.6218	4.6314	4.6770	4.6770	4.6855	4.6593	4.6314	4.6120	4.5919
util living area	0.9955	0.9885	0.9716	0.9174	0.8018	0.6184	0.4602	0.5124	0.7594	0.9490	0.9901	0.9966 (86)
MIT	19.4804	19.7284	20.0669	20.4951	20.8035	20.9563	20.9910	20.9855	20.8872	20.4614	19.8954	19.4474 (87)
Th 2	19.8600	19.8631	19.8661	19.8801	19.8827	19.8950	19.8950	19.8972	19.8902	19.8827	19.8774	19.8718 (88)
util rest of house	0.9941	0.9848	0.9621	0.8905	0.7430	0.5252	0.3483	0.3958	0.6730	0.9265	0.9862	0.9954 (89)
MIT 2	18.4943	18.7422	19.0765	19.4924	19.7588	19.8764	19.8929	19.8935	19.8334	19.4732	18.9205	18.4705 (90)
Living area fraction									fLA = Living area / (4) =			0.1272 (91)
MIT	18.6198	18.8677	19.2024	19.6199	19.8916	20.0137	20.0325	20.0324	19.9674	19.5989	19.0445	18.5947 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6198	18.8677	19.2024	19.6199	19.8916	20.0137	20.0325	20.0324	19.9674	19.5989	19.0445	18.5947 (93)

8. Space heating requirement

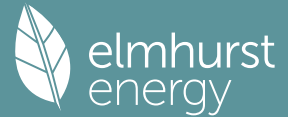
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9918	0.9803	0.9550	0.8830	0.7435	0.5357	0.3625	0.4105	0.6797	0.9192	0.9822	0.9936 (94)
Useful gains	626.5356	757.0761	845.9688	894.4149	807.8567	577.8383	375.0593	394.4512	598.0324	686.3906	629.0076	592.0433 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1629.9963	1585.1186	1437.2562	1195.9765	911.4801	594.9236	377.2054	398.2374	647.8961	1001.3003	1336.2117	1619.3305 (97)
Space heating kWh	746.5748	556.4446	439.9179	217.1243	77.0958	0.0000	0.0000	0.0000	0.0000	234.2928	509.1869	764.3017 (98a)
Space heating requirement - total per year (kWh/year)												3544.9389
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	746.5748	556.4446	439.9179	217.1243	77.0958	0.0000	0.0000	0.0000	0.0000	234.2928	509.1869	764.3017 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3544.9389
Space heating per m ²										(98c) / (4) =		39.7237 (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	1032.9792	813.1964	833.2350	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8832	0.9353	0.9123	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	912.3238	760.6129	760.1932	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1213.8042	1164.6151	1080.8662	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	217.0659	300.5776	238.5807	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	54.2665	75.1444	59.6452	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												189.0561 (107)
Energy for space heating												39.7237 (99)
Energy for space cooling												2.1185 (108)
Total												41.8422 (109)
Fabric Energy Efficiency (TFEE)												41.8 (109)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 18			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	93 A		DER	12.19		TER	12.23
Environmental	90 B		% DER < TER				0.33
CO ₂ Emissions (t/year)	1.04		DFEE	38.16		TFEE	41.84
Compliance Check	See BREL		% DFEE < TFEE				8.79
% DPER < TPER	-0.01		DPER	63.92		TPER	63.92
Assessor Details	Miss Victoria Gartside					Assessor ID	AL30-0001
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	44.6200 (1b)	x 2.3900 (2b)	= 106.6418 (1b) - (3b)
First floor	44.6200 (1c)	x 2.6200 (2c)	= 116.9044 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 223.5462 (5)

2. Ventilation rate

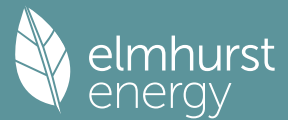
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	5 * 10 = 50.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	50.0000 / (5) = 0.2237 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.4237 (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) = 0.4237 (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	0.5402	0.5296	0.5190	0.4660	0.4554	0.4025	0.4025	0.3919	0.4237	0.4554	0.4766	0.4978 (22b)
Effective ac	0.6459	0.6402	0.6347	0.6086	0.6037	0.5810	0.5810	0.5768	0.5897	0.6037	0.6136	0.6239 (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)			21.6300	1.2357	26.7291		(27)
Door			2.1400	1.3000	2.7820		(26a)
Ground Floor			44.6200	0.1300	5.8006	75.0000	3346.5000 (28a)
External Wall	66.9600	7.4100	59.5500	0.1900	11.3145	110.0000	6550.5000 (29a)
Render wall	71.5400	16.3600	55.1800	0.1800	9.9324	110.0000	6069.8000 (29a)
Plane Roof	44.6200		44.6200	0.0900	4.0158	9.0000	401.5800 (30)
Total net area of external elements Aum(A, m ²)			227.7400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	60.5744		(33)
Studs			189.8400			9.0000	1708.5600 (32c)
Block			33.8400			75.0000	2538.0000 (32c)
Internal Floor 1			44.6200			18.0000	803.1600 (32d)
Internal Ceiling 1			44.6200			9.0000	401.5800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	21819.6800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							244.5056 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				16.6300	0.0240	0.3991	
E3 Sill				13.8000	0.0210	0.2898	

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E4 Jamb						36.3000			0.0160			0.5808	
E5 Ground floor (normal)						27.7000			0.0920			2.5484	
E10 Eaves (insulation at ceiling level)						17.5000			0.0580			1.0150	
E16 Corner (normal)						20.0400			0.0470			0.9419	
E6 Intermediate floor within a dwelling						27.7000			0.0010			0.0277	
E12 Gable (insulation at ceiling level)						10.2000			0.0570			0.5814	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												6.3841	(36)
Point Thermal bridges												0.0000	
Total fabric heat loss									(33) + (36) + (36a) =			66.9585	(37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	47.6478	47.2299	46.8203	44.8961	44.5361	42.8603	42.8603	42.5499	43.5058	44.5361	45.2644	46.0258	(38)
Average = Sum(39)m / 12 =	114.6063	114.1884	113.7787	111.8546	111.4946	109.8188	109.8188	109.5084	110.4643	111.4946	112.2229	112.9843	(39)
												111.8529	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2842	1.2796	1.2750	1.2534	1.2494	1.2306	1.2306	1.2271	1.2378	1.2494	1.2575	1.2661	(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													2.6152 (42)
Hot water usage for mixer showers													
Hot water usage for baths	68.0676	67.0447	65.5541	62.7021	60.5974	58.2503	56.9161	58.3955	60.0171	62.5372	65.4504	67.8068	(42a)
Hot water usage for other uses	29.3945	28.9580	28.3432	27.2097	26.3610	25.4199	24.9115	25.5220	26.1866	27.1937	28.3505	29.2952	(42b)
Average daily hot water use (litres/day)	41.4120	39.9061	38.4002	36.8943	35.3884	33.8825	33.8825	35.3884	36.8943	38.4002	39.9061	41.4120	(42c)
												127.6567	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	138.8742	135.9088	132.2975	126.8062	122.3468	117.5527	115.7102	119.3059	123.0980	128.1311	133.7071	138.5140	(44)
Energy content (annual)	219.9427	193.5323	203.3364	173.5913	164.7023	144.5447	139.9415	147.7256	151.7922	173.8727	190.4902	216.8794	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2120.3514	
Water storage loss:	32.9914	29.0298	30.5005	26.0387	24.7054	21.6817	20.9912	22.1588	22.7688	26.0809	28.5735	32.5319	(46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	19.4094	17.4793	19.2416	18.3868	18.8514	18.0934	18.6014	18.6800	18.1666	18.9441	18.5575	19.3784	(61)
Total heat required for water heating calculated for each month	239.3521	211.0116	222.5781	191.9781	183.5538	162.6381	158.5428	166.4056	169.9588	192.8167	209.0477	236.2579	(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	239.3521	211.0116	222.5781	191.9781	183.5538	162.6381	158.5428	166.4056	169.9588	192.8167	209.0477	236.2579	(64)
12Total per year (kWh/year)									Total per year (kWh/year) = Sum(64)m =			2344.1411	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)
Heat gains from water heating, kWh/month	77.9833	68.7193	72.4198	62.3158	59.4764	52.5845	51.1809	53.7887	55.0126	62.5487	67.9774	76.9570	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.8785	132.7226	119.8785	123.8745	119.8785	123.8745	119.8785	119.8785	123.8745	119.8785	123.8745	119.8785	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	237.6726	240.1389	233.9239	220.6929	203.9912	188.2939	177.8071	175.3408	181.5558	194.7868	211.4885	227.1858	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	(71)
Water heating gains (Table 5)	104.8163	102.2609	97.3384	86.5497	79.9414	73.0340	68.7915	72.2967	76.4063	84.0708	94.4130	103.4369	(72)
Total internal gains	527.5950	540.3500	516.3684	496.3447	469.0387	447.4300	428.7048	429.7437	444.0642	463.9637	495.0036	515.7288	(73)

6. Solar gains													

[Jan]				Area		Solar flux		g		FF		Access	Gains
				m2		Table 6a		Specific data		Specific data		factor	W
						W/m2		or Table 6b		or Table 6c		Table 6d	
North				3.7500		10.6334		0.7300		0.7000		0.7700	14.1207 (74)
East				10.4700		19.6403		0.7300		0.7000		0.7700	72.8196 (76)
South				6.5000		46.7521		0.7300		0.7000		0.7700	107.6139 (78)
West				0.9100		19.6403		0.7300		0.7000		0.7700	6.3291 (80)

