

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 2
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	12.56 kgCO ₂ /m ²	
Dwelling carbon dioxide emission rate	12.46 kgCO ₂ /m ²	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	65.7 kWh _{PE} /m ²	
Dwelling primary energy	65.36 kWh _{PE} /m ²	OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	43.3 kWh/m ²	
Dwelling fabric energy efficiency	39.8 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	South	0.7	1.3
Side, Windows	6.5	North	0.7	1.3

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

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	0.4 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 2	Prop Type Ref	SAP VG 21-0282	
Property				

SAP Rating	93 A	DER	12.46	TER	12.56
Environmental	89 B	% DER < TER			0.80
CO ₂ Emissions (t/year)	1.07	DFEE	39.80	TFEE	43.30
Compliance Check	See BREL	% DFEE < TFEE			8.08
% DPER < TPER	0.51	DPER	65.36	TPER	65.70

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	Ground floor:	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	1st Storey:	30.80 m	44.62 m ²	2.39 m
	2nd Storey:	30.80 m	44.62 m ²	2.62 m
		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	South	3.75	0
Side	Windows	External Wall	North	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	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	5
Number of passive vents	0
Number of flueless gas fires	0

21.0 Fixed Cooling System

22.0 Pressure Testing

Summary for Input Data

Designed AP ₅₀	4.00	m ² /(h.m ²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

22.0 Lighting

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

24.0 Main Heating 1

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

25.0 Main Heating 2

None

26.0 Heat Networks

None

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

27.0 Secondary Heating

None

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes

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

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

31.0 Thermal Store

None

32.0 Photovoltaic Unit

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

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

34.0 Small-scale Hydro

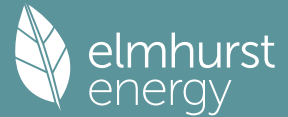
	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
Connected to dwelling's electricity meter	Yes	
Electricity Generation	Annual	

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

Recommendations

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

Full SAP Calculation Printout



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Property							
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Environmental	89 B	% DER < TER				0.80	
CO ₂ Emissions (t/year)	1.07	DFEE	39.80	TFEE	43.30		
Compliance Check	See BREL	% DFEE < TFEE				8.08	
% DPER < TPER	0.51	DPER	65.36	TPER	65.70		
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)
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												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													
	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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	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	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)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													
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)

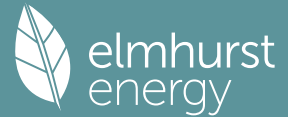
6. Solar gains													

[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				6.5000	10.6334		0.7300		0.7000		0.7700		24.4759 (74)
East				10.4700	19.6403		0.7300		0.7000		0.7700		72.8196 (76)
South				3.7500	46.7521		0.7300		0.7000		0.7700		62.0849 (78)
West				0.9100	19.6403		0.7300		0.7000		0.7700		6.3291 (80)

Solar gains	165.7096	303.2855	463.9885	645.9365	780.2795	797.4594	759.4968	657.2051	527.4218	349.0705	202.4751	139.1395	(83)
Total gains	693.3045	843.6355	980.3569	1142.2812	1249.3182	1244.8893	1188.2016	1086.9488	971.4861	813.0342	697.4788	654.8683	(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	0.9935	0.9840	0.9598	0.8838	0.7382	0.5470	0.4031	0.4566	0.7114	0.9330	0.9862	0.9950 (86)
MIT	19.8357	20.0291	20.2968	20.6236	20.8298	20.9140	20.9300	20.9273	20.8695	20.5721	20.1489	19.8136 (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	0.9914	0.9790	0.9471	0.8502	0.6746	0.4600	0.3038	0.3507	0.6229	0.9054	0.9810	0.9933 (89)
MIT 2	18.5084	18.7561	19.0930	19.4950	19.7148	19.8004	19.8096	19.8115	19.7648	19.4498	18.9236	18.4912 (90)
Living area fraction									fLA = Living area / (4) =			0.1272 (91)
MIT	18.6772	18.9180	19.2461	19.6386	19.8566	19.9420	19.9521	19.9534	19.9053	19.5926	19.0794	18.6594 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.5272	18.7680	19.0961	19.4886	19.7066	19.7920	19.8021	19.8034	19.7553	19.4426	18.9294	18.5094 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9879	0.9723	0.9361	0.8364	0.6638	0.4515	0.2953	0.3414	0.6111	0.8914	0.9747	0.9904 (94)
Useful gains	684.9207	820.3025	917.7426	955.3644	829.2541	562.0860	350.8202	371.0822	593.6343	724.7082	679.8626	648.5976 (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	1630.5258	1583.5637	1433.1712	1184.3812	892.6941	570.1828	351.6515	372.7038	624.7051	985.8978	1327.5324	1616.7359 (97)
Space heating kWh	703.5302	512.9115	383.4789	164.8921	47.1993	0.0000	0.0000	0.0000	0.0000	194.3250	466.3222	720.2949 (98a)
Space heating requirement - total per year (kWh/year)												3192.9541
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	703.5302	512.9115	383.4789	164.8921	47.1993	0.0000	0.0000	0.0000	0.0000	194.3250	466.3222	720.2949 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3192.9541
Space heating per m2										(98c) / (4) =		35.7794 (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	703.5302	512.9115	383.4789	164.8921	47.1993	0.0000	0.0000	0.0000	0.0000	194.3250	466.3222	720.2949 (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)	794.9494	579.5610	433.3095	186.3187	53.3325	0.0000	0.0000	0.0000	0.0000	219.5763	526.9178	813.8925 (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	88.1143	88.0575	87.9431	87.6867	87.3027	87.0000	87.0000	87.0000	87.0000	87.7465	88.0302	88.1247 (216)
Fuel for water heating, kWh/month	271.6381	239.6294	253.0931	218.9363	210.2499	186.9404	182.2331	191.2708	195.3549	219.7429	237.4727	268.0949 (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)	-30.1030	-46.4147	-73.1749	-87.8843	-97.6556	-91.9595	-90.4299	-83.6866	-71.5034	-55.3515	-34.1482	-25.3592 (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)	-13.7333	-32.9223	-76.7834	-132.0032	-188.4952	-194.8411	-190.3044	-152.2895	-99.9419	-50.2582	-19.1065	-10.4541 (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												3607.8578 (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												2674.6565 (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												-1948.8035 (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	4616.6268 (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	3607.8578	0.2100	757.6501 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2674.6565	0.2100	561.6779 (264)
Space and water heating			1319.3280 (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	-787.6706	0.1333	-104.9738
PV Unit electricity exported	-1161.1330	0.1227	-142.4382
Total			-247.4120 (269)
Total CO2, kg/year			1112.2664 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.4600 (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	3607.8578	1.1300	4076.8793 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2674.6565	1.1300	3022.3618 (278)
Space and water heating			7099.2411 (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	-787.6706	1.4925	-1175.5835
PV Unit electricity exported	-1161.1330	0.4501	-522.6691
Total			-1698.2526 (283)
Total Primary energy kWh/year			5833.1258 (286)
Dwelling Primary energy Rate (DPER)			65.3600 (287)

