

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 10:34:27

Project Information			
Assessed By	Victoria Gartside	Building Type	House, Detached
OCDEA Registration	EES/026678	Assessment Date	2024-11-15

Dwelling Details			
Assessment Type	As designed	Total Floor Area	118 m ²
Site Reference	SAP VG 21-0282	Plot Reference	Plot 24
Address			

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

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

1a Target emission rate and dwelling emission rate			
Fuel for main heating system	Mains gas		
Target carbon dioxide emission rate	10.22 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	10.22 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	53.35 kWh _{PE} /m ²		
Dwelling primary energy	53.21 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	38.7 kWh/m ²		
Dwelling fabric energy efficiency	35.1 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	1.28	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)	129.22	0.19	
Ground floor: Ground Floor, Ground Floor	58.87	0.13	
Exposed roof: Roof (1)	58.87	0.09 (!)	

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
Front , Windows	10.47	South	0.7	1.3
Rear , Windows	1.42	North	0.7	1.3
Front Door, Door	2.14	South	N/A	1.1 (!)
Side L, Windows	4.56	West	0.7	1.3
Side , Windows	6.5	East	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	2.65 kWp	
Orientation	South	
Pitch	45°	
Overshading	None or very little	
Manufacturer		
MCS certificate		
10 Heat networks		
N/A		
11 Supporting documentary evidence		
N/A		
12 Declarations		
a. Assessor Declaration		
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.		
Signed:	Assessor ID:	
Name:		
	Date:	
b. Client Declaration		
N/A		

Summary for Input Data



Property Reference	SAP VG 21-0282		Issued on Date	15/11/2024
Assessment Reference	Plot 24	Prop Type Ref	SAP VG 21-0282	
Property				

SAP Rating	94 A	DER	10.22	TER	10.22
Environmental	90 B	% DER < TER			0.00
CO ₂ Emissions (t/year)	1.16	DFEE	35.09	TFEE	38.72
Compliance Check	See BREL	% DFEE < TFEE			9.39
% DPER < TPER	0.26	DPER	53.21	TPER	53.35

Assessor Details	Miss Victoria Gartside	Assessor ID	AL30-0001
Client			

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

Orientation	South
Property Tenure	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	212.87 kJ/m ² K
7.0 Electricity Tariff	Standard
Smart electricity meter fitted	Yes
Smart gas meter fitted	Yes

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

8.0 Living Area	14.85 m ²
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9.0 External Walls	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area (m ²)	Shelter Res	Shelter	Openings	Area Calculation Type
	External Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.19	110.00	154.31	129.22	0.00	None	25.09	Enter Gross Area

9.2 Internal Walls	Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
	Studs	Plasterboard on timber frame	9.00	198.60
	Block	Dense block, plasterboard on dabs	75.00	33.70

10.0 External Roofs	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area (m ²)	Shelter Code	Shelter Factor	Calculation Type	Openings
	Plane Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	58.87	58.87	None	0.00	Enter Gross Area	0.00

10.2 Internal Ceilings	Description	Storey	Construction	Area (m ²)
	Internal Ceiling 1	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	58.87

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

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

11.2 Internal Floors

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

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Windows	Manufacturer	Window	Double Low-E Soft 0.05			0.73		0.70	1.30
Door	Manufacturer	Half Glazed Door	Double Low-E Soft 0.05			0.73		0.70	1.10

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Front	Windows	External Wall	South	10.47	0
Rear	Windows	External Wall	North	1.42	0
Front Door	Door	External Wall	South	2.14	0
Side L	Windows	External Wall	West	4.56	0
Side	Windows	External Wall	East	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	17.76	0.02	0.02 MFF-150-E2-02	No
E3 Sill	Independently assessed	14.93	0.02	0.02 E3-01	No
E4 Jamb	Independently assessed	38.40	0.02	0.02 E4-01 RCD	No
E5 Ground floor (normal)	Independently assessed	30.80	0.09	0.09 Manufacturer Declaration	No
E10 Eaves (insulation at ceiling level)	Independently assessed	16.70	0.06	0.06 E10-01	No
E16 Corner (normal)	Independently assessed	20.04	0.05	0.05 E16-01 RCD	No
E6 Intermediate floor within a dwelling	Independently assessed	30.80	0.00	0.00 E6-01 RCD	No
E12 Gable (insulation at ceiling level)	Independently assessed	14.10	0.06	0.06 E12-01 RCD	No

Y-value 0.03 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	25

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
2.65	South	45°	None Or Little	No	No	1.00		