Solar gains	200.8833	358.0609	525.3438	699.2735	819.3843	827.2222	791.9601	701.6591	586.2115	405.9389	243.6680	169.8481	(83)
Total gains	728.4783	898.4109	1041.7122	1195.6182	1288.4230	1274.6522	1220.6648	1131.4028	1030.2757	869.9026	738.6716	685.5769	(84)

7. Mean internal temperature (heating season)													

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Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	52.8856	53.0791	53.2703	54.1866	54.3616	55.1911	55.1911	55.3475	54.8686	54.3616	54.0088	53.6448
alpha	4.5257	4.5386	4.5514	4.6124	4.6241	4.6794	4.6794	4.6898	4.6579	4.6241	4.6006	4.5763
util living area	0.9921	0.9798	0.9507	0.8687	0.7232	0.5356	0.3927	0.4396	0.6820	0.9175	0.9828	0.9939 (86)
MIT	19.8660	20.0739	20.3411	20.6497	20.8384	20.9157	20.9304	20.9283	20.8798	20.6077	20.1831	19.8403 (87)
Th 2	19.8532	19.8569	19.8605	19.8775	19.8807	19.8956	19.8956	19.8984	19.8899	19.8807	19.8742	19.8675 (88)
util rest of house	0.9896	0.9736	0.9358	0.8326	0.6591	0.4499	0.2958	0.3372	0.5934	0.8854	0.9765	0.9920 (89)
MIT 2	18.5469	18.8121	19.1462	19.5231	19.7221	19.8013	19.8097	19.8118	19.7719	19.4893	18.9664	18.5253 (90)
Living area fraction									fLA = Living area /	(4) =		0.1272 (91)
MIT	18.7147	18.9726	19.2982	19.6664	19.8641	19.9430	19.9523	19.9538	19.9128	19.6315	19.1211	18.6925 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.5647	18.8226	19.1482	19.5164	19.7141	19.7930	19.8023	19.8038	19.7628	19.4815	18.9711	18.5425 (93)

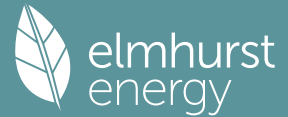
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9855	0.9659	0.9239	0.8190	0.6487	0.4416	0.2875	0.3282	0.5823	0.8710	0.9693	0.9886 (94)
Useful gains	717.9467	867.8132	962.4406	979.2250	835.7390	562.9044	350.9276	371.3778	599.9721	757.6863	716.0100	677.7943 (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	1634.8203	1589.7997	1439.0949	1187.4946	893.5273	570.2926	351.6687	372.7493	625.5415	990.2396	1332.2104	1620.4809 (97)
Space heating kWh	682.1539	485.1749	354.6308	149.9541	42.9945	0.0000	0.0000	0.0000	0.0000	173.0197	443.6643	701.3588 (98a)
Space heating requirement - total per year (kWh/year)												3032.9510
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	682.1539	485.1749	354.6308	149.9541	42.9945	0.0000	0.0000	0.0000	0.0000	173.0197	443.6643	701.3588 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3032.9510
Space heating per m2										(98c) / (4) =		33.9865 (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	682.1539	485.1749	354.6308	149.9541	42.9945	0.0000	0.0000	0.0000	0.0000	173.0197	443.6643	701.3588 (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)	770.7954	548.2203	400.7128	169.4396	48.5814	0.0000	0.0000	0.0000	0.0000	195.5024	501.3156	792.4958 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	239.3521	211.0116	222.5781	191.9781	183.5538	162.6381	158.5428	166.4056	169.9588	192.8167	209.0477	236.2579 (64)
Efficiency of water heater (217)m	88.1054	88.0399	87.9155	87.6515	87.2807	87.0000	87.0000	87.0000	87.0000	87.7030	88.0140	88.1172 (216)
Fuel for water heating, kWh/month	271.6655	239.6772	253.1727	219.0242	210.3027	186.9404	182.2331	191.2708	195.3549	219.8519	237.5164	268.1178 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	24.3993	19.5740	17.6242	12.9123	9.9738	8.1487	9.0984	11.8265	15.3614	20.1550	22.7651	25.0774 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-28.7736	-44.5482	-70.5624	-85.2018	-95.0902	-89.7000	-88.1991	-81.4061	-69.2505	-53.2818	-32.6993	-24.2214 (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)	-12.6872	-30.4510	-71.0977	-122.3788	-174.9265	-180.8812	-176.6792	-141.3180	-92.6617	-46.5271	-17.6620	-9.6561 (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												3427.0633 (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												2675.1276 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												196.9161 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1839.8610 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)

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Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4545.2460 (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	3427.0633	0.2100	719.6833 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2675.1276	0.2100	561.7768 (264)
Space and water heating			1281.4601 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	196.9161	0.1443	28.4211 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-762.9345	0.1332	-101.6018
PV Unit electricity exported	-1076.9265	0.1226	-132.0751
Total			-233.6769 (269)
Total CO2, kg/year			1088.1336 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.1900 (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	3427.0633	1.1300	3872.5815 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2675.1276	1.1300	3022.8942 (278)
Space and water heating			6895.4757 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	196.9161	1.5338	302.0365 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-762.9345	1.4921	-1138.3822
PV Unit electricity exported	-1076.9265	0.4500	-484.6400
Total			-1623.0222 (283)
Total Primary energy kWh/year			5704.5908 (286)
Dwelling Primary energy Rate (DPER)			63.9200 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	44.6200 (1b)	x 2.3900 (2b)	= 106.6418 (1b) - (3b)
First floor	44.6200 (1c)	x 2.6200 (2c)	= 116.9044 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 223.5462 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1342 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3842 (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) = 0.3842 (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	0.4899	0.4803	0.4706	0.4226	0.4130	0.3650	0.3650	0.3554	0.3842	0.4130	0.4322	0.4514 (22b)
Effective ac	0.6200	0.6153	0.6108	0.5893	0.5853	0.5666	0.5666	0.5631	0.5738	0.5853	0.5934	0.6019 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Semi-glazed door			2.1400	1.0000	2.1400			(26a)
TER Opening Type (Uw = 1.20)			20.1700	1.1450	23.0954			(27)
Ground Floor			44.6200	0.1300	5.8006			(28a)
External Wall	66.9600	6.9100	60.0500	0.1800	10.8090			(29a)
Render wall	71.5400	15.4000	56.1400	0.1800	10.1052			(29a)
Plane Roof	44.6200		44.6200	0.1100	4.9082			(30)
Total net area of external elements Aum(A, m2)			227.7400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		56.8584			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							244.5056	(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value		Total	
E2 Other lintels (including other steel lintels)				16.6300	0.0500		0.8315	
E3 Sill				13.8000	0.0500		0.6900	
E4 Jamb				36.3000	0.0500		1.8150	
E5 Ground floor (normal)				27.7000	0.1600		4.4320	
E10 Eaves (insulation at ceiling level)				17.5000	0.0600		1.0500	
E16 Corner (normal)				20.0400	0.0900		1.8036	
E6 Intermediate floor within a dwelling				27.7000	0.0000		0.0000	
E12 Gable (insulation at ceiling level)				10.2000	0.0600		0.6120	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.2341	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss						(33) + (36) + (36a) =	68.0925	(37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	45.7360	45.3923	45.0554	43.4731	43.1771	41.7989	41.7989	41.5437	42.3297	43.1771	43.7760	44.4021	(38)
Average = Sum(39)m / 12 =	113.8285	113.4848	113.1480	111.5656	111.2696	109.8914	109.8914	109.6362	110.4223	111.2696	111.8685	112.4946	(39)
												111.5642	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2755	1.2717	1.2679	1.2502	1.2469	1.2314	1.2314	1.2286	1.2374	1.2469	1.2536	1.2606	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

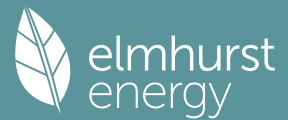
Assumed occupancy													2.6152 (42)
Hot water usage for mixer showers													
68.0676	67.0447	65.5541	62.7021	60.5974	58.2503	56.9161	58.3955	60.0171	62.5372	65.4504	67.8068	(42a)	
Hot water usage for baths													
29.3945	28.9580	28.3432	27.2097	26.3610	25.4199	24.9115	25.5220	26.1866	27.1937	28.3505	29.2952	(42b)	
Hot water usage for other uses													
41.4120	39.9061	38.4002	36.8943	35.3884	33.8825	33.8825	35.3884	36.8943	38.4002	39.9061	41.4120	(42c)	
Average daily hot water use (litres/day)													127.6567 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.8742	135.9088	132.2975	126.8062	122.3468	117.5527	115.7102	119.3059	123.0980	128.1311	133.7071	138.5140	(44)
Energy conte	219.9427	193.5323	203.3364	173.5913	164.7023	144.5447	139.9415	147.7256	151.7922	173.8727	190.4902	216.8794	(45)
Energy content (annual)										Total =	Sum(45)m =	2120.3514	
Distribution loss (46)m = 0.15 x (45)m													
32.9914	29.0298	30.5005	26.0387	24.7054	21.6817	20.9912	22.1588	22.7688	26.0809	28.5735	32.5319	(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													
270.9016	239.5597	254.2953	222.9064	215.6612	193.8598	190.9004	198.6845	201.1073	224.8316	239.8053	267.8383	(62)	
WWHRS	-31.1177	-27.5207	-28.8181	-23.8625	-22.2390	-19.0301	-17.8377	-18.9686	-19.6893	-23.2115	-26.2958	-30.5414	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	239.7839	212.0390	225.4772	199.0438	193.4222	174.8297	173.0627	179.7159	181.4180	201.6201	213.5095	237.2969	(64)
												2431.2189	(64)
12Total per year (kWh/year)												2431	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													
Heat gains from water heating, kWh/month	85.8707	75.8563	80.3491	70.0479	67.5033	60.3899	59.2703	61.8585	62.7997	70.5524	75.6668	84.8521	(65)