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

1. Overall dwelling characteristics

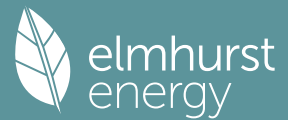
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	44.6200 (1b)	x 2.3900 (2b)	= 106.6418 (1b) - (3b)
First floor	44.6200 (1c)	x 2.6200 (2c)	= 116.9044 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 223.5462 (5)

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)

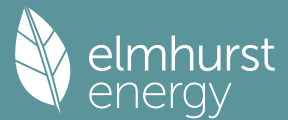
Assumed occupancy													2.6152 (42)
Hot water usage for mixer showers	68.0676	67.0447	65.5541	62.7021	60.5974	58.2503	56.9161	58.3955	60.0171	62.5372	65.4504	67.8068 (42a)	
Hot water usage for baths	29.3945	28.9580	28.3432	27.2097	26.3610	25.4199	24.9115	25.5220	26.1866	27.1937	28.3505	29.2952 (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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	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	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				6.0600	10.6334	0.6300	0.7000			0.7700		19.6932 (74)
East				9.7600	19.6403	0.6300	0.7000			0.7700		58.5826 (76)
South				3.5000	46.7521	0.6300	0.7000			0.7700		50.0081 (78)
West				0.8500	19.6403	0.6300	0.7000			0.7700		5.1020 (80)
Solar gains	133.3859	244.1158	373.4437	519.8559	627.9552	641.7732	611.2252	528.9166	424.4880	280.9619	162.9780	112.0000 (83)
Total gains	671.5604	795.0622	900.4480	1026.9171	1107.7608	1100.0215	1050.7810	969.4849	879.3451	755.6616	668.6389	638.3187 (84)
7. Mean internal temperature (heating season)												
Temperature during heating periods in the living area from Table 9, Th1 (C)												
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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	0.9943	0.9872	0.9699	0.9139	0.7933	0.6085	0.4535	0.5082	0.7597	0.9470	0.9883	0.9955 (86)
MIT	19.5267	19.7540	20.0820	20.5062	20.8126	20.9591	20.9916	20.9860	20.8870	20.4697	19.9275	19.4972 (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	0.9924	0.9830	0.9600	0.8862	0.7336	0.5159	0.3430	0.3924	0.6733	0.9238	0.9838	0.9940 (89)
MIT 2	18.1666	18.4571	18.8714	19.3951	19.7320	19.8728	19.8924	19.8926	19.8172	19.3667	18.6898	18.1371 (90)
Living area fraction									fLA = Living area / (4) =			0.1272 (91)
MIT	18.3396	18.6221	19.0254	19.5364	19.8695	20.0110	20.0322	20.0316	19.9533	19.5070	18.8472	18.3101 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3396	18.6221	19.0254	19.5364	19.8695	20.0110	20.0322	20.0316	19.9533	19.5070	18.8472	18.3101 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9887	0.9766	0.9502	0.8760	0.7329	0.5261	0.3570	0.4069	0.6788	0.9136	0.9777	0.9908 (94)
Useful gains	663.9606	776.4806	855.5661	899.5527	811.8309	578.7556	375.1601	394.5083	596.8628	690.3673	653.7467	632.4621 (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	1598.1037	1557.2477	1417.2202	1186.6571	909.0120	594.6185	377.1720	398.1581	646.3293	991.0788	1314.1442	1587.3127 (97)
Space heating kWh	695.0025	524.6755	417.8707	206.7151	72.3027	0.0000	0.0000	0.0000	0.0000	223.7293	475.4862	710.4088 (98a)
Space heating requirement - total per year (kWh/year)												3326.1908
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	695.0025	524.6755	417.8707	206.7151	72.3027	0.0000	0.0000	0.0000	0.0000	223.7293	475.4862	710.4088 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3326.1908
Space heating per m2										(98c) / (4) =		37.2724 (99)
9a. Energy requirements - Individual heating systems, including micro-CHP												
Fraction of space heat from secondary/supplementary system (Table 11)												
Fraction of space heat from main system(s)												
Efficiency of main space heating system 1 (in %)												
Efficiency of main space heating system 2 (in %)												
Efficiency of secondary/supplementary heating system, %												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	695.0025	524.6755	417.8707	206.7151	72.3027	0.0000	0.0000	0.0000	0.0000	223.7293	475.4862	710.4088 (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)	752.1672	567.8306	452.2410	223.7177	78.2497	0.0000	0.0000	0.0000	0.0000	242.1313	514.5955	768.8407 (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	86.5230	86.2416	85.6838	84.4626	82.4708	80.3000	80.3000	80.3000	80.3000	84.6050	86.0443	80.3000 (216)
Fuel for water heating, kWh/month	277.1331	245.8662	263.1502	235.6591	234.5342	217.7207	215.5201	223.8056	225.9253	238.3076	248.1389	274.0837 (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												3599.7736	(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												2899.8446	(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												4581.1513	(238)

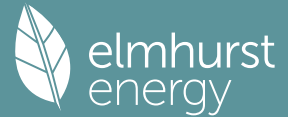
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3599.7736	0.2100	755.9524	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2899.8446	0.2100	608.9674	(264)
Space and water heating			1364.9198	(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			1120.4969	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.5600	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3599.7736	1.1300	4067.7441	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2899.8446	1.1300	3276.8244	(278)
Space and water heating			7344.5685	(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			5862.8562	(286)
Target Primary Energy Rate (TPER)			65.7000	(287)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024		
Assessment Reference	Plot 2			Prop Type Ref	SAP VG 21-0282			
Property								
SAP Rating	93 A		DER	12.46		TER	12.56	
Environmental	89 B		% DER < TER				0.80	
CO ₂ Emissions (t/year)	1.07		DFEE	39.80		TFEE	43.30	
Compliance Check	See BREL		% DFEE < TFEE				8.08	
% DPER < TPER	0.51		DPER	65.36		TPER	65.70	
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)
	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)												
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1077.8609
	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)
												Total per year (kWh/year) = Sum(64)m = 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)
												Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 620.0575 (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)

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

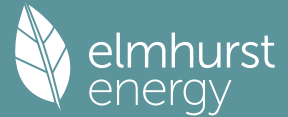
Metabolic gains (Table 5), Watts												
(66)m	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	119.8785	132.7226	119.8785	123.8745	119.8785	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	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	6.5000				10.6334		0.7300		0.7000		0.7700	24.4759 (74)
East	10.4700				19.6403		0.7300		0.7000		0.7700	72.8196 (76)
South	3.7500				46.7521		0.7300		0.7000		0.7700	62.0849 (78)
West	0.9100				19.6403		0.7300		0.7000		0.7700	6.3291 (80)

