

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 10:34:51

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 1
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	12.49 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	65.48 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	40.1 kWh/m ²		OK

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

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))			
Name	Net area [m ²]	U-Value [W/m ² K]	
Exposed wall: Walls (1)	114.73	0.19	
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	West	0.7	1.3
Rear , Windows	0.91	East	0.7	1.3
Front Door, Door	2.14	West	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
External wall	E3: Sill	Calculated by person with suitable expertise	0.021 (!)	E3-01

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E4: Jamb	Calculated by person with suitable expertise	0.016 (!)	E4-01 RCD
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.092	Manufacturer Declaration
External wall	E10: Eaves (insulation at ceiling level)	Calculated by person with suitable expertise	0.058	E10-01
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.047	E16-01 RCD
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.001 (!)	E6-01 RCD
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.057	E12-01 RCD

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

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

4 Space heating

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

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

Secondary heating system: N/A

Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water

Cylinder/store - type: N/A

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

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

Efficiency	
Manufacturer	
Model	

6 Controls

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

Function	
Ecodesign class	
Manufacturer	
Model	

Water heating - type: Cylinder thermostat and HW separately timed

Manufacturer	
Model	

7 Lighting

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

8 Mechanical ventilation		
System type: N/A		
Maximum permitted specific fan power	N/A	
Specific fan power	N/A	N/A
Minimum permitted heat recovery efficiency	N/A	
Heat recovery efficiency	N/A	N/A
Manufacturer/Model		
Commissioning		
9 Local generation		
Technology type: Photovoltaic system (1)		
Peak power	2.43 kWp	
Orientation	East	
Pitch	45°	
Overshading	None or very little	
Manufacturer		
MCS certificate		
Technology type: Photovoltaic system (2)		
Peak power	0.45 kWp	
Orientation	West	
Pitch	30°	
Overshading	None or very little	
Manufacturer	PV	
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 1	Prop Type Ref	SAP VG 21-0282	
Property				

SAP Rating	93 A	DER	12.49	TER	12.56
Environmental	89 B	% DER < TER			0.56
CO ₂ Emissions (t/year)	1.07	DFEE	40.10	TFEE	43.30
Compliance Check	See BREL	% DFEE < TFEE			7.38
% DPER < TPER	0.33	DPER	65.48	TPER	65.70

Assessor Details	Miss Victoria Gartside	Assessor ID	AL30-0001
Client			

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

Orientation	West	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	House, Detached	
Which Floor	0	
2.0 Number of Storeys	2	
3.0 Date Built	2023	
3.0 Property Age Band	L	
4.0 Sheltered Sides	0	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	244.51	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	30.80 m	44.62 m ²	2.39 m
1st Storey:	30.80 m	44.62 m ²	2.62 m
2nd Storey:	32.20 m	60.31 m ²	2.28 m

8.0 Living Area	11.35	m ²
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9.0 External Walls	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area (m ²)	Shelter Res	Shelter	Openings	Area Calculation Type
	External Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.19	110.00	138.50	114.73	0.00	None	23.77	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

11.0 Heat Loss Floors	Description	Type	Storey Index	Construction	U-Value (W/m ² K)	Shelter Code	Shelter Factor	Kappa (kJ/m ² K)	Area (m ²)
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Summary for Input Data

Ground Floor Ground Floor - Solid Lowest occupied Suspended concrete floor, carpeted 0.13 None 0.00 75.00 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	External Wall	West	10.47	0
Rear	Windows	External Wall	East	0.91	0
Front Door	Door	External Wall	West	2.14	0
Side	Windows	External Wall	South	3.75	0
Side	Windows	External Wall	North	6.50	0

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	16.63	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 0.03 W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present No

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.15	In Room Fan	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

No

22.0 Pressure Testing

Yes

Designed AP₅₀ 4.00 m³/(h.m²) @ 50 Pa

Summary for Input Data

Property Tested?

Test Method

22.0 Lighting

No Fixed Lighting

Name	Efficacy	Power	Capacity	Count
Lighting 1	85.00	10.00	850.00	16

24.0 Main Heating 1

Database

Percentage of Heat %

Database Ref. No.

Fuel Type

SAP Code

In Winter

In Summer

Model Name

Manufacturer

System Type

Controls SAP Code

Delayed Start Stat

Burner Control

HETAS approved System

Flue Type

Fan Assisted Flue

Is MHS Pumped

Heating Pump Age

Heat Emitter

Underfloor Heating

Flow Temperature

Flow Temperature Value

Boiler Interlock

Combi boiler type

25.0 Main Heating 2

26.0 Heat Networks

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

27.0 Secondary Heating

28.0 Water Heating

Water Heating

SAP Code

Flue Gas Heat Recovery System

Waste Water Heat Recovery Instantaneous System 1

Waste Water Heat Recovery Instantaneous System 2

Waste Water Heat Recovery Storage System

Solar Panel

Water use <= 125 litres/person/day

Immersion Heater

Summary for Input Data

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
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32.0 Photovoltaic Unit

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

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

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
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Recommendations

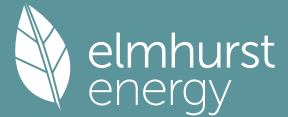
Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout



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Property							
SAP Rating	93 A	DER	12.49	TER	12.56		
Environmental	89 B	% DER < TER				0.56	
CO ₂ Emissions (t/year)	1.07	DFEE	40.10	TFEE	43.30		
Compliance Check	See BREL	% DFEE < TFEE				7.38	
% DPER < TPER	0.33	DPER	65.48	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)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	50.0000 / (5) = 0.2237 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.4237 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.4237 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.5402	0.5296	0.5190	0.4660	0.4554	0.4025	0.4025	0.3919	0.4237	0.4554	0.4766	0.4978 (22b)
Effective ac	0.6459	0.6402	0.6347	0.6086	0.6037	0.5810	0.5810	0.5768	0.5897	0.6037	0.6136	0.6239 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.30)			21.6300	1.2357	26.7291		(27)
Door			2.1400	1.3000	2.7820		(26a)
Ground Floor			44.6200	0.1300	5.8006	75.0000	3346.5000 (28a)
External Wall	138.5000	23.7700	114.7300	0.1900	21.7987	110.0000	12620.3000 (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) =	61.1262		(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	
E4 Jamb				36.3000	0.0160	0.5808	

Full SAP Calculation Printout



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) =	67.5103 (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 =	115.1581	114.7402	114.3305	112.4064	112.0464	110.3706	110.3706	110.0602	111.0161	112.0464	112.7747	113.5361 (39)
												112.4047
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2904	1.2857	1.2812	1.2596	1.2556	1.2368	1.2368	1.2333	1.2440	1.2556	1.2637	1.2723 (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												67.8068 (42a)
Hot water usage for baths												29.2952 (42b)
Hot water usage for other uses												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												2120.3514
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)
12Total per year (kWh/year)												2344.1411 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
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)