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.8567	132.6985	119.8567	123.8520	119.8567	123.8520	119.8567	119.8567	123.8520	119.8567	123.8520	119.8567 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	237.6726	240.1389	233.9239	220.6929	203.9912	188.2939	177.8071	175.3408	181.5558	194.7868	211.4885	227.1858 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759	36.0759 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070 (71)
Water heating gains (Table 5)	115.4176	112.8815	107.9961	97.2887	90.7302	83.8748	79.6643	83.1431	87.2218	94.8285	105.0927	114.0486 (72)
Total internal gains	538.1745	550.9465	527.0043	507.0612	479.8057	458.2483	439.5558	440.5683	454.8572	474.6996	505.6609	526.3187 (73)

6. Solar gains

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[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c				Access factor Table 6d	Gains W	
North				3.5000	10.6334	0.6300	0.7000				0.7700	11.3740 (74)	
East				9.7600	19.6403	0.6300	0.7000				0.7700	58.5826 (76)	
South				6.0600	46.7521	0.6300	0.7000				0.7700	86.5855 (78)	
West				0.8500	19.6403	0.6300	0.7000				0.7700	5.1020 (80)	
Solar gains	161.6441	288.1216	422.7358	562.7062	659.3715	665.6843	637.3057	564.6303	471.7188	326.6493	196.0718	136.6709	(83)
Total gains	699.8186	839.0681	949.7401	1069.7674	1139.1772	1123.9326	1076.8616	1005.1986	926.5760	801.3489	701.7327	662.9896	(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	53.2469	53.4082	53.5672	54.3270	54.4715	55.1547	55.1547	55.2830	54.8895	54.4715	54.1799	53.8783	
alpha	4.5498	4.5605	4.5711	4.6218	4.6314	4.6770	4.6770	4.6855	4.6593	4.6314	4.6120	4.5919	
util living area	0.9933	0.9842	0.9637	0.9029	0.7808	0.5976	0.4431	0.4916	0.7346	0.9358	0.9859	0.9947	(86)
MIT	19.5594	19.8030	20.1322	20.5391	20.8254	20.9620	20.9923	20.9878	20.9022	20.5109	19.9647	19.5261	(87)
Th 2	19.8600	19.8631	19.8661	19.8801	19.8827	19.8950	19.8950	19.8972	19.8902	19.8827	19.8774	19.8718	(88)
util rest of house	0.9911	0.9793	0.9521	0.8729	0.7200	0.5059	0.3349	0.3788	0.6468	0.9090	0.9805	0.9930	(89)
MIT 2	18.2081	18.5186	18.9325	19.4317	19.7435	19.8745	19.8927	19.8932	19.8283	19.4136	18.7364	18.1738	(90)
Living area fraction	fLA = Living area / (4) =												0.1272 (91)
MIT	18.3800	18.6820	19.0851	19.5725	19.8811	20.0128	20.0325	20.0324	19.9649	19.5531	18.8926	18.3458	(92)
Temperature adjustment													0.0000
adjusted MIT	18.3800	18.6820	19.0851	19.5725	19.8811	20.0128	20.0325	20.0324	19.9649	19.5531	18.8926	18.3458	(93)
8. Space heating requirement													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9869	0.9720	0.9416	0.8631	0.7199	0.5162	0.3486	0.3930	0.6533	0.8990	0.9738	0.9895	(94)
Useful gains	690.6388	815.6101	894.2668	923.3450	820.0630	580.1475	375.3879	395.0874	605.3021	720.3834	683.3302	655.9971	(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	1602.7061	1564.0472	1423.9768	1190.6862	910.3103	594.8225	377.2063	398.2442	647.6178	996.2110	1319.2226	1591.3264	(97)
Space heating kWh	678.5780	502.9497	394.1042	192.4857	67.1440	0.0000	0.0000	0.0000	0.0000	205.2157	457.8425	695.8850	(98a)
Space heating requirement - total per year (kWh/year)													3194.2048
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	678.5780	502.9497	394.1042	192.4857	67.1440	0.0000	0.0000	0.0000	0.0000	205.2157	457.8425	695.8850	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)													3194.2048
Space heating per m2	(98c) / (4) =												35.7934 (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	678.5780	502.9497	394.1042	192.4857	67.1440	0.0000	0.0000	0.0000	0.0000	205.2157	457.8425	695.8850	(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)	734.3918	544.3179	426.5197	208.3178	72.6667	0.0000	0.0000	0.0000	0.0000	222.0950	495.5005	753.1223	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	239.7839	212.0390	225.4772	199.0438	193.4222	174.8297	173.0627	179.7159	181.4180	201.6201	213.5095	237.2969	(64)
Efficiency of water heater (217)m	86.4817	86.1633	85.5651	84.3097	82.3529	80.3000	80.3000	80.3000	80.3000	84.4194	85.9718	80.3000	(216)
Fuel for water heating, kWh/month	277.2656	246.0896	263.5154	236.0866	234.8700	217.7207	215.5201	223.8056	225.9253	238.8316	248.3484	274.1951	(219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.9039	19.9788	17.9887	13.1793	10.1801	8.3172	9.2866	12.0711	15.6791	20.5719	23.2359	25.5960	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-41.2241	-57.8560	-82.7938	-92.6615	-99.5485	-92.7656	-91.5854	-86.6149	-77.8255	-65.9147	-45.2138	-35.6687	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-24.1084	-50.6173	-100.4333	-150.6081	-198.9301	-199.8225	-197.5026	-167.3524	-122.8121	-72.3483	-32.1731	-19.0747	(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)													

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(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												3456.9317	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2902.1738	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												200.9884	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2205.4553	(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												4440.6386	(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	3456.9317	0.2100	725.9556	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2902.1738	0.2100	609.4565	(264)
Space and water heating			1335.4122	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	200.9884	0.1443	29.0088	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-869.6725	0.1347	-117.1340	
PV Unit electricity exported	-1335.7828	0.1259	-168.2269	
Total			-285.3610	(269)
Total CO2, kg/year			1090.9893	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.2300	(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	3456.9317	1.1300	3906.3328	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2902.1738	1.1300	3279.4564	(278)
Space and water heating			7185.7892	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	200.9884	1.5338	308.2828	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-869.6725	1.4978	-1302.5851	
PV Unit electricity exported	-1335.7828	0.4623	-617.5108	
Total			-1920.0959	(283)
Total Primary energy kWh/year			5704.0769	(286)
Target Primary Energy Rate (TPER)			63.9200	(287)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 18			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	93 A	DER	12.19	TER	12.23		
Environmental	90 B	% DER < TER				0.33	
CO ₂ Emissions (t/year)	1.04	DFEE	38.16	TFEE	41.84		
Compliance Check	See BREL	% DFEE < TFEE				8.79	
% DPER < TPER	-0.01	DPER	63.92	TPER	63.92		
Assessor Details	Miss Victoria Gartside				Assessor ID	AL30-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	44.6200 (1b)	x 2.3900 (2b)	= 106.6418 (1b) - (3b)
First floor	44.6200 (1c)	x 2.6200 (2c)	= 116.9044 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 223.5462 (5)

2. Ventilation rate

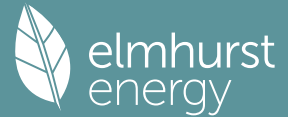
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	5 * 10 = 50.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	50.0000 / (5) = 0.2237 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.4237 (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) = 0.4237 (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	0.5402	0.5296	0.5190	0.4660	0.4554	0.4025	0.4025	0.3919	0.4237	0.4554	0.4766	0.4978 (22b)
Effective ac	0.6459	0.6402	0.6347	0.6086	0.6037	0.5810	0.5810	0.5768	0.5897	0.6037	0.6136	0.6239 (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)			21.6300	1.2357	26.7291		(27)
Door			2.1400	1.3000	2.7820		(26a)
Ground Floor			44.6200	0.1300	5.8006	75.0000	3346.5000 (28a)
External Wall	66.9600	7.4100	59.5500	0.1900	11.3145	110.0000	6550.5000 (29a)
Render wall	71.5400	16.3600	55.1800	0.1800	9.9324	110.0000	6069.8000 (29a)
Plane Roof	44.6200		44.6200	0.0900	4.0158	9.0000	401.5800 (30)
Total net area of external elements Aum(A, m ²)			227.7400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	60.5744		(33)
Studs			189.8400			9.0000	1708.5600 (32c)
Block			33.8400			75.0000	2538.0000 (32c)
Internal Floor 1			44.6200			18.0000	803.1600 (32d)
Internal Ceiling 1			44.6200			9.0000	401.5800 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	21819.6800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							244.5056 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				16.6300	0.0240	0.3991	
E3 Sill				13.8000	0.0210	0.2898	