Solar gains	165.7096	303.2855	463.9885	645.9365	780.2795	797.4594	759.4968	657.2051	527.4218	349.0705	202.4751	139.1395 (83)
Total gains	635.8344	787.4527	927.1392	1096.2049	1207.4450	1210.4546	1156.7974	1053.5191	935.6107	769.2077	646.8353	598.3691 (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	0.9954	0.9873	0.9652	0.8913	0.7445	0.5513	0.4057	0.4620	0.7208	0.9415	0.9895	0.9965 (86)	
MIT	19.5410	19.7990	20.1567	20.5899	20.8658	20.9745	20.9952	20.9913	20.9147	20.5106	19.9434	19.5010 (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	0.9939	0.9833	0.9541	0.8593	0.6822	0.4652	0.3075	0.3567	0.6337	0.9167	0.9854	0.9954 (89)	
MIT 2	18.5767	18.8338	19.1846	19.5960	19.8248	19.9053	19.9146	19.9153	19.8704	19.5374	18.9870	18.5437 (90)	
Living area fraction	fLA = Living area / (4) =												0.1272 (91)
MIT	18.6993	18.9565	19.3082	19.7224	19.9572	20.0413	20.0521	20.0521	20.0032	19.6612	19.1087	18.6655 (92)	
Temperature adjustment													0.0000
adjusted MIT	18.6993	18.9565	19.3082	19.7224	19.9572	20.0413	20.0521	20.0521	20.0032	19.6612	19.1087	18.6655 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9916	0.9786	0.9467	0.8532	0.6853	0.4755	0.3200	0.3701	0.6417	0.9097	0.9814	0.9935 (94)
Useful gains	630.4758	770.6357	877.7019	935.2769	827.4715	575.5930	370.1761	389.8935	600.3540	699.7347	634.7733	594.4814 (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	1591.7129	1550.1644	1409.2336	1177.7831	896.7738	585.2748	371.3105	392.1228	637.3277	984.0870	1309.6373	1584.4232 (97)
Space heating kWh	715.1603	523.8433	395.4597	174.6044	51.5609	0.0000	0.0000	0.0000	0.0000	211.5581	485.9021	736.5167 (98a)
Space heating requirement - total per year (kWh/year)												3294.6054
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	715.1603	523.8433	395.4597	174.6044	51.5609	0.0000	0.0000	0.0000	0.0000	211.5581	485.9021	736.5167 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3294.6054
Space heating per m2	(98c) / (4) =											36.9185 (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	0.9249	0.9608	0.9411	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	935.1034	764.7824	767.9134	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1367.8289	1307.4380	1189.0732	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	311.5624	403.7358	313.3429	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	77.8906	100.9339	78.3357	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												257.1602 (107)
Energy for space heating												36.9185 (99)
Energy for space cooling												2.8817 (108)
Total												39.8002 (109)
Fabric Energy Efficiency (DFEE)												39.8 (109)

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

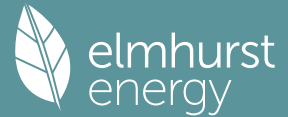
1. Overall dwelling characteristics

	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	

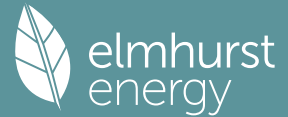
4. Water heating energy requirements (kWh/year)

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	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	(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)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		916.1818	(64)
Electric shower(s)												916	(64)
Heat gains from water heating, kWh/month	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)
	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					6.0600	10.6334	0.6300	0.7000			0.7700	19.6932 (74)	
East					9.7600	19.6403	0.6300	0.7000			0.7700	58.5826 (76)	
South					3.5000	46.7521	0.6300	0.7000			0.7700	50.0081 (78)	
West					0.8500	19.6403	0.6300	0.7000			0.7700	5.1020 (80)	

Solar gains	133.3859	244.1158	373.4437	519.8559	627.9552	641.7732	611.2252	528.9166	424.4880	280.9619	162.9780	112.0000	(83)
Total gains	603.4890	728.2589	836.5726	970.1019	1055.0989	1054.7459	1008.5039	925.2088	832.6543	701.0773	607.3157	571.2079	(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	0.9963	0.9909	0.9769	0.9276	0.8143	0.6297	0.4713	0.5302	0.7849	0.9589	0.9920	0.9971 (86)
MIT	19.4473	19.6784	20.0150	20.4598	20.7891	20.9529	20.9901	20.9834	20.8696	20.4176	19.8575	19.4184 (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	0.9951	0.9879	0.9690	0.9031	0.7570	0.5358	0.3571	0.4105	0.7008	0.9398	0.9888	0.9962 (89)
MIT 2	18.4615	18.6931	19.0266	19.4613	19.7485	19.8748	19.8926	19.8928	19.8230	19.4336	18.8832	18.4416 (90)
Living area fraction	18.5869	18.8184	19.1523	19.5883	19.8808	20.0119	20.0322	20.0315	19.9561	19.5587	19.0071	0.1272 (91)
Temperature adjustment												0.0000 (92)
adjusted MIT	18.5869	18.8184	19.1523	19.5883	19.8808	20.0119	20.0322	20.0315	19.9561	19.5587	19.0071	18.5658 (93)

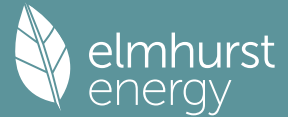
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9931	0.9840	0.9625	0.8954	0.7569	0.5463	0.3716	0.4256	0.7064	0.9326	0.9853	0.9945 (94)
Useful gains	599.2986	716.6101	805.1645	868.5905	798.5824	576.2188	374.7875	393.7475	588.1885	653.8150	598.3777	568.0841 (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	1626.2551	1579.5291	1431.5849	1192.4505	910.2752	594.7239	377.1700	398.1475	646.6452	996.8334	1332.0322	1616.0748 (97)
Space heating kWh	764.0557	579.8816	466.0568	233.1792	83.0995	0.0000	0.0000	0.0000	0.0000	255.2057	528.2312	779.7051 (98a)
Space heating requirement - total per year (kWh/year)												3689.4148
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	764.0557	579.8816	466.0568	233.1792	83.0995	0.0000	0.0000	0.0000	0.0000	255.2057	528.2312	779.7051 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3689.4148
Space heating per m ²										(98c) / (4) =		41.3426 (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	0.8755	0.9296	0.9015	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	904.4220	755.9794	751.1901	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1185.8562	1134.1314	1039.1229	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	202.6326	281.3451	214.2220	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	50.6581	70.3363	53.5555	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												174.5499 (107)
Energy for space heating												41.3426 (99)
Energy for space cooling												1.9560 (108)
Total												43.2986 (109)
Fabric Energy Efficiency (TFEE)												43.3 (109)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024		
Assessment Reference	Plot 2			Prop Type Ref	SAP VG 21-0282			
Property								
SAP Rating	93 A		DER	12.46		TER	12.56	
Environmental	89 B		% DER < TER				0.80	
CO ₂ Emissions (t/year)	1.07		DFEE	39.80		TFEE	43.30	
Compliance Check	See BREL		% DFEE < TFEE				8.08	
% DPER < TPER	0.51		DPER	65.36		TPER	65.70	
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)
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													
	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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	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)													
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													
	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)													
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	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													
	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)