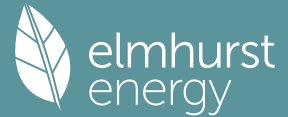
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587	130.7587 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), 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)
Cooking gains (calculated in Appendix L, equation L15 or L15a), 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)
Pumps, fans	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)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-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)
Total internal gains	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)
	527.5950	540.3500	516.3684	496.3447	469.0387	447.4300	428.7048	429.7437	444.0642	463.9637	495.0036	515.7288 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	6.5000	10.6334	0.7300	0.7000	0.7700	24.4759 (74)
East	0.9100	19.6403	0.7300	0.7000	0.7700	6.3291 (76)
South	3.7500	46.7521	0.7300	0.7000	0.7700	62.0849 (78)
West	10.4700	19.6403	0.7300	0.7000	0.7700	72.8196 (80)
Solar gains	165.7096	303.2855	463.9885	645.9365	780.2795	797.4594
Total gains	693.3045	843.6355	980.3569	1142.2812	1249.3182	1244.8893
						1188.2016
						1086.9488
						971.4861
						813.0342
						697.4788
						139.1395 (83)
						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	52.6322	52.8239	53.0132	53.9206	54.0939	54.9152	54.9152	55.0701	54.5959	54.0939	53.7445	53.3841
alpha	4.5088	4.5216	4.5342	4.5947	4.6063	4.6610	4.6610	4.6713	4.6397	4.6063	4.5830	4.5589
util living area	0.9935	0.9841	0.9601	0.8848	0.7401	0.5492	0.4050	0.4587	0.7135	0.9336	0.9863	0.9950 (86)
MIT	19.8284	20.0219	20.2904	20.6187	20.8272	20.9131	20.9296	20.9268	20.8676	20.5675	20.1426	19.8062 (87)
Th 2	19.8483	19.8520	19.8556	19.8726	19.8758	19.8907	19.8907	19.8934	19.8849	19.8758	19.8694	19.8626 (88)
util rest of house	0.9915	0.9791	0.9475	0.8513	0.6764	0.4617	0.3048	0.3519	0.6247	0.9060	0.9811	0.9933 (89)
MIT 2	18.4954	18.7433	19.0811	19.4852	19.7077	19.7948	19.8043	19.8062	19.7585	19.4403	18.9119	18.4781 (90)
Living area fraction	18.6649	18.9059	19.2349	19.6294	19.8501	19.9370	19.9474	19.9487	19.8996	19.5837	19.0685	18.6471 (92)
MIT	18.6649	18.9059	19.2349	19.6294	19.8501	19.9370	19.9474	19.9487	19.8996	19.5837	19.0685	18.6471 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.5149	18.7559	19.0849	19.4794	19.7001	19.7870	19.7974	19.7987	19.7496	19.4337	18.9185	18.4971 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9879	0.9724	0.9364	0.8374	0.6655	0.4531	0.2963	0.3426	0.6128	0.8920	0.9748	0.9904 (94)
Useful gains	684.9248	820.3725	918.0551	956.5211	831.4008	564.1171	352.0371	372.3773	595.3046	725.2155	679.9120	648.5970 (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	1636.9670	1589.8303	1438.8420	1189.1921	896.3802	572.4966	352.9032	374.0628	627.1948	989.7832	1332.8222	1623.2321 (97)
Space heating kWh	708.3194	517.0756	387.4655	167.5231	48.3447	0.0000	0.0000	0.0000	0.0000	196.8384	470.0954	725.1285 (98a)
Space heating requirement - total per year (kWh/year)												3220.7906
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	708.3194	517.0756	387.4655	167.5231	48.3447	0.0000	0.0000	0.0000	0.0000	196.8384	470.0954	725.1285 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3220.7906
Space heating per m2												36.0913 (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	708.3194	517.0756	387.4655	167.5231	48.3447	0.0000	0.0000	0.0000	0.0000	196.8384	470.0954	725.1285 (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)	800.3609	584.2662	437.8141	189.2917	54.6268	0.0000	0.0000	0.0000	0.0000	222.4163	531.1812	819.3542 (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	88.1163	88.0600	87.9468	87.6926	87.3085	87.0000	87.0000	87.0000	87.0000	87.7513	88.0328	88.1266 (217)	
Fuel for water heating, kWh/month	271.6321	239.6226	253.0827	218.9216	210.2359	186.9404	182.2331	191.2708	195.3549	219.7308	237.4657	268.0891 (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)	-30.5411	-47.0262	-74.0246	-88.7481	-98.4736	-92.6767	-91.1383	-84.4157	-72.2306	-56.0267	-34.6246	-25.7345 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)	-14.0871	-33.7567	-78.6997	-135.2417	-193.0552	-199.5303	-194.8813	-155.9777	-102.3923	-51.5165	-19.5946	-10.7240 (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													3639.3114 (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													2674.5797 (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													-1985.1177 (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	4611.6895 (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	3639.3114	0.2100	764.2554 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2674.5797	0.2100	561.6617 (264)
Space and water heating			1325.9171 (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	-795.6607	0.1333	-106.0646
PV Unit electricity exported	-1189.4570	0.1227	-145.9251
Total			-251.9897 (269)
Total CO2, kg/year			1114.2778 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.4900 (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	3639.3114	1.1300	4112.4218 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2674.5797	1.1300	3022.2750 (278)
Space and water heating			7134.6969 (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	-795.6607	1.4926	-1187.6061
PV Unit electricity exported	-1189.4570	0.4502	-535.4651
Total			-1723.0712 (283)
Total Primary energy kWh/year			5843.7630 (286)
Dwelling Primary energy Rate (DPER)			65.4800 (287)

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

1. Overall dwelling characteristics

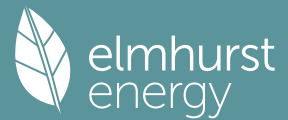
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	44.6200 (1b)	x 2.3900 (2b)	= 106.6418 (1b) - (3b)
First floor	44.6200 (1c)	x 2.6200 (2c)	= 116.9044 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 223.5462 (5)

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	138.5000	22.3100	116.1900	0.1800	20.9142			(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

	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)				

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

11.2341 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 68.0925 (37)

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

	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)

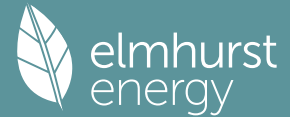
Assumed occupancy													2.6152 (42)
Hot water usage for mixer showers	68.0676	67.0447	65.5541	62.7021	60.5974	58.2503	56.9161	58.3955	60.0171	62.5372	65.4504	67.8068	(42a)
Hot water usage for baths	29.3945	28.9580	28.3432	27.2097	26.3610	25.4199	24.9115	25.5220	26.1866	27.1937	28.3505	29.2952	(42b)
Hot water usage for other uses	41.4120	39.9061	38.4002	36.8943	35.3884	33.8825	33.8825	35.3884	36.8943	38.4002	39.9061	41.4120	(42c)
Average daily hot water use (litres/day)													127.6567 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.8742	135.9088	132.2975	126.8062	122.3468	117.5527	115.7102	119.3059	123.0980	128.1311	133.7071	138.5140	(44)
Energy 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													
(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	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	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	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	-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	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		0.8500	19.6403	0.6300	0.7000	0.7700	5.1020 (76)
South		3.5000	46.7521	0.6300	0.7000	0.7700	50.0081 (78)
West		9.7600	19.6403	0.6300	0.7000	0.7700	58.5826 (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)

21.0000 (85)

	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, %

0.0000 (201)
1.0000 (202)
92.4000 (206)
0.0000 (207)
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	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)												
(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												

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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)

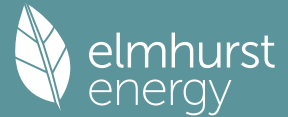
----- 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP -----

	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 1			Prop Type Ref	SAP VG 21-0282			
Property								
SAP Rating	93 A		DER	12.49		TER	12.56	
Environmental	89 B		% DER < TER				0.56	
CO ₂ Emissions (t/year)	1.07		DFEE	40.10		TFEE	43.30	
Compliance Check	See BREL		% DFEE < TFEE				7.38	
% DPER < TPER	0.33		DPER	65.48		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

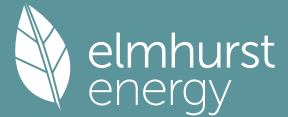
			m3 per hour
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
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	138.5000	23.7700	114.7300	0.1900	21.7987	110.0000	12620.3000	(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) =	61.1262			(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		