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E4 Jamb	36.3000	0.0160	0.5808	
E5 Ground floor (normal)	27.7000	0.0920	2.5484	
E10 Eaves (insulation at ceiling level)	17.5000	0.0580	1.0150	
E16 Corner (normal)	20.0400	0.0470	0.9419	
E6 Intermediate floor within a dwelling	27.7000	0.0010	0.0277	
E12 Gable (insulation at ceiling level)	10.2000	0.0570	0.5814	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				6.3841 (36)
Point Thermal bridges				0.0000
Total fabric heat loss		(33) + (36) + (36a) =		66.9585 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	47.6478	47.2299	46.8203	44.8961	44.5361	42.8603	42.8603	42.5499	43.5058	44.5361	45.2644	46.0258 (38)
Average = Sum(39)m / 12 =	114.6063	114.1884	113.7787	111.8546	111.4946	109.8188	109.8188	109.5084	110.4643	111.4946	112.2229	112.9843 (39)
												111.8529
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2842	1.2796	1.2750	1.2534	1.2494	1.2306	1.2306	1.2271	1.2378	1.2494	1.2575	1.2661 (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												2.6152 (42)
Hot water usage for mixer showers												
Hot water usage for baths	68.0676	67.0447	65.5541	62.7021	60.5974	58.2503	56.9161	58.3955	60.0171	62.5372	65.4504	67.8068 (42a)
Hot water usage for other uses	29.3945	28.9580	28.3432	27.2097	26.3610	25.4199	24.9115	25.5220	26.1866	27.1937	28.3505	29.2952 (42b)
Average daily hot water use (litres/day)	41.4120	39.9061	38.4002	36.8943	35.3884	33.8825	33.8825	35.3884	36.8943	38.4002	39.9061	41.4120 (42c)
												127.6567 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	138.8742	135.9088	132.2975	126.8062	122.3468	117.5527	115.7102	119.3059	123.0980	128.1311	133.7071	138.5140 (44)
Energy content (annual)	219.9427	193.5323	203.3364	173.5913	164.7023	144.5447	139.9415	147.7256	151.7922	173.8727	190.4902	216.8794 (45)
Distribution loss	(46)m = 0.15 x (45)m											Total = Sum(45)m = 2120.3514
Water storage loss:	32.9914	29.0298	30.5005	26.0387	24.7054	21.6817	20.9912	22.1588	22.7688	26.0809	28.5735	32.5319 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	19.4094	17.4793	19.2416	18.3868	18.8514	18.0934	18.6014	18.6800	18.1666	18.9441	18.5575	19.3784 (61)
Total heat required for water heating calculated for each month	239.3521	211.0116	222.5781	191.9781	183.5538	162.6381	158.5428	166.4056	169.9588	192.8167	209.0477	236.2579 (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	239.3521	211.0116	222.5781	191.9781	183.5538	162.6381	158.5428	166.4056	169.9588	192.8167	209.0477	236.2579 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Heat gains from water heating, kWh/month	77.9833	68.7193	72.4198	62.3158	59.4764	52.5845	51.1809	53.7887	55.0126	62.5487	67.9774	76.9570 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)												

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.8755	24.7588	20.1352	15.2436	11.3948	9.6200	10.3947	13.5114	18.1350	23.0266	26.8754	28.6503 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	354.7352	358.4162	349.1401	329.3924	304.4644	281.0357	265.3838	261.7028	270.9789	290.7266	315.6545	339.0833 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070 (71)
Water heating gains (Table 5)	104.8163	102.2609	97.3384	86.5497	79.9414	73.0340	68.7915	72.2967	76.4063	84.0708	94.4130	103.4369 (72)
Total internal gains	596.0367	594.0456	575.2234	539.7955	504.4103	469.2993	450.1797	453.1206	471.1299	506.4337	545.5527	579.7801 (73)

6. Solar gains												
[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d			Gains W
North					3.7500	10.6334	0.7300	0.7000	0.7700			14.1207 (74)
East					10.4700	19.6403	0.7300	0.7000	0.7700			72.8196 (76)
South					6.5000	46.7521	0.7300	0.7000	0.7700			107.6139 (78)
West					0.9100	19.6403	0.7300	0.7000	0.7700			6.3291 (80)
Solar gains	200.8833	358.0609	525.3438	699.2735	819.3843	827.2222	791.9601	701.6591	586.2115	405.9389	243.6680	169.8481 (83)
Total gains	796.9200	952.1065	1100.5672	1239.0690	1323.7946	1296.5215	1242.1398	1154.7797	1057.3414	912.3726	789.2207	749.6282 (84)

7. Mean internal temperature (heating season)

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Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	52.8856	53.0791	53.2703	54.1866	54.3616	55.1911	55.1911	55.3475	54.8686	54.3616	54.0088	53.6448
alpha	4.5257	4.5386	4.5514	4.6124	4.6241	4.6794	4.6794	4.6898	4.6579	4.6241	4.6006	4.5763
util living area	0.9888	0.9750	0.9410	0.8561	0.7098	0.5275	0.3861	0.4312	0.6689	0.9050	0.9780	0.9913 (86)
MIT	19.9244	20.1170	20.3817	20.6696	20.8455	20.9168	20.9306	20.9287	20.8840	20.6325	20.2244	19.8957 (87)
Th 2	19.8532	19.8569	19.8605	19.8775	19.8807	19.8956	19.8956	19.8984	19.8899	19.8807	19.8742	19.8675 (88)
util rest of house	0.9854	0.9675	0.9239	0.8181	0.6454	0.4427	0.2907	0.3305	0.5805	0.8697	0.9701	0.9886 (89)
MIT 2	18.6207	18.8656	19.1945	19.5441	19.7281	19.8019	19.8098	19.8120	19.7747	19.5162	19.0175	18.5955 (90)
Living area fraction	18.7865	19.0247	19.3455	19.6873	19.8702	19.9437	19.9524	19.9540	fLA = Living area / (4) =			0.1272 (91)
MIT	18.7865	19.0247	19.3455	19.6873	19.8702	19.9437	19.9524	19.9540	19.9158	19.6582	19.1710	18.7609 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.6365	18.8747	19.1955	19.5373	19.7202	19.7937	19.8024	19.8040	19.7658	19.5082	19.0210	18.6109 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9802	0.9589	0.9113	0.8048	0.6353	0.4346	0.2826	0.3217	0.5698	0.8552	0.9618	0.9843 (94)
Useful gains	781.1040	913.0175	1002.9931	997.1600	841.0652	563.4524	350.9910	371.5114	602.4588	780.2771	759.1023	737.8493 (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	1643.0590	1595.7514	1444.4751	1189.8281	894.2104	570.3662	351.6789	372.7699	625.8696	993.2110	1337.8062	1628.2059 (97)
Space heating kWh	641.2945	458.7972	328.4626	138.7210	39.5400	0.0000	0.0000	0.0000	0.0000	158.4229	416.6668	662.4253 (98a)
Space heating requirement - total per year (kWh/year)												2844.3304
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	641.2945	458.7972	328.4626	138.7210	39.5400	0.0000	0.0000	0.0000	0.0000	158.4229	416.6668	662.4253 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2844.3304
Space heating per m2										(98c) / (4) =		31.8728 (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	641.2945	458.7972	328.4626	138.7210	39.5400	0.0000	0.0000	0.0000	0.0000	158.4229	416.6668	662.4253 (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)	724.6266	518.4149	371.1442	156.7469	44.6780	0.0000	0.0000	0.0000	0.0000	179.0089	470.8100	748.5032 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	239.3521	211.0116	222.5781	191.9781	183.5538	162.6381	158.5428	166.4056	169.9588	192.8167	209.0477	236.2579 (64)
Efficiency of water heater (217)m	88.0872	88.0219	87.8879	87.6230	87.2621	87.0000	87.0000	87.0000	87.0000	87.6702	87.9931	87.0000 (216)
Fuel for water heating, kWh/month	271.7217	239.7262	253.2521	219.0956	210.3476	186.9404	182.2331	191.2708	195.3549	219.9341	237.5727	268.1681 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	24.3993	19.5740	17.6242	12.9123	9.9738	8.1487	9.0984	11.8265	15.3614	20.1550	22.7651	25.0774 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-28.7736	-44.5482	-70.5624	-85.2018	-95.0902	-89.7000	-88.1991	-81.4061	-69.2505	-53.2818	-32.6993	-24.2214 (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	-12.6872	-30.4510	-71.0977	-122.3788	-174.9265	-180.8812	-176.6792	-141.3180	-92.6617	-46.5271	-17.6620	-9.6561 (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												3213.9326 (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												2675.6173 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												196.9161 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1839.8610 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)

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Appendix Q - special features

Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4332.6050 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3213.9326	3.6400	116.9871 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2675.6173	3.6400	97.3925 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814 (249)
Energy for lighting	196.9161	16.4900	32.4715 (250)
Additional standing charges			92.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-762.9345	16.4900	-125.8079
PV Unit electricity exported	-1076.9265	5.5900	-60.2002
Total			-186.0081 (252)
Total energy cost			167.0244 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.4479 (257)
SAP value		92.7392
SAP rating (Section 12)		93 (258)
SAP band		A

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3213.9326	0.2100	674.9259 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2675.6173	0.2100	561.8796 (264)
Space and water heating			1236.8055 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	196.9161	0.1443	28.4211 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-762.9345	0.1332	-101.6018
PV Unit electricity exported	-1076.9265	0.1226	-132.0751
Total			-233.6769 (269)
Total CO2, kg/year			1043.4790 (272)
CO2 emissions per m2			11.6900 (273)
EI value			89.5839
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	44.6200 (1b)	x 2.3900 (2b)	= 106.6418 (1b) - (3b)
First floor	44.6200 (1c)	x 2.6200 (2c)	= 116.9044 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	223.5462 (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)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	50.0000 / (5) = 0.2237 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.4237 (18)
Number of sides sheltered	0 (19)