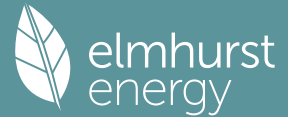
6. Solar gains													

[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			6.5000	10.6334	0.7300			0.7000		0.7700		24.4759	(74)
East			10.4700	19.6403	0.7300			0.7000		0.7700		72.8196	(76)
South			3.7500	46.7521	0.7300			0.7000		0.7700		62.0849	(78)
West			0.9100	19.6403	0.7300			0.7000		0.7700		6.3291	(80)

Solar gains	165.7096	303.2855	463.9885	645.9365	780.2795	797.4594	759.4968	657.2051	527.4218	349.0705	202.4751	139.1395	(83)
Total gains	693.3045	843.6355	980.3569	1142.2812	1249.3182	1244.8893	1188.2016	1086.9488	971.4861	813.0342	697.4788	654.8683	(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	0.9935	0.9840	0.9598	0.8838	0.7382	0.5470	0.4031	0.4566	0.7114	0.9330	0.9862	0.9950 (86)
MIT	19.8357	20.0291	20.2968	20.6236	20.8298	20.9140	20.9300	20.9273	20.8695	20.5721	20.1489	19.8136 (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	0.9914	0.9790	0.9471	0.8502	0.6746	0.4600	0.3038	0.3507	0.6229	0.9054	0.9810	0.9933 (89)
MIT 2	18.5084	18.7561	19.0930	19.4950	19.7148	19.8004	19.8096	19.8115	19.7648	19.4498	18.9236	18.4912 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.6772	18.9180	19.2461	19.6386	19.8566	19.9420	19.9521	19.9534	19.9053	19.5926	19.0794	18.6594 (92)
Temperature adjustment	-0.1500											
adjusted MIT	18.5272	18.7680	19.0961	19.4886	19.7066	19.7920	19.8021	19.8034	19.7553	19.4426	18.9294	18.5094 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9879	0.9723	0.9361	0.8364	0.6638	0.4515	0.2953	0.3414	0.6111	0.8914	0.9747	0.9904 (94)
Useful gains	684.9207	820.3025	917.7426	955.3644	829.2541	562.0860	350.8202	371.0822	593.6343	724.7082	679.8626	648.5976 (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	1630.5258	1583.5637	1433.1712	1184.3812	892.6941	570.1828	351.6515	372.7038	624.7051	985.8978	1327.5324	1616.7359 (97)
Space heating kWh	703.5302	512.9115	383.4789	164.8921	47.1993	0.0000	0.0000	0.0000	0.0000	194.3250	466.3222	720.2949 (98a)
Space heating requirement - total per year (kWh/year)	3192.9541											
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	703.5302	512.9115	383.4789	164.8921	47.1993	0.0000	0.0000	0.0000	0.0000	194.3250	466.3222	720.2949 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	3192.9541											
Space heating per m2	(98c) / (4) = 35.7794 (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	703.5302	512.9115	383.4789	164.8921	47.1993	0.0000	0.0000	0.0000	0.0000	194.3250	466.3222	720.2949 (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)	794.9494	579.5610	433.3095	186.3187	53.3325	0.0000	0.0000	0.0000	0.0000	219.5763	526.9178	813.8925 (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	88.1143	88.0575	87.9431	87.6867	87.3027	87.0000	87.0000	87.0000	87.0000	87.7465	88.0302	88.1247 (216)
Fuel for water heating, kWh/month	271.6381	239.6294	253.0931	218.9363	210.2499	186.9404	182.2331	191.2708	195.3549	219.7429	237.4727	268.0949 (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)	-30.1030	-46.4147	-73.1749	-87.8843	-97.6556	-91.9595	-90.4299	-83.6866	-71.5034	-55.3515	-34.1482	-25.3592 (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)	-13.7333	-32.9223	-76.7834	-132.0032	-188.4952	-194.8411	-190.3044	-152.2895	-99.9419	-50.2582	-19.1065	-10.4541 (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	3607.8578 (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	2674.6565 (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	-1948.8035 (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	4616.6268 (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	3607.8578	0.2100	757.6501 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2674.6565	0.2100	561.6779 (264)
Space and water heating			1319.3280 (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	-787.6706	0.1333	-104.9738
PV Unit electricity exported	-1161.1330	0.1227	-142.4382
Total			-247.4120 (269)
Total CO2, kg/year			1112.2664 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.4600 (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	3607.8578	1.1300	4076.8793 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2674.6565	1.1300	3022.3618 (278)
Space and water heating			7099.2411 (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	-787.6706	1.4925	-1175.5835
PV Unit electricity exported	-1161.1330	0.4501	-522.6691
Total			-1698.2526 (283)
Total Primary energy kWh/year			5833.1258 (286)
Dwelling Primary energy Rate (DPER)			65.3600 (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)

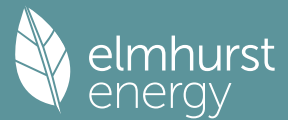
Assumed occupancy													2.6152 (42)
Hot water usage for mixer showers	68.0676	67.0447	65.5541	62.7021	60.5974	58.2503	56.9161	58.3955	60.0171	62.5372	65.4504	67.8068	(42a)
Hot water usage for baths	29.3945	28.9580	28.3432	27.2097	26.3610	25.4199	24.9115	25.5220	26.1866	27.1937	28.3505	29.2952	(42b)
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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	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)
Distribution loss (46)m = 0.15 x (45)m	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)
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	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