34.0 Small-scale Hydro

			None								
Electricity Generated			0.00								
Apportioned			0.00						kWh/Year		
Connected to dwelling's electricity meter			Yes								
Electricity Generation			Annual								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

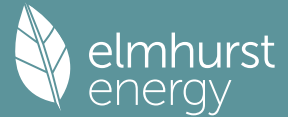
Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout



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Property							
SAP Rating	94 A	DER	10.22	TER	10.22		
Environmental	90 B	% DER < TER				0.00	
CO ₂ Emissions (t/year)	1.16	DFEE	35.09	TFEE	38.72		
Compliance Check	See BREL	% DFEE < TFEE				9.39	
% DPER < TPER	0.26	DPER	53.21	TPER	53.35		
Assessor Details	Miss Victoria Gartside				Assessor ID	AL30-0001	
Client							

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

1. Overall dwelling characteristics

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

2. Ventilation rate

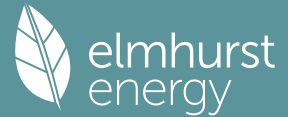
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	5 * 10 = 50.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	50.0000 / (5) = 0.1695 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3695 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3695 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4711	0.4619	0.4527	0.4065	0.3972	0.3511	0.3511	0.3418	0.3695	0.3972	0.4157	0.4342 (22b)
Effective ac	0.6110	0.6067	0.6025	0.5826	0.5789	0.5616	0.5616	0.5584	0.5683	0.5789	0.5864	0.5943 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (U _w = 1.30)			22.9500	1.2357	28.3603		(27)
Door			2.1400	1.1000	2.3540		(26a)
Ground Floor			58.8700	0.1300	7.6531	75.0000	4415.2500 (28a)
External Wall	154.3100	25.0900	129.2200	0.1900	24.5518	110.0000	14214.2000 (29a)
Plane Roof	58.8700		58.8700	0.0900	5.2983	9.0000	529.8300 (30)
Total net area of external elements A _{um} (A, m ²)			272.0500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		68.2175		(33)
Studs			198.6000			9.0000	1787.4000 (32c)
Block			33.7000			75.0000	2527.5000 (32c)
Internal Floor 1			58.8700			18.0000	1059.6600 (32d)
Internal Ceiling 1			58.8700			9.0000	529.8300 (32e)
Heat capacity C _m = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	25063.6700 (34)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							212.8730 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				17.7600	0.0240	0.4262	
E3 Sill				14.9300	0.0210	0.3135	
E4 Jamb				38.4000	0.0160	0.6144	

Full SAP Calculation Printout



E5 Ground floor (normal)	30.8000	0.0920	2.8336
E10 Eaves (insulation at ceiling level)	16.7000	0.0580	0.9686
E16 Corner (normal)	20.0400	0.0470	0.9419
E6 Intermediate floor within a dwelling	30.8000	0.0010	0.0308
E12 Gable (insulation at ceiling level)	14.1000	0.0570	0.8037
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.9328 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	75.1502 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	59.4675	59.0480	58.6368	56.7056	56.3442	54.6622	54.6622	54.3507	55.3101	56.3442	57.0752	57.8394 (38)
Average = Sum(39)m / 12 =	134.6177	134.1982	133.7870	131.8558	131.4945	129.8124	129.8124	129.5009	130.4603	131.4945	132.2254	132.9896 (39)
												131.8541
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1433	1.1398	1.1363	1.1199	1.1168	1.1025	1.1025	1.0999	1.1080	1.1168	1.1230	1.1295 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8541 (42)
Hot water usage for mixer showers												
	72.0744	70.9913	69.4129	66.3930	64.1645	61.6791	60.2665	61.8329	63.5500	66.2184	69.3032	71.7983 (42a)
Hot water usage for baths												
	31.1176	30.6554	30.0046	28.8047	27.9062	26.9099	26.3718	27.0180	27.7216	28.7877	30.0124	31.0124 (42b)
Hot water usage for other uses												
	43.8593	42.2644	40.6695	39.0746	37.4797	35.8849	35.8849	37.4797	39.0746	40.6695	42.2644	43.8593 (42c)
Average daily hot water use (litres/day)												135.1732 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	147.0513	143.9111	140.0871	134.2724	129.5504	124.4739	122.5231	126.3306	130.3462	135.6756	141.5799	146.6699 (44)
Energy conte	232.8933	204.9275	215.3086	183.8122	174.3997	153.0552	148.1811	156.4237	160.7299	184.1106	201.7065	229.6496 (45)
Energy content (annual)										Total = Sum(45)m =		2245.1980
Distribution loss (46)m = 0.15 x (45)m												
	34.9340	30.7391	32.2963	27.5718	26.1600	22.9583	22.2272	23.4636	24.1095	27.6166	30.2560	34.4474 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	19.5402	17.5944	19.3626	18.4900	18.9494	18.1794	18.6846	18.7678	18.2569	19.0475	18.6707	19.5074 (61)
Total heat required for water heating calculated for each month												
	252.4334	222.5219	234.6712	202.3022	193.3491	171.2346	166.8657	175.1916	178.9868	203.1580	220.3773	249.1571 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	252.4334	222.5219	234.6712	202.3022	193.3491	171.2346	166.8657	175.1916	178.9868	203.1580	220.3773	249.1571 (64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				2470.2488 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												0.0000 (64a)
Heat gains from water heating, kWh/month	82.3220	72.5370	76.4308	65.7401	62.7253	55.4357	53.9414	56.7028	58.0069	65.9786	71.7351	81.2354 (65)