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Shelter factor (20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.4237 (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													
Effective ac	0.5402	0.5296	0.5190	0.4660	0.4554	0.4025	0.4025	0.3919	0.4237	0.4554	0.4766	0.4978	(22b)
	0.6459	0.6402	0.6347	0.6086	0.6037	0.5810	0.5810	0.5768	0.5897	0.6037	0.6136	0.6239	(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)			21.6300	1.2357	26.7291			(27)
Door			2.1400	1.3000	2.7820			(26a)
Ground Floor			44.6200	0.1300	5.8006	75.0000	3346.5000	(28a)
External Wall	66.9600	7.4100	59.5500	0.1900	11.3145	110.0000	6550.5000	(29a)
Render wall	71.5400	16.3600	55.1800	0.1800	9.9324	110.0000	6069.8000	(29a)
Plane Roof	44.6200		44.6200	0.0900	4.0158	9.0000	401.5800	(30)
Total net area of external elements Aum(A, m2)			227.7400					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	60.5744		(33)
Studs			189.8400			9.0000	1708.5600	(32c)
Block			33.8400			75.0000	2538.0000	(32c)
Internal Floor 1			44.6200			18.0000	803.1600	(32d)
Internal Ceiling 1			44.6200			9.0000	401.5800	(32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K (28)...(30) + (32) + (32a)...(32e) = 21819.6800 (34)
List of Thermal Bridges 244.5056 (35)

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	16.6300	0.0240	0.3991	
E3 Sill	13.8000	0.0210	0.2898	
E4 Jamb	36.3000	0.0160	0.5808	
E5 Ground floor (normal)	27.7000	0.0920	2.5484	
E10 Eaves (insulation at ceiling level)	17.5000	0.0580	1.0150	
E16 Corner (normal)	20.0400	0.0470	0.9419	
E6 Intermediate floor within a dwelling	27.7000	0.0010	0.0277	
E12 Gable (insulation at ceiling level)	10.2000	0.0570	0.5814	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				6.3841 (36)
Point Thermal bridges				0.0000
Total fabric heat loss				(33) + (36) + (36a) = 66.9585 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	47.6478	47.2299	46.8203	44.8961	44.5361	42.8603	42.8603	42.5499	43.5058	44.5361	45.2644	46.0258	(38)
Heat transfer coeff	114.6063	114.1884	113.7787	111.8546	111.4946	109.8188	109.8188	109.5084	110.4643	111.4946	112.2229	112.9843	(39)
Average = Sum(39)m / 12 =												111.8529	
HLP	1.2842	1.2796	1.2750	1.2534	1.2494	1.2306	1.2306	1.2271	1.2378	1.2494	1.2575	1.2661	(40)
HLP (average)												1.2534	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

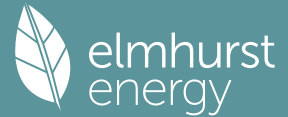
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6152 (42)
Hot water usage for mixer showers													
68.0676	67.0447	65.5541	62.7021	60.5974	58.2503	56.9161	58.3955	60.0171	62.5372	65.4504	67.8068	67.8068	(42a)
Hot water usage for baths													
29.3945	28.9580	28.3432	27.2097	26.3610	25.4199	24.9115	25.5220	26.1866	27.1937	28.3505	29.2952	29.2952	(42b)
Hot water usage for other uses													
41.4120	39.9061	38.4002	36.8943	35.3884	33.8825	33.8825	35.3884	36.8943	38.4002	39.9061	41.4120	41.4120	(42c)
Average daily hot water use (litres/day)												127.6567	(43)
Daily hot water use													
138.8742	135.9088	132.2975	126.8062	122.3468	117.5527	115.7102	119.3059	123.0980	128.1311	133.7071	138.5140	138.5140	(44)
Energy conte	219.9427	193.5323	203.3364	173.5913	164.7023	144.5447	139.9415	147.7256	151.7922	173.8727	190.4902	216.8794	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
32.9914	29.0298	30.5005	26.0387	24.7054	21.6817	20.9912	22.1588	22.7688	26.0809	28.5735	32.5319	32.5319	(46)
Water storage loss:													
Total storage loss													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	19.4094	17.4793	19.2416	18.3868	18.8514	18.0934	18.6014	18.6800	18.1666	18.9441	18.5575	19.3784	(61)
Total heat required for water heating calculated for each month													
239.3521	211.0116	222.5781	191.9781	183.5538	162.6381	158.5428	166.4056	169.9588	192.8167	209.0477	236.2579	236.2579	(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													
239.3521	211.0116	222.5781	191.9781	183.5538	162.6381	158.5428	166.4056	169.9588	192.8167	209.0477	236.2579	236.2579	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Heat gains from water heating, kWh/month													
77.9833	68.7193	72.4198	62.3158	59.4764	52.5845	51.1809	53.7887	55.0126	62.5487	67.9774	76.9570	76.9570	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	(66)

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Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.8755	24.7588	20.1352	15.2436	11.3948	9.6200	10.3947	13.5114	18.1350	23.0266	26.8754	28.6503 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	354.7352	358.4162	349.1401	329.3924	304.4644	281.0357	265.3838	261.7028	270.9789	290.7266	315.6545	339.0833 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070 (71)
Water heating gains (Table 5)	104.8163	102.2609	97.3384	86.5497	79.9414	73.0340	68.7915	72.2967	76.4063	84.0708	94.4130	103.4369 (72)
Total internal gains	596.0367	594.0456	575.2234	539.7955	504.4103	469.2993	450.1797	453.1206	471.1299	506.4337	545.5527	579.7801 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W		
North					3.7500	10.6334	0.7300	0.7000	0.7700	14.1207 (74)		
East					10.4700	19.6403	0.7300	0.7000	0.7700	72.8196 (76)		
South					6.5000	46.7521	0.7300	0.7000	0.7700	107.6139 (78)		
West					0.9100	19.6403	0.7300	0.7000	0.7700	6.3291 (80)		
Solar gains	200.8833	358.0609	525.3438	699.2735	819.3843	827.2222	791.9601	701.6591	586.2115	405.9389	243.6680	169.8481 (83)
Total gains	796.9200	952.1065	1100.5672	1239.0690	1323.7946	1296.5215	1242.1398	1154.7797	1057.3414	912.3726	789.2207	749.6282 (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	52.8856	53.0791	53.2703	54.1866	54.3616	55.1911	55.1911	55.3475	54.8686	54.3616	54.0088	53.6448
alpha	4.5257	4.5386	4.5514	4.6124	4.6241	4.6794	4.6794	4.6898	4.6579	4.6241	4.6006	4.5763
util living area	0.9888	0.9750	0.9410	0.8561	0.7098	0.5275	0.3861	0.4312	0.6689	0.9050	0.9780	0.9913 (86)
MIT	19.9244	20.1170	20.3817	20.6696	20.8455	20.9168	20.9306	20.9287	20.8840	20.6325	20.2244	19.8957 (87)
Th 2	19.8532	19.8569	19.8605	19.8775	19.8807	19.8956	19.8956	19.8984	19.8899	19.8807	19.8742	19.8675 (88)
util rest of house	0.9854	0.9675	0.9239	0.8181	0.6454	0.4427	0.2907	0.3305	0.5805	0.8697	0.9701	0.9886 (89)
MIT 2	18.6207	18.8656	19.1945	19.5441	19.7281	19.8019	19.8098	19.8120	19.7747	19.5162	19.0175	18.5955 (90)
Living area fraction	18.7865	19.0247	19.3455	19.6873	19.8702	19.9437	19.9524	19.9540	19.9158	19.6582	19.1710	18.7609 (92)
MIT	18.6365	18.8747	19.1955	19.5373	19.7202	19.7937	19.8024	19.8040	19.7658	19.5082	19.0210	-0.1500
Temperature adjustment												
adjusted MIT												18.6109 (93)

8. Space heating requirement

Utilisation	0.9802	0.9589	0.9113	0.8048	0.6353	0.4346	0.2826	0.3217	0.5698	0.8552	0.9618	0.9843 (94)
Useful gains	781.1040	913.0175	1002.9931	997.1600	841.0652	563.4524	350.9910	371.5114	602.4588	780.2771	759.1023	737.8493 (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	1643.0590	1595.7514	1444.4751	1189.8281	894.2104	570.3662	351.6789	372.7699	625.8696	993.2110	1337.8062	1628.2059 (97)
Space heating kWh	641.2945	458.7972	328.4626	138.7210	39.5400	0.0000	0.0000	0.0000	0.0000	158.4229	416.6668	662.4253 (98a)
Space heating requirement - total per year (kWh/year)												2844.3304
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	641.2945	458.7972	328.4626	138.7210	39.5400	0.0000	0.0000	0.0000	0.0000	158.4229	416.6668	662.4253 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2844.3304
Space heating per m2										(98c) / (4) =		31.8728 (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	641.2945	458.7972	328.4626	138.7210	39.5400	0.0000	0.0000	0.0000	0.0000	158.4229	416.6668	662.4253 (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)	724.6266	518.4149	371.1442	156.7469	44.6780	0.0000	0.0000	0.0000	0.0000	179.0089	470.8100	748.5032 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	239.3521	211.0116	222.5781	191.9781	183.5538	162.6381	158.5428	166.4056	169.9588	192.8167	209.0477	236.2579 (64)
Efficiency of water heater (217)m	88.0872	88.0219	87.8879	87.6230	87.2621	87.0000	87.0000	87.0000	87.0000	87.6702	87.9931	88.1007 (217)
Fuel for water heating, kWh/month	271.7217	239.7262	253.2521	219.0956	210.3476	186.9404	182.2331	191.2708	195.3549	219.9341	237.5727	268.1681 (219)
Space cooling fuel requirement												