Full SAP Calculation Printout



[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	6.0600				10.6334	0.6300		0.7000			0.7700		19.6932 (74)
East	9.7600				19.6403	0.6300		0.7000			0.7700		58.5826 (76)
South	3.5000				46.7521	0.6300		0.7000			0.7700		50.0081 (78)
West	0.8500				19.6403	0.6300		0.7000			0.7700		5.1020 (80)
Solar gains	133.3859	244.1158	373.4437	519.8559	627.9552	641.7732	611.2252	528.9166	424.4880	280.9619	162.9780	112.0000	(83)
Total gains	671.5604	795.0622	900.4480	1026.9171	1107.7608	1100.0215	1050.7810	969.4849	879.3451	755.6616	668.6389	638.3187	(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	0.9943	0.9872	0.9699	0.9139	0.7933	0.6085	0.4535	0.5082	0.7597	0.9470	0.9883	0.9955	(86)
MIT	19.5267	19.7540	20.0820	20.5062	20.8126	20.9591	20.9916	20.9860	20.8870	20.4697	19.9275	19.4972	(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	0.9924	0.9830	0.9600	0.8862	0.7336	0.5159	0.3430	0.3924	0.6733	0.9238	0.9838	0.9940	(89)
MIT 2	18.1666	18.4571	18.8714	19.3951	19.7320	19.8728	19.8924	19.8926	19.8172	19.3667	18.6898	18.1371	(90)
Living area fraction	fLA = Living area / (4) =												
MIT	18.3396	18.6221	19.0254	19.5364	19.8695	20.0110	20.0322	20.0316	19.9533	19.5070	18.8472	18.3101	(92)
Temperature adjustment	0.0000												
adjusted MIT	18.3396	18.6221	19.0254	19.5364	19.8695	20.0110	20.0322	20.0316	19.9533	19.5070	18.8472	18.3101	(93)
8. Space heating requirement													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9887	0.9766	0.9502	0.8760	0.7329	0.5261	0.3570	0.4069	0.6788	0.9136	0.9777	0.9908	(94)
Useful gains	663.9606	776.4806	855.5661	899.5527	811.8309	578.7556	375.1601	394.5083	596.8628	690.3673	653.7467	632.4621	(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	1598.1037	1557.2477	1417.2202	1186.6571	909.0120	594.6185	377.1720	398.1581	646.3293	991.0788	1314.1442	1587.3127	(97)
Space heating kWh	695.0025	524.6755	417.8707	206.7151	72.3027	0.0000	0.0000	0.0000	0.0000	223.7293	475.4862	710.4088	(98a)
Space heating requirement - total per year (kWh/year)													3326.1908
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)													0.0000
Space heating kWh	695.0025	524.6755	417.8707	206.7151	72.3027	0.0000	0.0000	0.0000	0.0000	223.7293	475.4862	710.4088	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)													3326.1908
Space heating per m2	(98c) / (4) =												37.2724 (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	695.0025	524.6755	417.8707	206.7151	72.3027	0.0000	0.0000	0.0000	0.0000	223.7293	475.4862	710.4088	(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)	752.1672	567.8306	452.2410	223.7177	78.2497	0.0000	0.0000	0.0000	0.0000	242.1313	514.5955	768.8407	(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	86.5230	86.2416	85.6838	84.4626	82.4708	80.3000	80.3000	80.3000	80.3000	84.6050	86.0443	86.5783	(216)
Fuel for water heating, kWh/month	277.1331	245.8662	263.1502	235.6591	234.5342	217.7207	215.5201	223.8056	225.9253	238.3076	248.1389	274.0837	(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												3599.7736	(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												2899.8446	(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												4581.1513	(238)

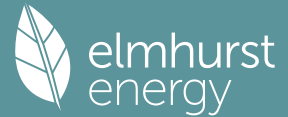
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3599.7736	0.2100	755.9524	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2899.8446	0.2100	608.9674	(264)
Space and water heating			1364.9198	(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			1120.4969	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.5600	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3599.7736	1.1300	4067.7441	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2899.8446	1.1300	3276.8244	(278)
Space and water heating			7344.5685	(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			5862.8562	(286)
Target Primary Energy Rate (TPER)			65.7000	(287)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024		
Assessment Reference	Plot 2			Prop Type Ref	SAP VG 21-0282			
Property								
SAP Rating	93 A		DER	12.46		TER	12.56	
Environmental	89 B		% DER < TER				0.80	
CO ₂ Emissions (t/year)	1.07		DFEE	39.80		TFEE	43.30	
Compliance Check	See BREL		% DFEE < TFEE				8.08	
% DPER < TPER	0.51		DPER	65.36		TPER	65.70	
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)

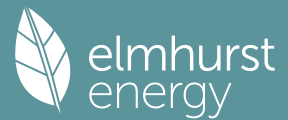
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.5402	0.5296	0.5190	0.4660	0.4554	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 (U _w = 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 A _{um} (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 C _m = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	21819.6800 (34)
Thermal mass parameter (TMP = C _m / 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	

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	0.9906	0.9799	0.9511	0.8715	0.7246	0.5386	0.3962	0.4475	0.6977	0.9216	0.9820	0.9927 (86)	
MIT	19.8945	20.0731	20.3393	20.6450	20.8376	20.9153	20.9303	20.9278	20.8745	20.5989	20.1908	19.8693 (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	0.9877	0.9737	0.9363	0.8359	0.6605	0.4525	0.2984	0.3435	0.6091	0.8906	0.9754	0.9903 (89)	
MIT 2	18.5830	18.8110	19.1441	19.5181	19.7214	19.8011	19.8097	19.8117	19.7683	19.4796	18.9759	18.5620 (90)	
Living area fraction									fLA = Living area / (4) =				0.1272 (91)
MIT	18.7498	18.9715	19.2961	19.6614	19.8634	19.9428	19.9522	19.9537	19.9090	19.6220	19.1305	18.7283 (92)	
Temperature adjustment												-0.1500	
adjusted MIT	18.5998	18.8215	19.1461	19.5114	19.7134	19.7928	19.8022	19.8037	19.7590	19.4720	18.9805	18.5783 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9831	0.9661	0.9244	0.8222	0.6501	0.4442	0.2901	0.3344	0.5976	0.8762	0.9680	0.9865 (94)
Useful gains	748.8388	866.8899	960.6671	974.9587	835.1478	562.6958	350.8929	371.2450	596.7237	749.6350	724.0943	709.2077 (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	1638.8457	1589.6783	1438.8597	1186.9386	893.4514	570.2646	351.6631	372.7288	625.1129	989.1798	1333.2586	1624.5179 (97)
Space heating kWh	662.1651	485.7138	355.7753	152.6255	43.3779	0.0000	0.0000	0.0000	0.0000	178.2213	438.5983	680.9908 (98a)
Space heating requirement - total per year (kWh/year)												2997.4680
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	662.1651	485.7138	355.7753	152.6255	43.3779	0.0000	0.0000	0.0000	0.0000	178.2213	438.5983	680.9908 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2997.4680
Space heating per m2										(98c) / (4) =		33.5888 (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	662.1651	485.7138	355.7753	152.6255	43.3779	0.0000	0.0000	0.0000	0.0000	178.2213	438.5983	680.9908 (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)	748.2091	548.8292	402.0060	172.4582	49.0145	0.0000	0.0000	0.0000	0.0000	201.3800	495.5913	769.4811 (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	88.0967	88.0403	87.9166	87.6580	87.2828	87.0000	87.0000	87.0000	87.0000	87.7141	88.0102	88.1087 (216)
Fuel for water heating, kWh/month	271.6924	239.6762	253.1694	219.0080	210.2978	186.9404	182.2331	191.2708	195.3549	219.8241	237.5266	268.1436 (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)	-30.1030	-46.4147	-73.1749	-87.8843	-97.6556	-91.9595	-90.4299	-83.6866	-71.5034	-55.3515	-34.1482	-25.3592 (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)	-13.7333	-32.9223	-76.7834	-132.0032	-188.4952	-194.8411	-190.3044	-152.2895	-99.9419	-50.2582	-19.1065	-10.4541 (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												3386.9694 (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												2675.1372 (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												-1948.8035 (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	4396.2193 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3386.9694	3.6400	123.2857 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2675.1372	3.6400	97.3750 (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	-787.6706	16.4900	-129.8869
PV Unit electricity exported	-1161.1330	5.5900	-64.9073
Total			-194.7942 (252)
Total energy cost			164.5193 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.4412 (257)
SAP value		92.8481
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	3386.9694	0.2100	711.2636 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2675.1372	0.2100	561.7788 (264)
Space and water heating			1273.0424 (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	-787.6706	0.1333	-104.9738
PV Unit electricity exported	-1161.1330	0.1227	-142.4382
Total			-247.4120 (269)
Total CO2, kg/year			1065.9808 (272)
CO2 emissions per m2			11.9500 (273)
EI value			89.3593
EI rating			89 (274)
EI band			B