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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) =	67.5103 (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	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)
Heat transfer coeff	111.0925	110.8324	110.5775	109.3802	109.1562	108.1134	108.1134	107.9203	108.5151	109.1562	109.6094	110.0832 (39)
Average = Sum(39)m / 12 =												109.3792
HLP	1.2449	1.2420	1.2391	1.2257	1.2232	1.2115	1.2115	1.2093	1.2160	1.2232	1.2283	1.2336 (40)
HLP (average)												1.2257
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6152 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	29.3945	28.9580	28.3432	27.2097	26.3610	25.4199	24.9115	25.5220	26.1866	27.1937	28.3505	29.2952 (42b)
Hot water usage for other uses	41.4120	39.9061	38.4002	36.8943	35.3884	33.8825	33.8825	35.3884	36.8943	38.4002	39.9061	41.4120 (42c)
Average daily hot water use (litres/day)												64.9006 (43)
Daily hot water use	70.8065	68.8641	66.7434	64.1041	61.7494	59.3024	58.7941	60.9104	63.0810	65.5939	68.2566	70.7072 (44)
Energy conte	112.1402	98.0615	102.5822	87.7553	83.1266	72.9192	71.1063	75.4198	77.7851	89.0103	97.2441	110.7103 (45)
Energy content (annual)										Total = Sum(45)m =		1077.8609
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	95.3192	83.3523	87.1949	74.5920	70.6576	61.9813	60.4404	64.1068	66.1174	75.6587	82.6575	94.1038 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	95.3192	83.3523	87.1949	74.5920	70.6576	61.9813	60.4404	64.1068	66.1174	75.6587	82.6575	94.1038 (64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				916.1818 (64)
Electric shower(s)	54.5108	48.5696	53.0361	50.6117	51.5614	49.1846	50.8241	51.5614	50.6117	53.0361	52.0389	54.5108 (64a)
												620.0575 (64a)
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	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				0.9100	19.6403	0.7300		0.7000		0.7700	6.3291 (76)		
South				3.7500	46.7521	0.7300		0.7000		0.7700	62.0849 (78)		
West				10.4700	19.6403	0.7300		0.7000		0.7700	72.8196 (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	54.5583	54.6864	54.8124	55.4124	55.5261	56.0617	56.0617	56.1620	55.8542	55.5261	55.2966	55.0586
alpha	4.6372	4.6458	4.6542	4.6942	4.7017	4.7374	4.7374	4.7441	4.7236	4.7017	4.6864	4.6706
util living area	0.9954	0.9874	0.9655	0.8922	0.7464	0.5536	0.4076	0.4641	0.7229	0.9420	0.9895	0.9965 (86)
MIT	19.5316	19.7898	20.1483	20.5836	20.8627	20.9736	20.9949	20.9909	20.9125	20.5047	19.9354	19.4915 (87)
Th 2	19.8843	19.8866	19.8888	19.8995	19.9015	19.9108	19.9108	19.9125	19.9072	19.9015	19.8975	19.8932 (88)
util rest of house	0.9939	0.9833	0.9544	0.8604	0.6841	0.4670	0.3086	0.3580	0.6356	0.9173	0.9855	0.9954 (89)
MIT 2	18.5636	18.8208	19.1726	19.5862	19.8179	19.9000	19.9097	19.9102	19.8643	19.5279	18.9753	18.5306 (90)
Living area fraction	18.6867	18.9441	19.2967	19.7130	19.9508	20.0366	20.0477	20.0477	fLA = Living area / (4) =			0.1272 (91)
MIT	18.6867	18.9441	19.2967	19.7130	19.9508	20.0366	20.0477	20.0477	19.9977	19.6522	19.0974	18.6528 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6867	18.9441	19.2967	19.7130	19.9508	20.0366	20.0477	20.0477	19.9977	19.6522	19.0974	18.6528 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9916	0.9787	0.9470	0.8542	0.6871	0.4773	0.3212	0.3715	0.6435	0.9102	0.9814	0.9935 (94)
Useful gains	630.4741	770.6815	877.9558	936.3427	829.6138	577.7394	371.5590	391.3412	602.0336	700.1503	634.8010	594.4771 (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	1598.2550	1556.5385	1415.0244	1182.7302	900.6268	587.7651	372.7422	393.6598	639.9850	988.1008	1315.0318	1591.0080 (97)
Space heating kWh	720.0289	528.0959	399.5790	177.3990	52.8337	0.0000	0.0000	0.0000	0.0000	214.2352	489.7662	741.4190 (98a)
Space heating requirement - total per year (kWh/year)												3323.3570
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	720.0289	528.0959	399.5790	177.3990	52.8337	0.0000	0.0000	0.0000	0.0000	214.2352	489.7662	741.4190 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3323.3570
Space heating per m2										(98c) / (4) =		37.2407 (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	1016.2663	800.0394	820.1945	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9231	0.9597	0.9396	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	938.1208	767.8109	770.6320	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	309.3898	401.4826	311.3203	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	77.3475	100.3706	77.8301	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												255.5482 (107)
Energy for space heating												37.2407 (99)
Energy for space cooling												2.8636 (108)
Total												40.1043 (109)
Fabric Energy Efficiency (DFEE)												40.1 (109)

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

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

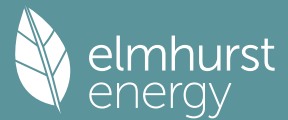
1. Overall dwelling characteristics

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

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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)													(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													(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	138.5000	22.3100	116.1900	0.1800	20.9142			(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

	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)				

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

Point Thermal Bridges

Total fabric heat loss (33) + (36) + (36a) = 68.0925 (37)

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

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

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

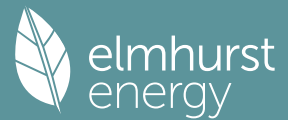
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6152 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.3945	28.9580	28.3432	27.2097	26.3610	25.4199	24.9115	25.5220	26.1866	27.1937	28.3505	29.2952	(42b)
Hot water usage for other uses	41.4120	39.9061	38.4002	36.8943	35.3884	33.8825	33.8825	35.3884	36.8943	38.4002	39.9061	41.4120	(42c)
Average daily hot water use (litres/day)													64.9006 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.8065	68.8641	66.7434	64.1041	61.7494	59.3024	58.7941	60.9104	63.0810	65.5939	68.2566	70.7072	(44)
Energy conte	112.1402	98.0615	102.5822	87.7553	83.1266	72.9192	71.1063	75.4198	77.7851	89.0103	97.2441	110.7103	(45)
Energy content (annual)													Total = Sum(45)m = 1077.8609
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Total heat required for water heating calculated for each month	95.3192	83.3523	87.1949	74.5920	70.6576	61.9813	60.4404	64.1068	66.1174	75.6587	82.6575	94.1038	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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)
12Total per year (kWh/year)													Total per year (kWh/year) = Sum(64)m = 916.1818 (64)
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)
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)

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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				0.8500	19.6403		0.6300		0.7000		0.7700		5.1020 (76)
South				3.5000	46.7521		0.6300		0.7000		0.7700		50.0081 (78)
West				9.7600	19.6403		0.6300		0.7000		0.7700		58.5826 (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									fLA = Living area / (4) =			0.1272 (91)
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 (92)
Temperature adjustment												0.0000
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)

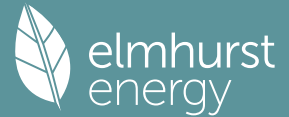
8. Space heating requirement

	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 1			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	93 A	DER	12.49	TER	12.56		
Environmental	89 B	% DER < TER				0.56	
CO ₂ Emissions (t/year)	1.07	DFEE	40.10	TFEE	43.30		
Compliance Check	See BREL	% DFEE < TFEE				7.38	
% DPER < TPER	0.33	DPER	65.48	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)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	50.0000 / (5) = 0.2237 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.4237 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.4237 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.5402	0.5296	0.5190	0.4660	0.4554	0.4025	0.4025	0.3919	0.4237	0.4554	0.4766	0.4978 (22b)
Effective ac	0.6459	0.6402	0.6347	0.6086	0.6037	0.5810	0.5810	0.5768	0.5897	0.6037	0.6136	0.6239 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.30)			21.6300	1.2357	26.7291		(27)
Door			2.1400	1.3000	2.7820		(26a)
Ground Floor			44.6200	0.1300	5.8006	75.0000	3346.5000 (28a)
External Wall	138.5000	23.7700	114.7300	0.1900	21.7987	110.0000	12620.3000 (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) =	61.1262		(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	
E4 Jamb				36.3000	0.0160	0.5808	