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(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	24.3993	19.5740	17.6242	12.9123	9.9738	8.1487	9.0984	11.8265	15.3614	20.1550	22.7651	25.0774	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-28.7736	-44.5482	-70.5624	-85.2018	-95.0902	-89.7000	-88.1991	-81.4061	-69.2505	-53.2818	-32.6993	-24.2214	(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	-12.6872	-30.4510	-71.0977	-122.3788	-174.9265	-180.8812	-176.6792	-141.3180	-92.6617	-46.5271	-17.6620	-9.6561	(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												3213.9326	(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												2675.6173	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												196.9161	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1839.8610	(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												4332.6050	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3213.9326	5.6000	179.9802	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2675.6173	5.6000	149.8346	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	26.0600	22.4116	(249)
Energy for lighting	196.9161	26.0600	51.3163	(250)
Additional standing charges			99.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-762.9345	26.0600	-198.8207	
PV Unit electricity exported	-1076.9265	5.8100	-62.5694	
Total			-261.3902	(252)
Total energy cost			241.1526	(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	3213.9326	0.2100	674.9259	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2675.6173	0.2100	561.8796	(264)
Space and water heating			1236.8055	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	196.9161	0.1443	28.4211	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-762.9345	0.1332	-101.6018	
PV Unit electricity exported	-1076.9265	0.1226	-132.0751	
Total			-233.6769	(269)
Total CO2, kg/year			1043.4790	(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	3213.9326	1.1300	3631.7439	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2675.6173	1.1300	3023.4475	(278)
Space and water heating			6655.1914	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	196.9161	1.5338	302.0365	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-762.9345	1.4921	-1138.3822	
PV Unit electricity exported	-1076.9265	0.4500	-484.6400	
Total			-1623.0222	(283)
Total Primary energy kWh/year			5464.3065	(286)

SAP 10 EPC IMPROVEMENTS

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Plot 18

Current energy efficiency rating: A 93
Current environmental impact rating: B 90

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

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

Measures omitted - SAP change or cost saving too small:
N Solar water heating + 0.6 -£ 20 -135 kg (12.9%)

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

Potential energy efficiency rating: A 93
Potential environmental impact rating: B 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	£74	£74	£0
Mains gas	£429	£429	£0
Space heating	£301	£301	£0
Water heating	£150	£150	£0
Lighting	£51	£51	£0
Generated (PV)	-£261	-£261	£0
Total cost of fuels	£242	£242	£0
Total cost of uses	£241	£241	£0
Delivered energy	49 kWh/m²	49 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.0 tonnes	1.0 tonnes	0.0 tonnes
CO2 emissions per m²	12 kg/m²	12 kg/m²	0 kg/m²
Primary energy	61 kWh/m²	61 kWh/m²	0 kWh/m²

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	44.6200 (1b)	x 2.3900 (2b)	= 106.6418 (1b) - (3b)
First floor	44.6200 (1c)	x 2.6200 (2c)	= 116.9044 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 223.5462 (5)

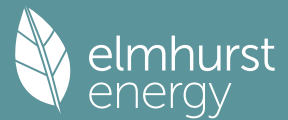
2. Ventilation rate

	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) = 0.2237 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		4.0000 (17)
Infiltration rate		0.4237 (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) =	0.4237 (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	0.5402	0.5296	0.5190	0.4660	0.4554	0.4025	0.4025	0.3919	0.4237	0.4554	0.4766	0.4978 (22b)
Effective ac	0.6459	0.6402	0.6347	0.6086	0.6037	0.5810	0.5810	0.5768	0.5897	0.6037	0.6136	0.6239 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Windows (Uw = 1.30)			21.6300	1.2357	26.7291			(27)
Door			2.1400	1.3000	2.7820			(26a)
Ground Floor			44.6200	0.1300	5.8006	75.0000	3346.5000	(28a)
External Wall	66.9600	7.4100	59.5500	0.1900	11.3145	110.0000	6550.5000	(29a)
Render wall	71.5400	16.3600	55.1800	0.1800	9.9324	110.0000	6069.8000	(29a)
Plane Roof	44.6200		44.6200	0.0900	4.0158	9.0000	401.5800	(30)
Total net area of external elements Aum(A, m2)			227.7400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		60.5744			(33)
Studs			189.8400			9.0000	1708.5600	(32c)
Block			33.8400			75.0000	2538.0000	(32c)
Internal Floor 1			44.6200			18.0000	803.1600	(32d)
Internal Ceiling 1			44.6200			9.0000	401.5800	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 21819.6800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 244.5056 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	16.6300	0.0240	0.3991	
E3 Sill	13.8000	0.0210	0.2898	
E4 Jamb	36.3000	0.0160	0.5808	
E5 Ground floor (normal)	27.7000	0.0920	2.5484	
E10 Eaves (insulation at ceiling level)	17.5000	0.0580	1.0150	
E16 Corner (normal)	20.0400	0.0470	0.9419	
E6 Intermediate floor within a dwelling	27.7000	0.0010	0.0277	
E12 Gable (insulation at ceiling level)	10.2000	0.0570	0.5814	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				6.3841 (36)
Point Thermal Bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	66.9585 (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	47.6478	47.2299	46.8203	44.8961	44.5361	42.8603	42.8603	42.5499	43.5058	44.5361	45.2644	46.0258	(38)
Heat transfer coeff	114.6063	114.1884	113.7787	111.8546	111.4946	109.8188	109.8188	109.5084	110.4643	111.4946	112.2229	112.9843	(39)
Average = Sum(39)m / 12 =												111.8529	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2842	1.2796	1.2750	1.2534	1.2494	1.2306	1.2306	1.2271	1.2378	1.2494	1.2575	1.2661	(40)
HLP (average)												1.2534	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

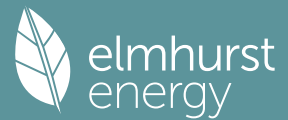
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6152 (42)
Hot water usage for mixer showers	68.0676	67.0447	65.5541	62.7021	60.5974	58.2503	56.9161	58.3955	60.0171	62.5372	65.4504	67.8068	(42a)
Hot water usage for baths	29.3945	28.9580	28.3432	27.2097	26.3610	25.4199	24.9115	25.5220	26.1866	27.1937	28.3505	29.2952	(42b)
Hot water usage for other uses	41.4120	39.9061	38.4002	36.8943	35.3884	33.8825	33.8825	35.3884	36.8943	38.4002	39.9061	41.4120	(42c)
Average daily hot water use (litres/day)													127.6567 (43)
Daily hot water use	138.8742	135.9088	132.2975	126.8062	122.3468	117.5527	115.7102	119.3059	123.0980	128.1311	133.7071	138.5140	(44)
Energy conte	219.9427	193.5323	203.3364	173.5913	164.7023	144.5447	139.9415	147.7256	151.7922	173.8727	190.4902	216.8794	(45)
Energy content (annual)										Total = Sum(45)m =		2120.3514	
Distribution loss (46)m = 0.15 x (45)m	32.9914	29.0298	30.5005	26.0387	24.7054	21.6817	20.9912	22.1588	22.7688	26.0809	28.5735	32.5319	(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	19.4094	17.4793	19.2416	18.3868	18.8514	18.0934	18.6014	18.6800	18.1666	18.9441	18.5575	19.3784	(61)
Total heat required for water heating calculated for each month	239.3521	211.0116	222.5781	191.9781	183.5538	162.6381	158.5428	166.4056	169.9588	192.8167	209.0477	236.2579	(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	239.3521	211.0116	222.5781	191.9781	183.5538	162.6381	158.5428	166.4056	169.9588	192.8167	209.0477	236.2579	(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	77.9833	68.7193	72.4198	62.3158	59.4764	52.5845	51.1809	53.7887	55.0126	62.5487	67.9774	76.9570	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.8755	24.7588	20.1352	15.2436	11.3948	9.6200	10.3947	13.5114	18.1350	23.0266	26.8754	28.6503	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	354.7352	358.4162	349.1401	329.3924	304.4644	281.0357	265.3838	261.7028	270.9789	290.7266	315.6545	339.0833	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	(71)
Water heating gains (Table 5)	104.8163	102.2609	97.3384	86.5497	79.9414	73.0340	68.7915	72.2967	76.4063	84.0708	94.4130	103.4369	(72)
Total internal gains	596.0367	594.0456	575.2234	539.7955	504.4103	469.2993	450.1797	453.1206	471.1299	506.4337	545.5527	579.7801	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	3.7500	10.6334	0.7300	0.7000	0.7700	14.1207 (74)
East	10.4700	19.6403	0.7300	0.7000	0.7700	72.8196 (76)
South	6.5000	46.7521	0.7300	0.7000	0.7700	107.6139 (78)
West	0.9100	19.6403	0.7300	0.7000	0.7700	6.3291 (80)
Solar gains	200.8833	358.0609	525.3438	699.2735	819.3843	827.2222
Total gains	796.9200	952.1065	1100.5672	1239.0690	1323.7946	1296.5215
						791.9601
						701.6591
						586.2115
						405.9389
						243.6680
						169.8481 (83)
						749.6282 (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	52.8856	53.0791	53.2703	54.1866	54.3616	55.1911	55.1911	55.3475	54.8686	54.3616	54.0088	53.6448
alpha	4.5257	4.5386	4.5514	4.6124	4.6241	4.6794	4.6794	4.6898	4.6579	4.6241	4.6006	4.5763
util living area	0.9888	0.9750	0.9410	0.8561	0.7098	0.5275	0.3861	0.4312	0.6689	0.9050	0.9780	0.9913 (86)
MIT	19.9244	20.1170	20.3817	20.6696	20.8455	20.9168	20.9306	20.9287	20.8840	20.6325	20.2244	19.8957 (87)
Th 2	19.8532	19.8569	19.8605	19.8775	19.8807	19.8956	19.8956	19.8984	19.8899	19.8807	19.8742	19.8675 (88)
util rest of house	0.9854	0.9675	0.9239	0.8181	0.6454	0.4427	0.2907	0.3305	0.5805	0.8697	0.9701	0.9886 (89)
MIT 2	18.6207	18.8656	19.1945	19.5441	19.7281	19.8019	19.8098	19.8120	19.7747	19.5162	19.0175	18.5955 (90)
Living area fraction	18.7865	19.0247	19.3455	19.6873	19.8702	19.9437	19.9524	19.9540	19.9158	19.6582	19.1710	18.7609 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.6365	18.8747	19.1955	19.5373	19.7202	19.7937	19.8024	19.8040	19.7658	19.5082	19.0210	18.6109 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9802	0.9589	0.9113	0.8048	0.6353	0.4346	0.2826	0.3217	0.5698	0.8552	0.9618	0.9843 (94)
Useful gains	781.1040	913.0175	1002.9931	997.1600	841.0652	563.4524	350.9910	371.5114	602.4588	780.2771	759.1023	737.8493 (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	1643.0590	1595.7514	1444.4751	1189.8281	894.2104	570.3662	351.6789	372.7699	625.8696	993.2110	1337.8062	1628.2059 (97)
Space heating kWh	641.2945	458.7972	328.4626	138.7210	39.5400	0.0000	0.0000	0.0000	0.0000	158.4229	416.6668	662.4253 (98a)
Space heating requirement - total per year (kWh/year)												2844.3304
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	641.2945	458.7972	328.4626	138.7210	39.5400	0.0000	0.0000	0.0000	0.0000	158.4229	416.6668	662.4253 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2844.3304
Space heating per m2										(98c) / (4) =		31.8728 (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	641.2945	458.7972	328.4626	138.7210	39.5400	0.0000	0.0000	0.0000	0.0000	158.4229	416.6668	662.4253 (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)	724.6266	518.4149	371.1442	156.7469	44.6780	0.0000	0.0000	0.0000	0.0000	179.0089	470.8100	748.5032 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	239.3521	211.0116	222.5781	191.9781	183.5538	162.6381	158.5428	166.4056	169.9588	192.8167	209.0477	236.2579 (64)
Efficiency of water heater	88.0872	88.0219	87.8879	87.6230	87.2621	87.0000	87.0000	87.0000	87.0000	87.6702	87.9931	87.0000 (216)
Fuel for water heating, kWh/month	271.7217	239.7262	253.2521	219.0956	210.3476	186.9404	182.2331	191.2708	195.3549	219.9341	237.5727	268.1681 (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)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	24.3993	19.5740	17.6242	12.9123	9.9738	8.1487	9.0984	11.8265	15.3614	20.1550	22.7651	25.0774 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-28.7736	-44.5482	-70.5624	-85.2018	-95.0902	-89.7000	-88.1991	-81.4061	-69.2505	-53.2818	-32.6993	-24.2214 (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)	-12.6872	-30.4510	-71.0977	-122.3788	-174.9265	-180.8812	-176.6792	-141.3180	-92.6617	-46.5271	-17.6620	-9.6561 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												