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

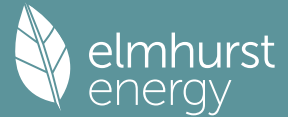
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	44.6200 (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	

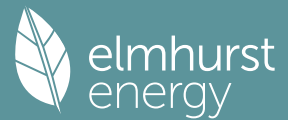
4. Water heating energy requirements (kWh/year)

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)										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	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		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W
North	6.5000			10.6334		0.7300		0.7000		0.7700		24.4759 (74)
East	10.4700			19.6403		0.7300		0.7000		0.7700		72.8196 (76)
South	3.7500			46.7521		0.7300		0.7000		0.7700		62.0849 (78)
West	0.9100			19.6403		0.7300		0.7000		0.7700		6.3291 (80)
Solar gains	165.7096	303.2855	463.9885	645.9365	780.2795	797.4594	759.4968	657.2051	527.4218	349.0705	202.4751	139.1395 (83)
Total gains	761.7462	897.3311	1039.2120	1185.7319	1284.6898	1266.7587	1209.6766	1110.3257	998.5517	855.5042	748.0278	718.9196 (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	0.9906	0.9799	0.9511	0.8715	0.7246	0.5386	0.3962	0.4475	0.6977	0.9216	0.9820	0.9927 (86)
MIT	19.8945	20.0731	20.3393	20.6450	20.8376	20.9153	20.9303	20.9278	20.8745	20.5989	20.1908	19.8693 (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	0.9877	0.9737	0.9363	0.8359	0.6605	0.4525	0.2984	0.3435	0.6091	0.8906	0.9754	0.9903 (89)
MIT 2	18.5830	18.8110	19.1441	19.5181	19.7214	19.8011	19.8097	19.8117	19.7683	19.4796	18.9759	18.5620 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.7498	18.9715	19.2961	19.6614	19.8634	19.9428	19.9522	19.9537	19.9090	19.6220	19.1305	18.7283 (92)
Temperature adjustment	-0.1500											
adjusted MIT	18.5998	18.8215	19.1461	19.5114	19.7134	19.7928	19.8022	19.8037	19.7590	19.4720	18.9805	18.5783 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9831	0.9661	0.9244	0.8222	0.6501	0.4442	0.2901	0.3344	0.5976	0.8762	0.9680	0.9865 (94)
Useful gains	748.8388	866.8899	960.6671	974.9587	835.1478	562.6958	350.8929	371.2450	596.7237	749.6350	724.0943	709.2077 (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	1638.8457	1589.6783	1438.8597	1186.9386	893.4514	570.2646	351.6631	372.7288	625.1129	989.1798	1333.2586	1624.5179 (97)
Space heating kWh	662.1651	485.7138	355.7753	152.6255	43.3779	0.0000	0.0000	0.0000	0.0000	178.2213	438.5983	680.9908 (98a)
Space heating requirement - total per year (kWh/year)	2997.4680											
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											0.0000
Space heating kWh	662.1651	485.7138	355.7753	152.6255	43.3779	0.0000	0.0000	0.0000	0.0000	178.2213	438.5983	680.9908 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2997.4680											
Space heating per m2	(98c) / (4) =											33.5888 (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	662.1651	485.7138	355.7753	152.6255	43.3779	0.0000	0.0000	0.0000	0.0000	178.2213	438.5983	680.9908 (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)	748.2091	548.8292	402.0060	172.4582	49.0145	0.0000	0.0000	0.0000	0.0000	201.3800	495.5913	769.4811 (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	88.0967	88.0403	87.9166	87.6580	87.2828	87.0000	87.0000	87.0000	87.0000	87.7141	88.0102	88.1087 (217)
Fuel for water heating, kWh/month	271.6924	239.6762	253.1694	219.0080	210.2978	186.9404	182.2331	191.2708	195.3549	219.8241	237.5266	268.1436 (219)
Space cooling fuel requirement												

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

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

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

SAP 10 EPC IMPROVEMENTS

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Plot 2

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

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

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

Measures omitted - SAP change or cost saving too small:
N Solar water heating + 0.6 -£ 20 -135 kg (12.6%)

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

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

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

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

	Current	Potential	Saving
Electricity	£74	£74	£0
Mains gas	£438	£438	£0
Space heating	£311	£311	£0
Water heating	£150	£150	£0
Lighting	£51	£51	£0
Generated (PV)	-£273	-£273	£0
Total cost of fuels	£239	£239	£0
Total cost of uses	£239	£239	£0
Delivered energy	49 kWh/m²	49 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.1 tonnes	1.1 tonnes	0.0 tonnes
CO2 emissions per m²	12 kg/m²	12 kg/m²	0 kg/m²
Primary energy	63 kWh/m²	63 kWh/m²	0 kWh/m²

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	44.6200 (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)

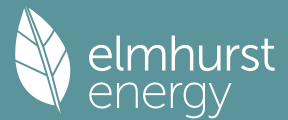
2. Ventilation rate

	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	

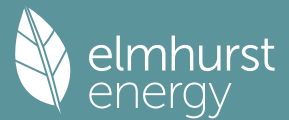
4. Water heating energy requirements (kWh/year)