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

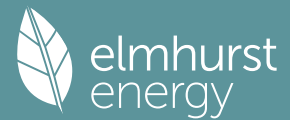
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	143.7758	159.1803	143.7758	148.5683	143.7758	148.5683	143.7758	143.7758	148.5683	143.7758	148.5683	143.7758 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	282.2411	285.1699	277.7895	262.0774	242.2438	223.6029	211.1497	208.2209	215.6013	231.3134	251.1471	269.7879 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657 (71)
Water heating gains (Table 5)												
	110.6479	107.9419	102.7295	91.3056	84.3081	76.9940	72.5018	76.2135	80.5652	88.6810	99.6321	109.1873 (72)
Total internal gains	605.4769	621.1043	593.1069	570.7635	539.1398	514.9774	493.2394	494.0223	510.5469	532.5823	568.1596	591.5631 (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				1.4200	10.6334	0.7300	0.7000	0.7700	5.3471 (74)			
East				6.5000	19.6403	0.7300	0.7000	0.7700	45.2079 (76)			
South				10.4700	46.7521	0.7300	0.7000	0.7700	173.3411 (78)			
West				4.5600	19.6403	0.7300	0.7000	0.7700	31.7151 (80)			
Solar gains	255.6112	444.5844	626.8023	798.0274	906.4139	903.5223	869.7046	789.5138	686.8546	496.9184	307.9786	217.4980 (83)
Total gains	861.0882	1065.6887	1219.9092	1368.7908	1445.5537	1418.4997	1362.9440	1283.5361	1197.4015	1029.5006	876.1382	809.0612 (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	51.7178	51.8795	52.0389	52.8011	52.9462	53.6323	53.6323	53.7613	53.3659	52.9462	52.6535	52.3509	
alpha	4.4479	4.4586	4.4693	4.5201	4.5297	4.5755	4.5755	4.5841	4.5577	4.5297	4.5102	4.4901	
util living area	0.9913	0.9778	0.9493	0.8755	0.7448	0.5636	0.4145	0.4566	0.6878	0.9138	0.9812	0.9933 (86)	
MIT	19.8501	20.0634	20.3242	20.6224	20.8177	20.9079	20.9275	20.9250	20.8724	20.5992	20.1703	19.8196 (87)	
Th 2	19.9656	19.9685	19.9713	19.9846	19.9871	19.9988	19.9988	20.0009	19.9943	19.9871	19.9821	19.9768 (88)	
util rest of house	0.9889	0.9720	0.9359	0.8446	0.6886	0.4839	0.3225	0.3611	0.6088	0.8848	0.9751	0.9914 (89)	
MIT 2	18.6264	18.8982	19.2249	19.5917	19.8052	19.8976	19.9103	19.9114	19.8672	19.5762	19.0465	18.5963 (90)	
Living area fraction	18.7808	19.0451	19.3636	19.7217	19.9329	20.0250	20.0386	20.0393	fLA = Living area / (4) =				0.1261 (91)
MIT	18.7808	19.0451	19.3636	19.7217	19.9329	20.0250	20.0386	20.0393	19.9939	19.7052	19.1883	18.7506 (92)	
Temperature adjustment												-0.1500	
adjusted MIT	18.6308	18.8951	19.2136	19.5717	19.7829	19.8750	19.8886	19.8893	19.8439	19.5552	19.0383	18.6006 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9845	0.9638	0.9236	0.8300	0.6761	0.4737	0.3122	0.3501	0.5960	0.8695	0.9675	0.9878 (94)
Useful gains	847.7380	1027.0864	1126.6734	1136.0472	977.3759	671.8917	425.4489	449.4128	713.5968	895.1838	847.6286	799.2175 (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	1929.1734	1878.1232	1700.9093	1407.1210	1062.8538	684.7632	426.8979	451.8641	749.3558	1177.5630	1578.5412	1915.1299 (97)
Space heating kWh	804.5880	571.8968	427.2315	195.1732	63.5956	0.0000	0.0000	0.0000	0.0000	210.0901	526.2570	830.2388 (98a)