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(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												3213.9326	(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												2675.6173	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												196.9161	(232)

Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1839.8610	(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												4332.6050	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3213.9326	3.6400	116.9871	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2675.6173	3.6400	97.3925	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814	(249)
Energy for lighting	196.9161	16.4900	32.4715	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-762.9345	16.4900	-125.8079	
PV Unit electricity exported	-1076.9265	5.5900	-60.2002	
Total			-186.0081	(252)
Total energy cost			167.0244	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		0.4479	(257)
SAP value	[(255) x (256)] / [(4) + 45.0] =	92.7392	
SAP rating (Section 12)		93	(258)
SAP band		A	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3213.9326	0.2100	674.9259	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2675.6173	0.2100	561.8796	(264)
Space and water heating			1236.8055	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	196.9161	0.1443	28.4211	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-762.9345	0.1332	-101.6018	
PV Unit electricity exported	-1076.9265	0.1226	-132.0751	
Total			-233.6769	(269)
Total CO2, kg/year			1043.4790	(272)
CO2 emissions per m2			11.6900	(273)
EI value			89.5839	
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	44.6200 (1b)	x 2.3900 (2b)	= 106.6418 (1b) - (3b)	
First floor	44.6200 (1c)	x 2.6200 (2c)	= 116.9044 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	89.2400			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n) =	223.5462	(5)

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2. Ventilation rate

										m3 per hour		
Number of open chimneys										0 * 80 =	0.0000 (6a)	
Number of open flues										0 * 20 =	0.0000 (6b)	
Number of chimneys / flues attached to closed fire										0 * 10 =	0.0000 (6c)	
Number of flues attached to solid fuel boiler										0 * 20 =	0.0000 (6d)	
Number of flues attached to other heater										0 * 35 =	0.0000 (6e)	
Number of blocked chimneys										0 * 20 =	0.0000 (6f)	
Number of intermittent extract fans										5 * 10 =	50.0000 (7a)	
Number of passive vents										0 * 10 =	0.0000 (7b)	
Number of flueless gas fires										0 * 40 =	0.0000 (7c)	
										Air changes per hour		
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =									50.0000 / (5) =	0.2237 (8)	
Pressure test											Yes	
Pressure Test Method											Blower Door	
Measured/design AP50											4.0000 (17)	
Infiltration rate											0.4237 (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) = 0.4237 (21)	

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	0.5402	0.5296	0.5190	0.4660	0.4554	0.4025	0.4025	0.3919	0.4237	0.4554	0.4766	0.4978	(22b)
	0.6459	0.6402	0.6347	0.6086	0.6037	0.5810	0.5810	0.5768	0.5897	0.6037	0.6136	0.6239	(25)

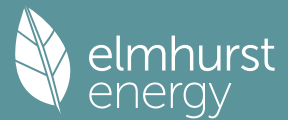
3. Heat losses and heat loss parameter

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)			21.6300	1.2357	26.7291			(27)					
Door			2.1400	1.3000	2.7820			(26a)					
Ground Floor			44.6200	0.1300	5.8006	75.0000	3346.5000	(28a)					
External Wall	66.9600	7.4100	59.5500	0.1900	11.3145	110.0000	6550.5000	(29a)					
Render wall	71.5400	16.3600	55.1800	0.1800	9.9324	110.0000	6069.8000	(29a)					
Plane Roof	44.6200		44.6200	0.0900	4.0158	9.0000	401.5800	(30)					
Total net area of external elements Aum(A, m2)			227.7400					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	60.5744			(33)					
Studs			189.8400			9.0000	1708.5600	(32c)					
Block			33.8400			75.0000	2538.0000	(32c)					
Internal Floor 1			44.6200			18.0000	803.1600	(32d)					
Internal Ceiling 1			44.6200			9.0000	401.5800	(32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	21819.6800	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							244.5056	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
E2 Other lintels (including other steel lintels)				16.6300	0.0240	0.3991							
E3 Sill				13.8000	0.0210	0.2898							
E4 Jamb				36.3000	0.0160	0.5808							
E5 Ground floor (normal)				27.7000	0.0920	2.5484							
E10 Eaves (insulation at ceiling level)				17.5000	0.0580	1.0150							
E16 Corner (normal)				20.0400	0.0470	0.9419							
E6 Intermediate floor within a dwelling				27.7000	0.0010	0.0277							
E12 Gable (insulation at ceiling level)				10.2000	0.0570	0.5814							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.3841	(36)					
Point Thermal bridges							0.0000	(36a) =					
Total fabric heat loss						(33) + (36) + (36a) =	66.9585	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	47.6478	47.2299	46.8203	44.8961	44.5361	42.8603	42.8603	42.5499	43.5058	44.5361	45.2644	46.0258	(38)
Average = Sum(39)m / 12 =	114.6063	114.1884	113.7787	111.8546	111.4946	109.8188	109.8188	109.5084	110.4643	111.4946	112.2229	112.9843	(39)
												111.8529	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2842	1.2796	1.2750	1.2534	1.2494	1.2306	1.2306	1.2271	1.2378	1.2494	1.2575	1.2661	(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													2.6152 (42)
Hot water usage for mixer showers													
Hot water usage for baths	68.0676	67.0447	65.5541	62.7021	60.5974	58.2503	56.9161	58.3955	60.0171	62.5372	65.4504	67.8068	(42a)
Hot water usage for other uses	29.3945	28.9580	28.3432	27.2097	26.3610	25.4199	24.9115	25.5220	26.1866	27.1937	28.3505	29.2952	(42b)
Average daily hot water use (litres/day)	41.4120	39.9061	38.4002	36.8943	35.3884	33.8825	33.8825	35.3884	36.8943	38.4002	39.9061	41.4120	(42c)
													127.6567 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	138.8742	135.9088	132.2975	126.8062	122.3468	117.5527	115.7102	119.3059	123.0980	128.1311	133.7071	138.5140	(44)
Energy content (annual)	219.9427	193.5323	203.3364	173.5913	164.7023	144.5447	139.9415	147.7256	151.7922	173.8727	190.4902	216.8794	(45)
Distribution loss (46)m = 0.15 x (45)m	32.9914	29.0298	30.5005	26.0387	24.7054	21.6817	20.9912	22.1588	22.7688	26.0809	28.5735	32.5319	(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)
													(59)