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		Specific data or Table 6b		Specific data or Table 6c		FF Access factor Table 6d		Gains W	
North	6.5000		10.6334		0.7300		0.7000		0.7700		24.4759 (74)	
East	10.4700		19.6403		0.7300		0.7000		0.7700		72.8196 (76)	
South	3.7500		46.7521		0.7300		0.7000		0.7700		62.0849 (78)	
West	0.9100		19.6403		0.7300		0.7000		0.7700		6.3291 (80)	
Solar gains	165.7096	303.2855	463.9885	645.9365	780.2795	797.4594	759.4968	657.2051	527.4218	349.0705	202.4751	139.1395 (83)
Total gains	761.7462	897.3311	1039.2120	1185.7319	1284.6898	1266.7587	1209.6766	1110.3257	998.5517	855.5042	748.0278	718.9196 (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	0.9906	0.9799	0.9511	0.8715	0.7246	0.5386	0.3962	0.4475	0.6977	0.9216	0.9820	0.9927 (86)
MIT	19.8945	20.0731	20.3393	20.6450	20.8376	20.9153	20.9303	20.9278	20.8745	20.5989	20.1908	19.8693 (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	0.9877	0.9737	0.9363	0.8359	0.6605	0.4525	0.2984	0.3435	0.6091	0.8906	0.9754	0.9903 (89)
MIT 2	18.5830	18.8110	19.1441	19.5181	19.7214	19.8011	19.8097	19.8117	19.7683	19.4796	18.9759	18.5620 (90)
Living area fraction	18.7498	18.9715	19.2961	19.6614	19.8634	19.9428	19.9522	19.9537	19.9090	19.6220	19.1305	18.7283 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.5998	18.8215	19.1461	19.5114	19.7134	19.7928	19.8022	19.8037	19.7590	19.4720	18.9805	18.5783 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9831	0.9661	0.9244	0.8222	0.6501	0.4442	0.2901	0.3344	0.5976	0.8762	0.9680	0.9865 (94)
Useful gains	748.8388	866.8899	960.6671	974.9587	835.1478	562.6958	350.8929	371.2450	596.7237	749.6350	724.0943	709.2077 (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	1638.8457	1589.6783	1438.8597	1186.9386	893.4514	570.2646	351.6631	372.7288	625.1129	989.1798	1333.2586	1624.5179 (97)
Space heating kWh	662.1651	485.7138	355.7753	152.6255	43.3779	0.0000	0.0000	0.0000	0.0000	178.2213	438.5983	680.9908 (98a)
Space heating requirement - total per year (kWh/year)												2997.4680
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	662.1651	485.7138	355.7753	152.6255	43.3779	0.0000	0.0000	0.0000	0.0000	178.2213	438.5983	680.9908 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2997.4680
Space heating per m2										(98c) / (4) =		33.5888 (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	662.1651	485.7138	355.7753	152.6255	43.3779	0.0000	0.0000	0.0000	0.0000	178.2213	438.5983	680.9908 (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)	748.2091	548.8292	402.0060	172.4582	49.0145	0.0000	0.0000	0.0000	0.0000	201.3800	495.5913	769.4811 (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	88.0967	88.0403	87.9166	87.6580	87.2828	87.0000	87.0000	87.0000	87.0000	87.7141	88.0102	87.0000 (216)
Fuel for water heating, kWh/month	271.6924	239.6762	253.1694	219.0080	210.2978	186.9404	182.2331	191.2708	195.3549	219.8241	237.5266	268.1436 (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)	-30.1030	-46.4147	-73.1749	-87.8843	-97.6556	-91.9595	-90.4299	-83.6866	-71.5034	-55.3515	-34.1482	-25.3592 (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)	-13.7333	-32.9223	-76.7834	-132.0032	-188.4952	-194.8411	-190.3044	-152.2895	-99.9419	-50.2582	-19.1065	-10.4541 (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												3386.9694	(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												2675.1372	(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												-1948.8035	(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												4396.2193	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3386.9694	3.6400	123.2857	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2675.1372	3.6400	97.3750	(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	-787.6706	16.4900	-129.8869	
PV Unit electricity exported	-1161.1330	5.5900	-64.9073	
Total			-194.7942	(252)
Total energy cost			164.5193	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		0.4412	(257)
SAP value	[(255) x (256)] / [(4) + 45.0] =	92.8481	
SAP rating (Section 12)		93	(258)
SAP band		A	

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

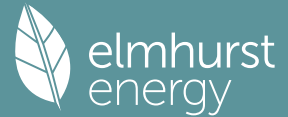
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3386.9694	0.2100	711.2636	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2675.1372	0.2100	561.7788	(264)
Space and water heating			1273.0424	(265)
Pumps, fans and 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	-787.6706	0.1333	-104.9738	
PV Unit electricity exported	-1161.1330	0.1227	-142.4382	
Total			-247.4120	(269)
Total CO2, kg/year			1065.9808	(272)
CO2 emissions per m2			11.9500	(273)
EI value			89.3593	
EI rating			89	(274)
EI band			B	

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	44.6200 (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)

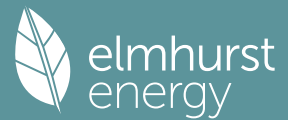
3. Heat losses and heat loss parameter

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						
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)
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	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													
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)

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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					6.5000	10.6334	0.7300	0.7000			0.7700	24.4759 (74)	
East					10.4700	19.6403	0.7300	0.7000			0.7700	72.8196 (76)	
South					3.7500	46.7521	0.7300	0.7000			0.7700	62.0849 (78)	
West					0.9100	19.6403	0.7300	0.7000			0.7700	6.3291 (80)	

Solar gains	165.7096	303.2855	463.9885	645.9365	780.2795	797.4594	759.4968	657.2051	527.4218	349.0705	202.4751	139.1395	(83)
Total gains	761.7462	897.3311	1039.2120	1185.7319	1284.6898	1266.7587	1209.6766	1110.3257	998.5517	855.5042	748.0278	718.9196	(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	0.9906	0.9799	0.9511	0.8715	0.7246	0.5386	0.3962	0.4475	0.6977	0.9216	0.9820	0.9927 (86)
MIT	19.8945	20.0731	20.3393	20.6450	20.8376	20.9153	20.9303	20.9278	20.8745	20.5989	20.1908	19.8693 (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	0.9877	0.9737	0.9363	0.8359	0.6605	0.4525	0.2984	0.3435	0.6091	0.8906	0.9754	0.9903 (89)
MIT 2	18.5830	18.8110	19.1441	19.5181	19.7214	19.8011	19.8097	19.8117	19.7683	19.4796	18.9759	18.5620 (90)
Living area fraction	fLA = Living area / (4) = 0.1272 (91)											
MIT	18.7498	18.9715	19.2961	19.6614	19.8634	19.9428	19.9522	19.9537	19.9090	19.6220	19.1305	18.7283 (92)
Temperature adjustment	-0.1500											
adjusted MIT	18.5998	18.8215	19.1461	19.5114	19.7134	19.7928	19.8022	19.8037	19.7590	19.4720	18.9805	18.5783 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9831	0.9661	0.9244	0.8222	0.6501	0.4442	0.2901	0.3344	0.5976	0.8762	0.9680	0.9865	(94)
Ext temp.	748.8388	866.8899	960.6671	974.9587	835.1478	562.6958	350.8929	371.2450	596.7237	749.6350	724.0943	709.2077	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Space heating kWh	1638.8457	1589.6783	1438.8597	1186.9386	893.4514	570.2646	351.6631	372.7288	625.1129	989.1798	1333.2586	1624.5179	(97)
Space heating requirement - total per year (kWh/year)	662.1651	485.7138	355.7753	152.6255	43.3779	0.0000	0.0000	0.0000	0.0000	178.2213	438.5983	680.9908	(98a)
Solar heating kWh												2997.4680	
Solar heating contribution - total per year (kWh/year)	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)
Space heating kWh	662.1651	485.7138	355.7753	152.6255	43.3779	0.0000	0.0000	0.0000	0.0000	178.2213	438.5983	680.9908	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2997.4680	
Space heating per m2	(98c) / (4) =											33.5888	(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)