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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) =	67.5103 (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 =	115.1581	114.7402	114.3305	112.4064	112.0464	110.3706	110.3706	110.0602	111.0161	112.0464	112.7747	113.5361 (39)
												112.4047
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2904	1.2857	1.2812	1.2596	1.2556	1.2368	1.2368	1.2333	1.2440	1.2556	1.2637	1.2723 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

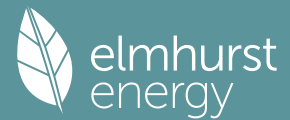
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.6152 (42)
Hot water usage for mixer showers												
	68.0676	67.0447	65.5541	62.7021	60.5974	58.2503	56.9161	58.3955	60.0171	62.5372	65.4504	67.8068 (42a)
Hot water usage for baths												
	29.3945	28.9580	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												
(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		0.9100	19.6403	0.7300	0.7000	0.7700	6.3291 (76)					
South		3.7500	46.7521	0.7300	0.7000	0.7700	62.0849 (78)					
West		10.4700	19.6403	0.7300	0.7000	0.7700	72.8196 (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	52.6322	52.8239	53.0132	53.9206	54.0939	54.9152	54.9152	55.0701	54.5959	54.0939	53.7445	53.3841
alpha	4.5088	4.5216	4.5342	4.5947	4.6063	4.6610	4.6610	4.6713	4.6397	4.6063	4.5830	4.5589
util living area	0.9935	0.9841	0.9601	0.8848	0.7401	0.5492	0.4050	0.4587	0.7135	0.9336	0.9863	0.9950 (86)
MIT	19.8284	20.0219	20.2904	20.6187	20.8272	20.9131	20.9296	20.9268	20.8676	20.5675	20.1426	19.8062 (87)
Th 2	19.8483	19.8520	19.8556	19.8726	19.8758	19.8907	19.8907	19.8934	19.8849	19.8758	19.8694	19.8626 (88)
util rest of house	0.9915	0.9791	0.9475	0.8513	0.6764	0.4617	0.3048	0.3519	0.6247	0.9060	0.9811	0.9933 (89)
MIT 2	18.4954	18.7433	19.0811	19.4852	19.7077	19.7948	19.8043	19.8062	19.7585	19.4403	18.9119	18.4781 (90)
Living area fraction	18.6649	18.9059	19.2349	19.6294	19.8501	19.9370	19.9474	19.9487	19.8996	19.5837	19.0685	18.6471 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.5149	18.7559	19.0849	19.4794	19.7001	19.7870	19.7974	19.7987	19.7496	19.4337	18.9185	18.4971 (93)

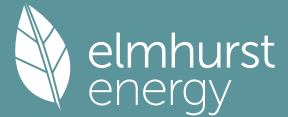
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9879	0.9724	0.9364	0.8374	0.6655	0.4531	0.2963	0.3426	0.6128	0.8920	0.9748	0.9904 (94)
Useful gains	684.9248	820.3725	918.0551	956.5211	831.4008	564.1171	352.0371	372.3773	595.3046	725.2155	679.9120	648.5970 (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	1636.9670	1589.8303	1438.8420	1189.1921	896.3802	572.4966	352.9032	374.0628	627.1948	989.7832	1332.8222	1623.2321 (97)
Space heating kWh	708.3194	517.0756	387.4655	167.5231	48.3447	0.0000	0.0000	0.0000	0.0000	196.8384	470.0954	725.1285 (98a)
Space heating requirement - total per year (kWh/year)												3220.7906
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	708.3194	517.0756	387.4655	167.5231	48.3447	0.0000	0.0000	0.0000	0.0000	196.8384	470.0954	725.1285 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3220.7906
Space heating per m2										(98c) / (4) =		36.0913 (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	708.3194	517.0756	387.4655	167.5231	48.3447	0.0000	0.0000	0.0000	0.0000	196.8384	470.0954	725.1285	(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)	800.3609	584.2662	437.8141	189.2917	54.6268	0.0000	0.0000	0.0000	0.0000	222.4163	531.1812	819.3542	(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	88.1163	88.0600	87.9468	87.6926	87.3085	87.0000	87.0000	87.0000	87.0000	87.7513	88.0328	88.1266	(216)
Fuel for water heating, kWh/month	271.6321	239.6226	253.0827	218.9216	210.2359	186.9404	182.2331	191.2708	195.3549	219.7308	237.4657	268.0891	(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)	-30.5411	-47.0262	-74.0246	-88.7481	-98.4736	-92.6767	-91.1383	-84.4157	-72.2306	-56.0267	-34.6246	-25.7345	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-14.0871	-33.7567	-78.6997	-135.2417	-193.0552	-199.5303	-194.8813	-155.9777	-102.3923	-51.5165	-19.5946	-10.7240	(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													3639.3114 (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													2674.5797 (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													-1985.1177 (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
Energy used
Total delivered energy for all uses

-0.0000 (236)
0.0000 (237)
4611.6895 (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	3639.3114	0.2100	764.2554 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2674.5797	0.2100	561.6617 (264)
Space and water heating			1325.9171 (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	-795.6607	0.1333	-106.0646
PV Unit electricity exported	-1189.4570	0.1227	-145.9251
Total			-251.9897 (269)
Total CO2, kg/year			1114.2778 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.4900 (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	3639.3114	1.1300	4112.4218 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2674.5797	1.1300	3022.2750 (278)
Space and water heating			7134.6969 (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	-795.6607	1.4926	-1187.6061
PV Unit electricity exported	-1189.4570	0.4502	-535.4651
Total			-1723.0712 (283)
Total Primary energy kWh/year			5843.7630 (286)
Dwelling Primary energy Rate (DPER)			65.4800 (287)

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

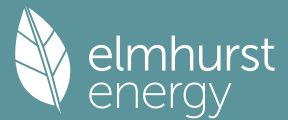
1. Overall dwelling characteristics

	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)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000 (22)
Wind factor	1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1250 1.1750 (22a)
Adj infilt rate	0.4899 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	138.5000	22.3100	116.1900	0.1800	20.9142			(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

	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)				

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

Point Thermal bridges	(36a) =	0.0000	11.2341 (36)
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)

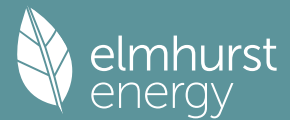
Assumed occupancy													2.6152 (42)
Hot water usage for mixer showers	68.0676	67.0447	65.5541	62.7021	60.5974	58.2503	56.9161	58.3955	60.0171	62.5372	65.4504	67.8068	(42a)
Hot water usage for baths	29.3945	28.9580	28.3432	27.2097	26.3610	25.4199	24.9115	25.5220	26.1866	27.1937	28.3505	29.2952	(42b)
Hot water usage for other uses	41.4120	39.9061	38.4002	36.8943	35.3884	33.8825	33.8825	35.3884	36.8943	38.4002	39.9061	41.4120	(42c)
Average daily hot water use (litres/day)												127.6567	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.8742	135.9088	132.2975	126.8062	122.3468	117.5527	115.7102	119.3059	123.0980	128.1311	133.7071	138.5140	(44)
Energy conte	219.9427	193.5323	203.3364	173.5913	164.7023	144.5447	139.9415	147.7256	151.7922	173.8727	190.4902	216.8794	(45)
Energy content (annual)										Total = Sum(45)m =		2120.3514	
Distribution loss (46)m = 0.15 x (45)m	32.9914	29.0298	30.5005	26.0387	24.7054	21.6817	20.9912	22.1588	22.7688	26.0809	28.5735	32.5319	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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		0.8500	19.6403	0.6300	0.7000	0.7700	5.1020 (76)
South		3.5000	46.7521	0.6300	0.7000	0.7700	50.0081 (78)
West		9.7600	19.6403	0.6300	0.7000	0.7700	58.5826 (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) =			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)