Space heating requirement - total per year (kWh/year)												3629.0709
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	804.5880	571.8968	427.2315	195.1732	63.5956	0.0000	0.0000	0.0000	0.0000	210.0901	526.2570	830.2388 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3629.0709
Space heating per m2										(98c) / (4) =		30.8228 (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	804.5880	571.8968	427.2315	195.1732	63.5956	0.0000	0.0000	0.0000	0.0000	210.0901	526.2570	830.2388 (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)	909.1389	646.2110	482.7474	220.5347	71.8594	0.0000	0.0000	0.0000	0.0000	237.3899	594.6407	938.1230 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	252.4334	222.5219	234.6712	202.3022	193.3491	171.2346	166.8657	175.1916	178.9868	203.1580	220.3773	249.1571 (64)
Efficiency of water heater	88.1371	88.0747	87.9623	87.7301	87.3665	87.0000	87.0000	87.0000	87.0000	87.7562	88.0519	87.0000 (216)
Fuel for water heating, kWh/month	286.4100	252.6514	266.7861	230.5960	221.3081	196.8213	191.7996	201.3696	205.7320	231.5028	250.2811	282.6538 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	29.2632	23.4760	21.1375	15.4863	11.9620	9.7731	10.9122	14.1840	18.4237	24.1729	27.3032	30.0765 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-47.1523	-65.0301	-91.1628	-100.7104	-107.8811	-100.4643	-99.3309	-94.2100	-85.4593	-73.5480	-51.4472	-41.0367 (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)	-26.9992	-54.4952	-102.4089	-146.1699	-187.6680	-186.5897	-185.3899	-160.5795	-122.9001	-76.4169	-35.6478	-21.6112 (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												4100.6451 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												87.0000
Water heating fuel used												2817.9119 (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)												236.1705 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2264.3094 (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	4976.4180 (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	4100.6451	0.2100	861.1355 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2817.9119	0.2100	591.7615 (264)
Space and water heating			1452.8970 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	236.1705	0.1443	34.0867 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-957.4332	0.1349	-129.1995
PV Unit electricity exported	-1306.8762	0.1272	-166.2553
Total			-295.4548 (269)
Total CO2, kg/year			1203.4581 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.2200 (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	4100.6451	1.1300	4633.7290 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2817.9119	1.1300	3184.2404 (278)
Space and water heating			7817.9694 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	236.1705	1.5338	362.2461 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-957.4332	1.4987	-1434.9492
PV Unit electricity exported	-1306.8762	0.4670	-610.3435
Total			-2045.2927 (283)
Total Primary energy kWh/year			6265.0236 (286)
Dwelling Primary energy Rate (DPER)			53.2100 (287)