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Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	662.1651	485.7138	355.7753	152.6255	43.3779	0.0000	0.0000	0.0000	0.0000	178.2213	438.5983	680.9908 (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)	748.2091	548.8292	402.0060	172.4582	49.0145	0.0000	0.0000	0.0000	0.0000	201.3800	495.5913	769.4811 (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 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	88.0967	88.0403	87.9166	87.6580	87.2828	87.0000	87.0000	87.0000	87.0000	87.7141	88.0102	87.0000 (216)
Fuel for water heating, kWh/month	271.6924	239.6762	253.1694	219.0080	210.2978	186.9404	182.2331	191.2708	195.3549	219.8241	237.5266	268.1436 (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	-30.1030	-46.4147	-73.1749	-87.8843	-97.6556	-91.9595	-90.4299	-83.6866	-71.5034	-55.3515	-34.1482	-25.3592 (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	-13.7333	-32.9223	-76.7834	-132.0032	-188.4952	-194.8411	-190.3044	-152.2895	-99.9419	-50.2582	-19.1065	-10.4541 (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												3386.9694 (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												2675.1372 (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												-1948.8035 (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												4396.2193 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3386.9694	5.6000	189.6703 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2675.1372	5.6000	149.8077 (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	-787.6706	26.0600	-205.2669
PV Unit electricity exported	-1161.1330	5.8100	-67.4618
Total			-272.7288 (252)
Total energy cost			239.4771 (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	3386.9694	0.2100	711.2636 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2675.1372	0.2100	561.7788 (264)
Space and water heating			1273.0424 (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	-787.6706	0.1333	-104.9738
PV Unit electricity exported	-1161.1330	0.1227	-142.4382
Total			-247.4120 (269)
Total CO2, kg/year			1065.9808 (272)

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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	3386.9694	1.1300	3827.2755 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2675.1372	1.1300	3022.9051 (278)
Space and water heating			6850.1806 (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	-787.6706	1.4925	-1175.5835
PV Unit electricity exported	-1161.1330	0.4501	-522.6691
Total			-1698.2526 (283)
Total Primary energy kWh/year			5584.0653 (286)

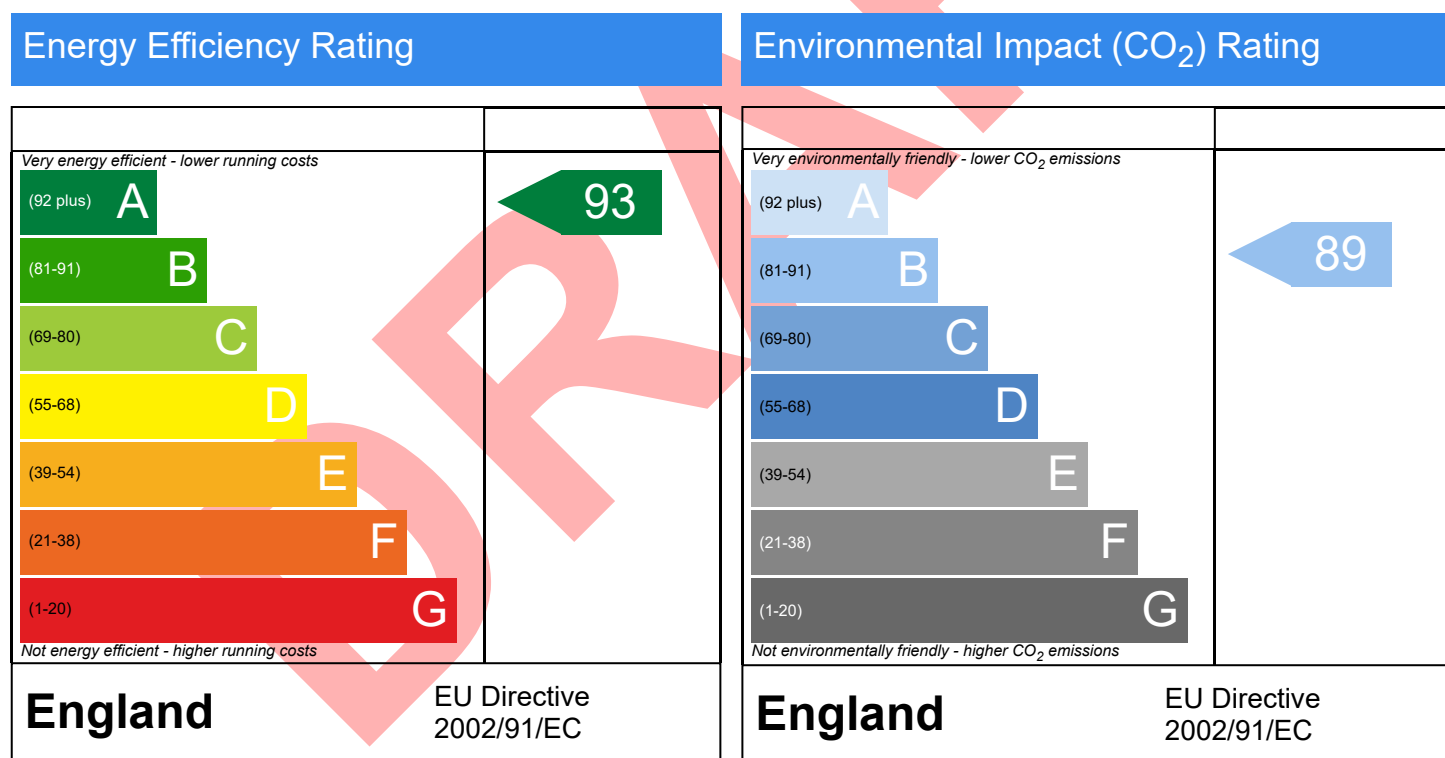
Predicted Energy Assessment



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.