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	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)												
(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												

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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)

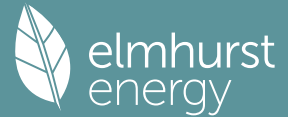
----- 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP -----

	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 1			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	93 A	DER	12.49	TER	12.56		
Environmental	89 B	% DER < TER				0.56	
CO ₂ Emissions (t/year)	1.07	DFEE	40.10	TFEE	43.30		
Compliance Check	See BREL	% DFEE < TFEE				7.38	
% DPER < TPER	0.33	DPER	65.48	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	138.5000	23.7700	114.7300	0.1900	21.7987	110.0000	12620.3000 (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) =	61.1262		(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	
E4 Jamb				36.3000	0.0160	0.5808	

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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) =	67.5103 (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 =	115.1581	114.7402	114.3305	112.4064	112.0464	110.3706	110.3706	110.0602	111.0161	112.0464	112.7747	113.5361 (39)
												112.4047
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2904	1.2857	1.2812	1.2596	1.2556	1.2368	1.2368	1.2333	1.2440	1.2556	1.2637	1.2723 (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)
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
	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)

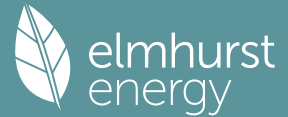
6. Solar gains

[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					0.9100	19.6403	0.7300	0.7000	0.7700	6.3291 (76)			
South					3.7500	46.7521	0.7300	0.7000	0.7700	62.0849 (78)			
West					10.4700	19.6403	0.7300	0.7000	0.7700	72.8196 (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)
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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	52.6322	52.8239	53.0132	53.9206	54.0939	54.9152	54.9152	55.0701	54.5959	54.0939	53.7445	53.3841
alpha	4.5088	4.5216	4.5342	4.5947	4.6063	4.6610	4.6610	4.6713	4.6397	4.6063	4.5830	4.5589
util living area	0.9907	0.9800	0.9514	0.8726	0.7266	0.5408	0.3980	0.4496	0.6998	0.9222	0.9821	0.9927 (86)
MIT	19.8872	20.0659	20.3329	20.6403	20.8351	20.9144	20.9299	20.9273	20.8727	20.5944	20.1846	19.8619 (87)
Th 2	19.8483	19.8520	19.8556	19.8726	19.8758	19.8907	19.8907	19.8934	19.8849	19.8758	19.8694	19.8626 (88)
util rest of house	0.9877	0.9738	0.9367	0.8371	0.6624	0.4542	0.2995	0.3447	0.6109	0.8914	0.9755	0.9903 (89)
MIT 2	18.5699	18.7982	19.1323	19.5085	19.7144	19.7955	19.8044	19.8064	19.7621	19.4703	18.9642	18.5489 (90)
Living area fraction									FLA = Living area / (4) =			0.1272 (91)
MIT	18.7375	18.9594	19.2850	19.6524	19.8570	19.9378	19.9475	19.9489	19.9033	19.6132	19.1195	18.7159 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.5875	18.8094	19.1350	19.5024	19.7070	19.7878	19.7975	19.7989	19.7533	19.4632	18.9695	18.5659 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9831	0.9662	0.9248	0.8233	0.6518	0.4458	0.2911	0.3355	0.5993	0.8770	0.9681	0.9865 (94)
Useful gains	748.8588	866.9983	961.0845	976.2631	837.3947	564.7449	352.1125	372.5458	598.4546	750.2581	724.1775	709.2177 (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	1645.3195	1595.9724	1444.5659	1191.7793	897.1535	572.5811	352.9154	374.0888	627.6120	993.0935	1338.5744	1631.0446 (97)
Space heating kWh	666.9668	489.8706	359.7102	155.1717	44.4606	0.0000	0.0000	0.0000	0.0000	180.6695	442.3657	685.8393 (98a)
Space heating requirement - total per year (kWh/year)												3025.0543
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	666.9668	489.8706	359.7102	155.1717	44.4606	0.0000	0.0000	0.0000	0.0000	180.6695	442.3657	685.8393 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3025.0543
Space heating per m2										(98c) / (4) =		33.8980 (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	666.9668	489.8706	359.7102	155.1717	44.4606	0.0000	0.0000	0.0000	0.0000	180.6695	442.3657	685.8393 (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)	753.6348	553.5261	406.4522	175.3352	50.2379	0.0000	0.0000	0.0000	0.0000	204.1464	499.8483	774.9596 (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	88.0989	88.0430	87.9206	87.6641	87.2885	87.0000	87.0000	87.0000	87.0000	87.7192	88.0130	87.0000 (216)
Fuel for water heating, kWh/month	271.6858	239.6688	253.1581	218.9927	210.2841	186.9404	182.2331	191.2708	195.3549	219.8113	237.5190	268.1373 (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	-30.5411	-47.0262	-74.0246	-88.7481	-98.4736	-92.6767	-91.1383	-84.4157	-72.2306	-56.0267	-34.6246	-25.7345 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-14.0871	-33.7567	-78.6997	-135.2417	-193.0552	-199.5303	-194.8813	-155.9777	-102.3923	-51.5165	-19.5946	-10.7240 (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												3418.1405 (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												2675.0564 (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												-1985.1177 (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												

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Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4390.9953 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3418.1405	3.6400	124.4203 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2675.0564	3.6400	97.3721 (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	-795.6607	16.4900	-131.2045
PV Unit electricity exported	-1189.4570	5.5900	-66.4906
Total			-197.6951 (252)
Total energy cost			162.7501 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.4365 (257)
SAP value		92.9250
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	3418.1405	0.2100	717.8095 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2675.0564	0.2100	561.7618 (264)
Space and water heating			1279.5713 (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	-795.6607	0.1333	-106.0646
PV Unit electricity exported	-1189.4570	0.1227	-145.9251
Total			-251.9897 (269)
Total CO2, kg/year			1067.9320 (272)
CO2 emissions per m2			11.9700 (273)
EI value			89.3398
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

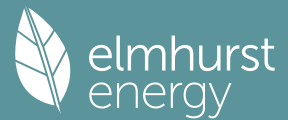
1. Overall dwelling characteristics

	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	50.0000 / (5) = 0.2237 (8)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Yes
Pressure test	Blower Door
Pressure Test Method	4.0000 (17)
Measured/design AP50	0.4237 (18)
Infiltration rate	0 (19)
Number of sides sheltered	
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)

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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 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	138.5000	23.7700	114.7300	0.1900	21.7987	110.0000	12620.3000	(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) =	61.1262			(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)
							244.5056	(35)