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

1. Overall dwelling characteristics

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

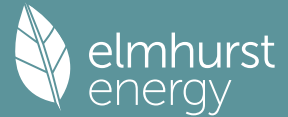
2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1356 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3856	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.3856 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4917	0.4820	0.4724	0.4242	0.4145	0.3663	0.3663	0.3567	0.3856	0.4145	0.4338	0.4531 (22b)
Effective ac	0.6209	0.6162	0.6116	0.5900	0.5859	0.5671	0.5671	0.5636	0.5744	0.5859	0.5941	0.6027 (25)

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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)			22.9500	1.1450	26.2786			(27)
Ground Floor			58.8700	0.1300	7.6531			(28a)
External Wall	154.3100	25.0900	129.2200	0.1800	23.2596			(29a)
Plane Roof	58.8700		58.8700	0.1100	6.4757			(30)
Total net area of external elements Aum(A, m2)			272.0500					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	65.8070		(33)

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

212.8730 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element	17.7600	0.0500	0.8880	
E2 Other lintels (including other steel lintels)	14.9300	0.0500	0.7465	
E3 Sill	38.4000	0.0500	1.9200	
E4 Jamb	30.8000	0.1600	4.9280	
E5 Ground floor (normal)	16.7000	0.0600	1.0020	
E10 Eaves (insulation at ceiling level)	20.0400	0.0900	1.8036	
E16 Corner (normal)	30.8000	0.0000	0.0000	
E6 Intermediate floor within a dwelling	14.1000	0.0600	0.8460	
E12 Gable (insulation at ceiling level)				

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

Point Thermal bridges	(36a) =	0.0000	12.1341 (36)
Total fabric heat loss	(33) + (36) + (36a) =		77.9411 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	60.4290	59.9722	59.5244	57.4212	57.0277	55.1960	55.1960	54.8567	55.9015	57.0277	57.8238	58.6560	(38)
Heat transfer coeff	138.3701	137.9133	137.4655	135.3624	134.9689	133.1371	133.1371	132.7979	133.8427	134.9689	135.7649	136.5971	(39)
Average = Sum(39)m / 12 =												135.3605	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1752	1.1713	1.1675	1.1497	1.1463	1.1308	1.1308	1.1279	1.1368	1.1463	1.1531	1.1602	(40)
HLP (average)												1.1497	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8541 (42)
Hot water usage for mixer showers	72.0744	70.9913	69.4129	66.3930	64.1645	61.6791	60.2665	61.8329	63.5500	66.2184	69.3032	71.7983	(42a)
Hot water usage for baths	31.1176	30.6554	30.0046	28.8047	27.9062	26.9099	26.3718	27.0180	27.7216	28.7877	30.0124	31.0124	(42b)
Hot water usage for other uses	43.8593	42.2644	40.6695	39.0746	37.4797	35.8849	35.8849	37.4797	39.0746	40.6695	42.2644	43.8593	(42c)
Average daily hot water use (litres/day)												135.1732	(43)
Daily hot water use	147.0513	143.9111	140.0871	134.2724	129.5504	124.4739	122.5231	126.3306	130.3462	135.6756	141.5799	146.6699	(44)
Energy conte	232.8933	204.9275	215.3086	183.8122	174.3997	153.0552	148.1811	156.4237	160.7299	184.1106	201.7065	229.6496	(45)
Energy content (annual)										Total = Sum(45)m =		2245.1980	
Distribution loss (46)m = 0.15 x (45)m	34.9340	30.7391	32.2963	27.5718	26.1600	22.9583	22.2272	23.4636	24.1095	27.6166	30.2560	34.4474	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	283.8522	250.9549	266.2675	233.1272	225.3587	202.3703	199.1400	207.3826	210.0450	235.0695	251.0216	280.6085	(62)
WWHRS	-32.9494	-29.1407	-30.5145	-25.2672	-23.5481	-20.1503	-18.8877	-20.0852	-20.8483	-24.5778	-27.8437	-32.3392	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	250.9027	221.8142	235.7530	207.8600	201.8105	182.2200	180.2523	187.2975	189.1967	210.4917	223.1779	248.2693	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2539.0459	(64)
Electric shower(s)	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	90.1767	79.6452	84.3298	73.4463	70.7276	63.2196	62.0099	64.7506	65.7715	73.9565	79.3962	89.0982	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	143.7758	159.1803	143.7758	148.5683	143.7758	148.5683	143.7758	143.7758	148.5683	143.7758	148.5683	143.7758	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	282.2411	285.1699	277.7895	262.0774	242.2438	223.6029	211.1497	208.2209	215.6013	231.3134	251.1471	269.7879	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	(71)
Water heating gains (Table 5)	121.2053	118.5197	113.3466	102.0088	95.0640	87.8050	83.3467	87.0304	91.3493	99.4039	110.2725	119.7557	(72)
Total internal gains	616.0343	631.6821	603.7239	581.4666	549.8957	525.7884	504.0843	504.8392	521.3310	543.3052	578.8000	602.1315	(73)