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Combi loss	19.4094	17.4793	19.2416	18.3868	18.8514	18.0934	18.6014	18.6800	18.1666	18.9441	18.5575	19.3784 (61)
Total heat required for water heating calculated for each month	239.3521	211.0116	222.5781	191.9781	183.5538	162.6381	158.5428	166.4056	169.9588	192.8167	209.0477	236.2579 (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	239.3521	211.0116	222.5781	191.9781	183.5538	162.6381	158.5428	166.4056	169.9588	192.8167	209.0477	236.2579 (64)
	Total per year (kWh/year) = Sum(64)m =											2344.1411 (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	77.9833	68.7193	72.4198	62.3158	59.4764	52.5845	51.1809	53.7887	55.0126	62.5487	67.9774	76.9570 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	156.9105	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.8755	24.7588	20.1352	15.2436	11.3948	9.6200	10.3947	13.5114	18.1350	23.0266	26.8754	28.6503	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	354.7352	358.4162	349.1401	329.3924	304.4644	281.0357	265.3838	261.7028	270.9789	290.7266	315.6545	339.0833	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	53.3062	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	-104.6070	(71)
Water heating gains (Table 5)	104.8163	102.2609	97.3384	86.5497	79.9414	73.0340	68.7915	72.2967	76.4063	84.0708	94.4130	103.4369	(72)
Total internal gains	596.0367	594.0456	575.2234	539.7955	504.4103	469.2993	450.1797	453.1206	471.1299	506.4337	545.5527	579.7801	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North					3.7500	10.6334	0.7300	0.7000	0.7700	14.1207 (74)			
East					10.4700	19.6403	0.7300	0.7000	0.7700	72.8196 (76)			
South					6.5000	46.7521	0.7300	0.7000	0.7700	107.6139 (78)			
West					0.9100	19.6403	0.7300	0.7000	0.7700	6.3291 (80)			
Solar gains	200.8833	358.0609	525.3438	699.2735	819.3843	827.2222	791.9601	701.6591	586.2115	405.9389	243.6680	169.8481	(83)
Total gains	796.9200	952.1065	1100.5672	1239.0690	1323.7946	1296.5215	1242.1398	1154.7797	1057.3414	912.3726	789.2207	749.6282	(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	Dec	
tau	52.8856	53.0791	53.2703	54.1866	54.3616	55.1911	55.1911	55.3475	54.8686	54.3616	54.0088	53.6448	
alpha	4.5257	4.5386	4.5514	4.6124	4.6241	4.6794	4.6794	4.6898	4.6579	4.6241	4.6006	4.5763	
util living area	0.9888	0.9750	0.9410	0.8561	0.7098	0.5275	0.3861	0.4312	0.6689	0.9050	0.9780	0.9913	(86)
MIT	19.9244	20.1170	20.3817	20.6696	20.8455	20.9168	20.9306	20.9287	20.8840	20.6325	20.2244	19.8957	(87)
Th 2	19.8532	19.8569	19.8605	19.8775	19.8807	19.8956	19.8956	19.8807	19.8807	19.8807	19.8742	19.8675	(88)
util rest of house	0.9854	0.9675	0.9239	0.8181	0.6454	0.4427	0.2907	0.3305	0.5805	0.8697	0.9701	0.9886	(89)
MIT 2	18.6207	18.8656	19.1945	19.5441	19.7281	19.8019	19.8098	19.8120	19.7747	19.5162	19.0175	18.5955	(90)
Living area fraction									fLA = Living area / (4) =			0.1272	(91)
MIT	18.7865	19.0247	19.3455	19.6873	19.8702	19.9437	19.9524	19.9540	19.9158	19.6582	19.1710	18.7609	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.6365	18.8747	19.1955	19.5373	19.7202	19.7937	19.8024	19.8040	19.7658	19.5082	19.0210	18.6109	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9802	0.9589	0.9113	0.8048	0.6353	0.4346	0.2826	0.3217	0.5698	0.8552	0.9618	0.9843	(94)
Useful gains	781.1040	913.0175	1002.9931	997.1600	841.0652	563.4524	350.9910	371.5114	602.4588	780.2771	759.1023	737.8493	(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	1643.0590	1595.7514	1444.4751	1189.8281	894.2104	570.3662	351.6789	372.7699	625.8696	993.2110	1337.8062	1628.2059	(97)
Space heating kWh	641.2945	458.7972	328.4626	138.7210	39.5400	0.0000	0.0000	0.0000	0.0000	158.4229	416.6668	662.4253	(98a)
Space heating requirement - total per year (kWh/year)												2844.3304	
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	641.2945	458.7972	328.4626	138.7210	39.5400	0.0000	0.0000	0.0000	0.0000	158.4229	416.6668	662.4253	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2844.3304	
Space heating per m2										(98c) / (4) =		31.8728	(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)

10a. Fuel costs - using BEDF prices (554)			
	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3213.9326	5.6000	179.9802 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2675.6173	5.6000	149.8346 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	86.0000	26.0600	22.4116 (249)
Energy for lighting	196.9161	26.0600	51.3163 (250)
Additional standing charges			99.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-762.9345	26.0600	-198.8207
PV Unit electricity exported	-1076.9265	5.8100	-62.5694
Total			-261.3902 (252)
Total energy cost			241.1526 (255)

SAP 10 Online 2.20.7 Page 14 of 15

Full SAP Calculation Printout



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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3213.9326	1.1300	3631.7439 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2675.6173	1.1300	3023.4475 (278)
Space and water heating			6655.1914 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	196.9161	1.5338	302.0365 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-762.9345	1.4921	-1138.3822
PV Unit electricity exported	-1076.9265	0.4500	-484.6400
Total			-1623.0222 (283)
Total Primary energy kWh/year			5464.3065 (286)

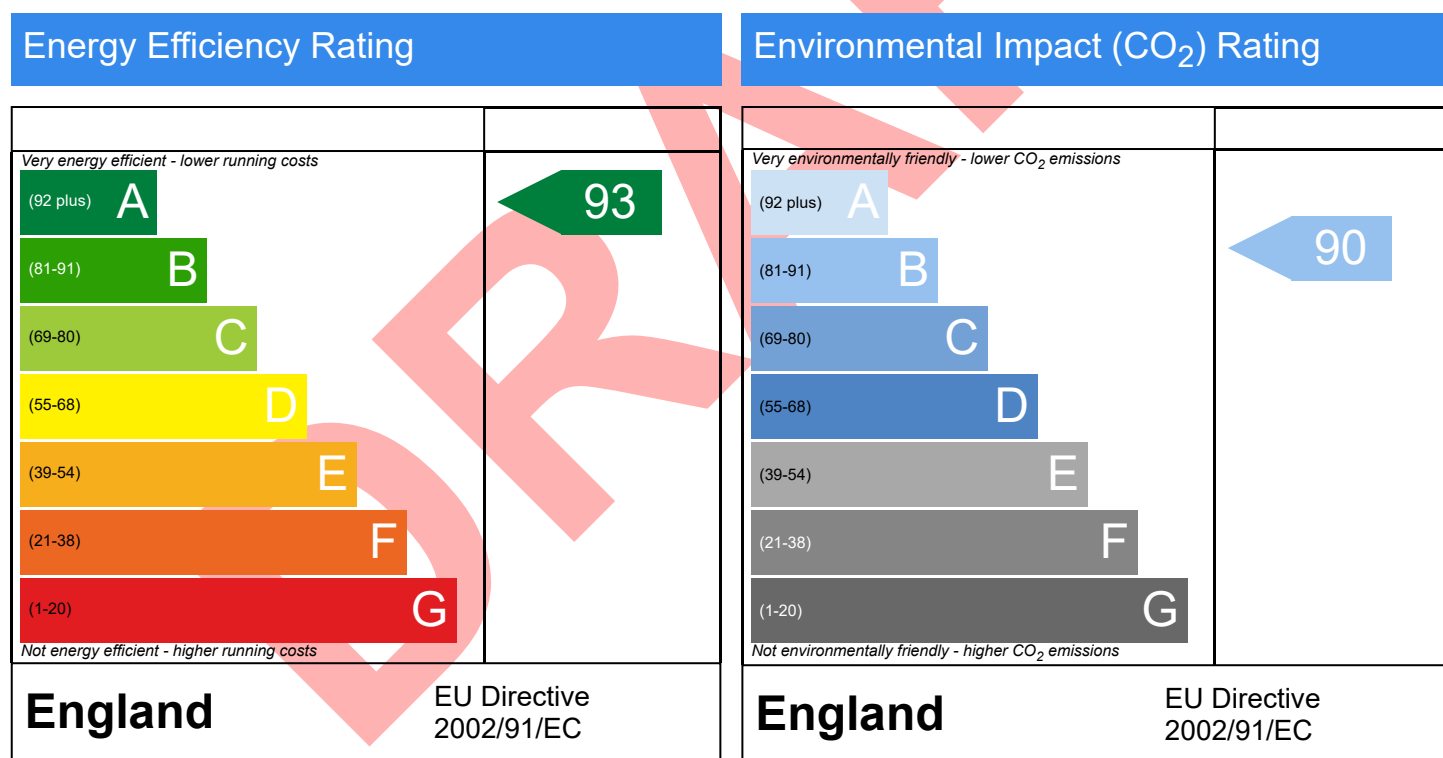
Predicted Energy Assessment



Dwelling type: House, Detached
Date of assessment: 15/11/2024
Produced by: Victoria Gartside
Total floor area: 89.24 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.