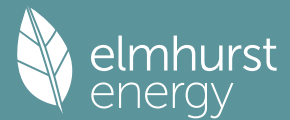
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6152 (42)
Hot water usage for mixer showers													
68.0676	67.0447	65.5541	62.7021	60.5974	58.2503	56.9161	58.3955	60.0171	62.5372	65.4504	67.8068	67.8068	(42a)
Hot water usage for baths													
29.3945	28.9580	28.3432	27.2097	26.3610	25.4199	24.9115	25.5220	26.1866	27.1937	28.3505	29.2952	29.2952	(42b)
Hot water usage for other uses													
41.4120	39.9061	38.4002	36.8943	35.3884	33.8825	33.8825	35.3884	36.8943	38.4002	39.9061	41.4120	41.4120	(42c)
Average daily hot water use (litres/day)												127.6567	(43)
Daily hot water use													
138.8742	135.9088	132.2975	126.8062	122.3468	117.5527	115.7102	119.3059	123.0980	128.1311	133.7071	138.5140	138.5140	(44)
Energy conte	219.9427	193.5323	203.3364	173.5913	164.7023	144.5447	139.9415	147.7256	151.7922	173.8727	190.4902	216.8794	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
32.9914	29.0298	30.5005	26.0387	24.7054	21.6817	20.9912	22.1588	22.7688	26.0809	28.5735	32.5319	32.5319	(46)
Water storage loss:													
Total storage loss													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	19.4094	17.4793	19.2416	18.3868	18.8514	18.0934	18.6014	18.6800	18.1666	18.9441	18.5575	19.3784	(61)
Total heat required for water heating calculated for each month													
239.3521	211.0116	222.5781	191.9781	183.5538	162.6381	158.5428	166.4056	169.9588	192.8167	209.0477	236.2579	236.2579	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
239.3521	211.0116	222.5781	191.9781	183.5538	162.6381	158.5428	166.4056	169.9588	192.8167	209.0477	236.2579	236.2579	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
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	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	28.6503	(67)

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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					0.9100	19.6403	0.7300	0.7000			0.7700	6.3291 (76)	
South					3.7500	46.7521	0.7300	0.7000			0.7700	62.0849 (78)	
West					10.4700	19.6403	0.7300	0.7000			0.7700	72.8196 (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	52.6322	52.8239	53.0132	53.9206	54.0939	54.9152	54.9152	55.0701	54.5959	54.0939	53.7445	53.3841
alpha	4.5088	4.5216	4.5342	4.5947	4.6063	4.6610	4.6610	4.6713	4.6397	4.6063	4.5830	4.5589
util living area	0.9907	0.9800	0.9514	0.8726	0.7266	0.5408	0.3980	0.4496	0.6998	0.9222	0.9821	0.9927 (86)
MIT	19.8872	20.0659	20.3329	20.6403	20.8351	20.9144	20.9299	20.9273	20.8727	20.5944	20.1846	19.8619 (87)
Th 2	19.8483	19.8520	19.8556	19.8726	19.8758	19.8907	19.8907	19.8934	19.8849	19.8758	19.8694	19.8626 (88)
util rest of house	0.9877	0.9738	0.9367	0.8371	0.6624	0.4542	0.2995	0.3447	0.6109	0.8914	0.9755	0.9903 (89)
MIT 2	18.5699	18.7982	19.1323	19.5085	19.7144	19.7955	19.8044	19.8064	19.7621	19.4703	18.9642	18.5489 (90)
Living area fraction	18.7375	18.9594	19.2850	19.6524	19.8570	19.9378	19.9475	19.9489	19.9033	19.6132	19.1195	18.7159 (91)
MIT	18.7375	18.9594	19.2850	19.6524	19.8570	19.9378	19.9475	19.9489	19.9033	19.6132	19.1195	18.7159 (92)
Temperature adjustment	18.5875	18.8094	19.1350	19.5024	19.7070	19.7878	19.7975	19.7989	19.7533	19.4632	18.9695	-0.1500
adjusted MIT	18.5875	18.8094	19.1350	19.5024	19.7070	19.7878	19.7975	19.7989	19.7533	19.4632	18.9695	18.5659 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9831	0.9662	0.9248	0.8233	0.6518	0.4458	0.2911	0.3355	0.5993	0.8770	0.9681	0.9865 (94)
Ext temp.	748.8588	866.9983	961.0845	976.2631	837.3947	564.7449	352.1125	372.5458	598.4546	750.2581	724.1775	709.2177 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	16.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Space heating kWh	1645.3195	1595.9724	1444.5659	1191.7793	897.1535	572.5811	352.9154	374.0888	627.6120	993.0935	1338.5744	1631.0446 (97)
Space heating requirement - total per year (kWh/year)	666.9668	489.8706	359.7102	155.1717	44.4606	0.0000	0.0000	0.0000	0.0000	180.6695	442.3657	685.8393 (98a)
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)	666.9668	489.8706	359.7102	155.1717	44.4606	0.0000	0.0000	0.0000	0.0000	180.6695	442.3657	685.8393 (98c)
Space heating requirement after solar 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	3025.0543 (99)
Space heating per m2	(98c) / (4) = 33.8980 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)											
Fraction of space heat from main system(s)	1.0000 (202)											
Efficiency of main space heating system 1 (in %)	88.5000 (206)											
Efficiency of main space heating system 2 (in %)	0.0000 (207)											
Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
666.9668	489.8706	359.7102	155.1717	44.4606	0.0000	0.0000	0.0000	0.0000	0.0000	180.6695	442.3657	685.8393 (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)	753.6348	553.5261	406.4522	175.3352	50.2379	0.0000	0.0000	0.0000	0.0000	204.1464	499.8483	774.9596 (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	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)
Water heating requirement	88.0989	88.0430	87.9206	87.6641	87.2885	87.0000	87.0000	87.0000	87.0000	87.7192	88.0130	87.0000 (216)
Efficiency of water heater (217)m	271.6858	239.6688	253.1581	218.9927	210.2841	186.9404	182.2331	191.2708	195.3549	219.8113	237.5190	268.1373 (219)
Fuel for water heating, kWh/month	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)
Space cooling fuel requirement (221)m	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)
Pumps and Fa												

Full SAP Calculation Printout



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	-30.5411	-47.0262	-74.0246	-88.7481	-98.4736	-92.6767	-91.1383	-84.4157	-72.2306	-56.0267	-34.6246	-25.7345	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-14.0871	-33.7567	-78.6997	-135.2417	-193.0552	-199.5303	-194.8813	-155.9777	-102.3923	-51.5165	-19.5946	-10.7240	(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												3418.1405	(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												2675.0564	(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												-1985.1177	(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												4390.9953	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3418.1405	5.6000	191.4159 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2675.0564	5.6000	149.8032 (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	-795.6607	26.0600	-207.3492
PV Unit electricity exported	-1189.4570	5.8100	-69.1074
Total			-276.4566 (252)
Total energy cost			237.4903 (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	3418.1405	0.2100	717.8095 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2675.0564	0.2100	561.7618 (264)
Space and water heating			1279.5713 (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	-795.6607	0.1333	-106.0646
PV Unit electricity exported	-1189.4570	0.1227	-145.9251
Total			-251.9897 (269)
Total CO2, kg/year			1067.9320 (272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3418.1405	1.1300	3862.4988 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2675.0564	1.1300	3022.8137 (278)
Space and water heating			6885.3125 (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	-795.6607	1.4926	-1187.6061
PV Unit electricity exported	-1189.4570	0.4502	-535.4651
Total			-1723.0712 (283)
Total Primary energy kWh/year			5594.3786 (286)

SAP 10 EPC IMPROVEMENTS

Plot 1

Full SAP Calculation Printout



Current energy efficiency rating:
Current environmental impact rating:

A 93
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	£440	£440	£0
Space heating	£313	£313	£0
Water heating	£150	£150	£0
Lighting	£51	£51	£0
Generated (PV)	-£276	-£276	£0
Total cost of fuels	£238	£238	£0
Total cost of uses	£238	£238	£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)

3. Heat losses and heat loss parameter

Full SAP Calculation Printout



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	138.5000	23.7700	114.7300	0.1900	21.7987	110.0000	12620.3000	(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) =		61.1262			(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) =		67.5103 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 47.6478	Feb 47.2299	Mar 46.8203	Apr 44.8961	May 44.5361	Jun 42.8603	Jul 42.8603	Aug 42.5499	Sep 43.5058	Oct 44.5361	Nov 45.2644	Dec 46.0258	(38)
Heat transfer coeff	115.1581	114.7402	114.3305	112.4064	112.0464	110.3706	110.3706	110.0602	111.0161	112.0464	112.7747	113.5361	(39)
Average = Sum(39)m / 12 =												112.4047	
HLP	Jan 1.2904	Feb 1.2857	Mar 1.2812	Apr 1.2596	May 1.2556	Jun 1.2368	Jul 1.2368	Aug 1.2333	Sep 1.2440	Oct 1.2556	Nov 1.2637	Dec 1.2723	(40)
HLP (average)												1.2596	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

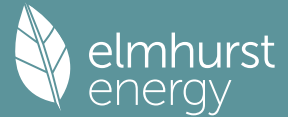
4. Water heating energy requirements (kWh/year)													

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	Jan 138.8742	Feb 135.9088	Mar 132.2975	Apr 126.8062	May 122.3468	Jun 117.5527	Jul 115.7102	Aug 119.3059	Sep 123.0980	Oct 128.1311	Nov 133.7071	Dec 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	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	19.4094	17.4793	19.2416	18.3868	18.8514	18.0934	18.6014	18.6800	18.1666	18.9441	18.5575	19.3784	(61)
Total heat required for water heating calculated for each month	239.3521	211.0116	222.5781	191.9781	183.5538	162.6381	158.5428	166.4056	169.9588	192.8167	209.0477	236.2579	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	239.3521	211.0116	222.5781	191.9781	183.5538	162.6381	158.5428	166.4056	169.9588	192.8167	209.0477	236.2579	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Heat gains from water heating, kWh/month	77.9833	68.7193	72.4198	62.3158	59.4764	52.5845	51.1809	53.7887	55.0126	62.5487	67.9774	76.9570	(65)

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

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

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6. Solar gains

[Jan]	Area				Solar flux	g		FF	Access		Gains
	m2				Table 6a	Specific data		or Table 6c	factor		W
					W/m2	or Table 6b			Table 6d		
North	6.5000				10.6334	0.7300		0.7000	0.7700		24.4759 (74)
East	0.9100				19.6403	0.7300		0.7000	0.7700		6.3291 (76)
South	3.7500				46.7521	0.7300		0.7000	0.7700		62.0849 (78)
West	10.4700				19.6403	0.7300		0.7000	0.7700		72.8196 (80)
Solar gains	165.7096	303.2855	463.9885	645.9365	780.2795	797.4594	759.4968	657.2051	527.4218	349.0705	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	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	52.6322	52.8239	53.0132	53.9206	54.0939	54.9152	54.9152	55.0701	54.5959	54.0939	53.7445	53.3841
alpha	4.5088	4.5216	4.5342	4.5947	4.6063	4.6610	4.6610	4.6713	4.6397	4.6063	4.5830	4.5589
util living area												
	0.9907	0.9800	0.9514	0.8726	0.7266	0.5408	0.3980	0.4496	0.6998	0.9222	0.9821	0.9927 (86)
MIT	19.8872	20.0659	20.3329	20.6403	20.8351	20.9144	20.9299	20.9273	20.8727	20.5944	20.1846	19.8619 (87)
Th 2	19.8483	19.8520	19.8556	19.8726	19.8758	19.8907	19.8907	19.8934	19.8849	19.8758	19.8694	19.8626 (88)
util rest of house												
	0.9877	0.9738	0.9367	0.8371	0.6624	0.4542	0.2995	0.3447	0.6109	0.8914	0.9755	0.9903 (89)
MIT 2	18.5699	18.7982	19.1323	19.5085	19.7144	19.7955	19.8044	19.8064	19.7621	19.4703	18.9642	18.5489 (90)
Living area fraction												
	18.7375	18.9594	19.2850	19.6524	19.8570	19.9378	19.9475	19.9489	19.9033	fLA = Living area / (4) =	19.1195	0.1272 (91)
MIT	18.7375	18.9594	19.2850	19.6524	19.8570	19.9378	19.9475	19.9489	19.9033	19.6132	19.1195	18.7159 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.5875	18.8094	19.1350	19.5024	19.7070	19.7878	19.7975	19.7989	19.7533	19.4632	18.9695	18.5659 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9831	0.9662	0.9248	0.8233	0.6518	0.4458	0.2911	0.3355	0.5993	0.8770	0.9681	0.9865 (94)
Useful gains	748.8588	866.9983	961.0845	976.2631	837.3947	564.7449	352.1125	372.5458	598.4546	750.2581	724.1775	709.2177 (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	1645.3195	1595.9724	1444.5659	1191.7793	897.1535	572.5811	352.9154	374.0888	627.6120	993.0935	1338.5744	1631.0446 (97)
Space heating kWh	666.9668	489.8706	359.7102	155.1717	44.4606	0.0000	0.0000	0.0000	0.0000	180.6695	442.3657	685.8393 (98a)
Space heating requirement - total per year (kWh/year)												3025.0543
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	666.9668	489.8706	359.7102	155.1717	44.4606	0.0000	0.0000	0.0000	0.0000	180.6695	442.3657	685.8393 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3025.0543
Space heating per m2										(98c) / (4) =		33.8980 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												88.5000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	666.9668	489.8706	359.7102	155.1717	44.4606	0.0000	0.0000	0.0000	0.0000	180.6695	442.3657	685.8393 (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)	753.6348	553.5261	406.4522	175.3352	50.2379	0.0000	0.0000	0.0000	0.0000	204.1464	499.8483	774.9596 (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	88.0989	88.0430	87.9206	87.6641	87.2885	87.0000	87.0000	87.0000	87.0000	87.7192	88.0130	87.0000 (216)
Fuel for water heating, kWh/month	271.6858	239.6688	253.1581	218.9927	210.2841	186.9404	182.2331	191.2708	195.3549	219.8113	237.5190	268.1373 (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)	-30.5411	-47.0262	-74.0246	-88.7481	-98.4736	-92.6767	-91.1383	-84.4157	-72.2306	-56.0267	-34.6246	-25.7345 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-14.0871	-33.7567	-78.6997	-135.2417	-193.0552	-199.5303	-194.8813	-155.9777	-102.3923	-51.5165	-19.5946	-10.7240 (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)

10a. Fuel costs - using Table 12 prices

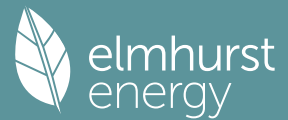
11a. SAP rating - Individual heating systems12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

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

2. Ventilation rate

Full SAP Calculation Printout



											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)	
	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)

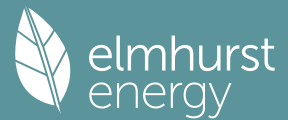
3. Heat losses and heat loss parameter

Element	Gross 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	138.5000	23.7700	114.7300	0.1900	21.7987	110.0000	12620.3000	(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) =	61.1262			(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) =	67.5103	(37)

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
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
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
Average daily hot water use (litres/day)	32.9914	29.0298	30.5005	26.0387	24.7054	21.6817	20.9912	22.1588	22.7688	26.0809	28.5735	32.5319
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
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
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
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
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
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
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
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
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

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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				0.9100	19.6403		0.7300		0.7000		0.7700		6.3291 (76)
South				3.7500	46.7521		0.7300		0.7000		0.7700		62.0849 (78)
West				10.4700	19.6403		0.7300		0.7000		0.7700		72.8196 (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	52.6322	52.8239	53.0132	53.9206	54.0939	54.9152	54.9152	55.0701	54.5959	54.0939	53.7445	53.3841	
alpha	4.5088	4.5216	4.5342	4.5947	4.6063	4.6610	4.6610	4.6713	4.6397	4.6063	4.5830	4.5589	
util living area	0.9907	0.9800	0.9514	0.8726	0.7266	0.5408	0.3980	0.4496	0.6998	0.9222	0.9821	0.9927	(86)
MIT	19.8872	20.0659	20.3329	20.6403	20.8351	20.9144	20.9299	20.9273	20.8727	20.5944	20.1846	19.8619	(87)
Th 2	19.8483	19.8520	19.8556	19.8726	19.8758	19.8907	19.8907	19.8934	19.8849	19.8758	19.8694	19.8626	(88)
util rest of house	0.9877	0.9738	0.9367	0.8371	0.6624	0.4542	0.2995	0.3447	0.6109	0.8914	0.9755	0.9903	(89)
MIT 2	18.5699	18.7982	19.1323	19.5085	19.7144	19.7955	19.8044	19.8064	19.7621	19.4703	18.9642	18.5489	(90)
Living area fraction	18.7375	18.9594	19.2850	19.6524	19.8570	19.9378	19.9475	19.9489	19.9033	19.6132	19.1195	18.7159	(91)
MIT	18.7375	18.9594	19.2850	19.6524	19.8570	19.9378	19.9475	19.9489	19.9033	19.6132	19.1195	18.7159	(92)
Temperature adjustment	18.5875	18.8094	19.1350	19.5024	19.7070	19.7878	19.7975	19.7989	19.7533	19.4632	18.9695	18.5659	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9831	0.9662	0.9248	0.8233	0.6518	0.4458	0.2911	0.3355	0.5993	0.8770	0.9681	0.9865	(94)
Ext temp.	748.8588	866.9983	961.0845	976.2631	837.3947	564.7449	352.1125	372.5458	598.4546	750.2581	724.1775	709.2177	(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	1645.3195	1595.9724	1444.5659	1191.7793	897.1535	572.5811	352.9154	374.0888	627.6120	993.0935	1338.5744	1631.0446	(97)
Space heating requirement - total per year (kWh/year)	666.9668	489.8706	359.7102	155.1717	44.4606	0.0000	0.0000	0.0000	0.0000	180.6695	442.3657	685.8393	(98a)
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)	666.9668	489.8706	359.7102	155.1717	44.4606	0.0000	0.0000	0.0000	0.0000	180.6695	442.3657	685.8393	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)	3025.0543												(98c) / (4) =
Space heating per m2													(99)

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

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Fraction of space heat from secondary/supplementary system (Table 11)												
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												

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Space heating efficiency (main heating system 1)	666.9668	489.8706	359.7102	155.1717	44.4606	0.0000	0.0000	0.0000	0.0000	180.6695	442.3657	685.8393	(98)
Space heating fuel (main heating system)	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 efficiency (main heating system 2)	753.6348	553.5261	406.4522	175.3352	50.2379	0.0000	0.0000	0.0000	0.0000	204.1464	499.8483	774.9596	(211)
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	(212)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
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	88.0989	88.0430	87.9206	87.6641	87.2885	87.0000	87.0000	87.0000	87.0000	87.7192	88.0130	87.0000	(216)
Fuel for water heating, kWh/month	271.6858	239.6688	253.1581	218.9927	210.2841	186.9404	182.2331	191.2708	195.3549	219.8113	237.5190	268.1373	(217)
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)	-30.5411	-47.0262	-74.0246	-88.7481	-98.4736	-92.6767	-91.1383	-84.4157	-72.2306	-56.0267	-34.6246	-25.7345	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-14.0871	-33.7567	-78.6997	-135.2417	-193.0552	-199.5303	-194.8813	-155.9777	-102.3923	-51.5165	-19.5946	-10.7240	(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												3418.1405	(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												2675.0564	(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												-1985.1177	(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												4390.9953	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3418.1405	5.6000	191.4159	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2675.0564	5.6000	149.8032	(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	-795.6607	26.0600	-207.3492	
PV Unit electricity exported	-1189.4570	5.8100	-69.1074	
Total			-276.4566	(252)
Total energy cost			237.4903	(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	3418.1405	0.2100	717.8095	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2675.0564	0.2100	561.7618	(264)
Space and water heating			1279.5713	(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	-795.6607	0.1333	-106.0646	
PV Unit electricity exported	-1189.4570	0.1227	-145.9251	
Total			-251.9897	(269)
Total CO2, kg/year			1067.9320	(272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
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Space heating - main system 1	3418.1405	1.1300	3862.4988 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2675.0564	1.1300	3022.8137 (278)
Space and water heating			6885.3125 (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	-795.6607	1.4926	-1187.6061
PV Unit electricity exported	-1189.4570	0.4502	-535.4651
Total			-1723.0712 (283)
Total Primary energy kWh/year			5594.3786 (286)

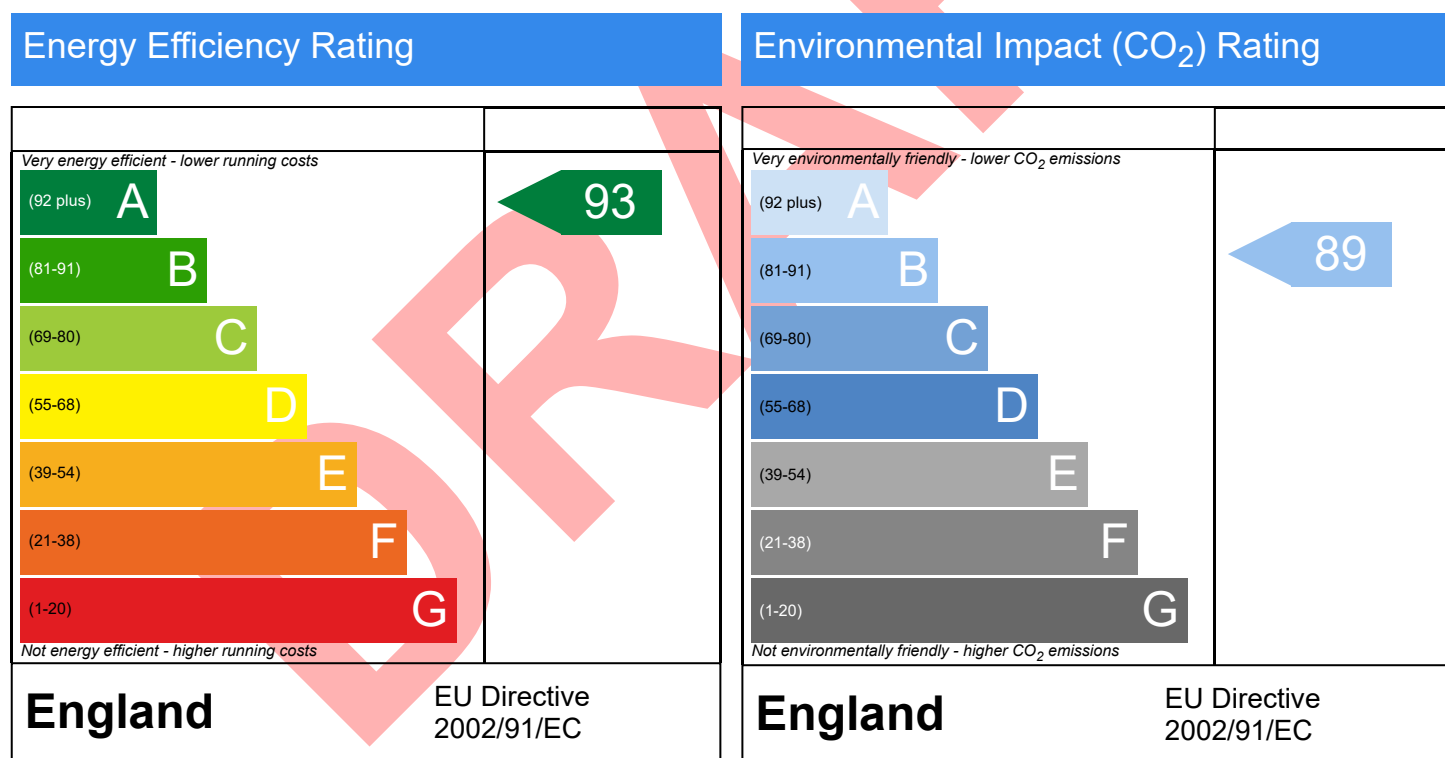
Predicted Energy Assessment



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.