6. Solar gains

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[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b		g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
North	1.4200				10.6334	0.6300			0.7000		0.7700	4.6146 (74)
East	6.5000				19.6403	0.6300			0.7000		0.7700	39.0151 (76)
South	10.4700				46.7521	0.6300			0.7000		0.7700	149.5958 (78)
West	4.5600				19.6403	0.6300			0.7000		0.7700	27.3706 (80)
Solar gains	220.5960	383.6824	540.9390	688.7085	782.2476	779.7521	750.5670	681.3612	592.7649	428.8473	265.7898	187.7038 (83)
Total gains	836.6303	1015.3645	1144.6630	1270.1752	1332.1433	1305.5405	1254.6513	1186.2004	1114.0959	972.1525	844.5898	789.8353 (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	50.3153	50.4819	50.6464	51.4333	51.5832	52.2929	52.2929	52.4265	52.0173	51.5832	51.2808	50.9684
alpha	4.3544	4.3655	4.3764	4.4289	4.4389	4.4862	4.4862	4.4951	4.4678	4.4389	4.4187	4.3979
util living area	0.9923	0.9819	0.9604	0.9027	0.7911	0.6157	0.4586	0.5020	0.7333	0.9304	0.9840	0.9940 (86)
MIT	19.4806	19.7435	20.0812	20.4932	20.7921	20.9500	20.9892	20.9840	20.8898	20.4846	19.9113	19.4458 (87)
Th 2	19.9399	19.9430	19.9461	19.9605	19.9632	19.9758	19.9758	19.9781	19.9709	19.9632	19.9577	19.9520 (88)
util rest of house	0.9902	0.9769	0.9494	0.8760	0.7372	0.5309	0.3559	0.3966	0.6540	0.9052	0.9787	0.9923 (89)
MIT 2	18.1810	18.5162	18.9415	19.4515	19.7868	19.9457	19.9719	19.9719	19.8951	19.4549	18.7420	18.1450 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.3449	18.6710	19.0853	19.5829	19.9136	20.0724	20.1002	20.0995	20.0205	19.5848	18.8895	18.3091 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.3449	18.6710	19.0853	19.5829	19.9136	20.0724	20.1002	20.0995	20.0205	19.5848	18.8895	18.3091 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9853	0.9687	0.9377	0.8645	0.7344	0.5393	0.3687	0.4095	0.6582	0.8937	0.9711	0.9882 (94)
Useful gains	824.3558	983.5518	1073.3913	1098.0685	978.2987	704.0563	462.5524	485.7735	733.3170	868.8336	820.1608	780.5394 (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	1943.3943	1899.1973	1730.0419	1446.0640	1108.5761	728.5740	466.0120	491.2908	792.4213	1212.6618	1600.5968	1927.2630 (97)
Space heating kWh	832.5646	615.3137	488.5480	250.5568	96.9264	0.0000	0.0000	0.0000	0.0000	255.8082	561.9139	853.1624 (98a)
Space heating requirement - total per year (kWh/year)	3954.7940											
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	832.5646	615.3137	488.5480	250.5568	96.9264	0.0000	0.0000	0.0000	0.0000	255.8082	561.9139	853.1624 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	3954.7940											
Space heating per m2	(98c) / (4) = 33.5892 (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	832.5646	615.3137	488.5480	250.5568	96.9264	0.0000	0.0000	0.0000	0.0000	255.8082	561.9139	853.1624 (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)	901.0440	665.9239	528.7316	271.1653	104.8987	0.0000	0.0000	0.0000	0.0000	276.8487	608.1319	923.3359 (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	250.9027	221.8142	235.7530	207.8600	201.8105	182.2200	180.2523	187.2975	189.1967	210.4917	223.1779	248.2693 (64)
Efficiency of water heater	86.7485	86.4468	85.9054	84.7828	82.9020	80.3000	80.3000	80.3000	80.3000	84.8003	86.2734	80.3000 (216)
(217)m	86.7485	86.4468	85.9054	84.7828	82.9020	80.3000	80.3000	80.3000	80.3000	84.8003	86.2734	86.8045 (217)
Fuel for water heating, kWh/month	289.2300	256.5903	274.4334	245.1677	243.4325	226.9240	224.4736	233.2471	235.6124	248.2203	258.6868	286.0098 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	29.8738	23.9658	21.5786	15.8094	12.2116	9.9770	11.1399	14.4800	18.8081	24.6772	27.8729	30.7040 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-52.8854	-73.4638	-104.0484	-115.1827	-122.6494	-113.8542	-112.3551	-106.7623	-96.7544	-83.0538	-57.7134	-45.8442 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-33.3119	-69.6518	-137.6948	-205.7783	-271.1523	-272.1759	-269.0570	-228.3129	-167.9596	-99.3653	-44.3881	-26.3822 (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	4280.0800 (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	3022.0278 (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)	241.0984 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2909.7972 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4719.4090 (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	4280.0800	0.2100	898.8168 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3022.0278	0.2100	634.6258 (264)
Space and water heating			1533.4427 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	241.0984	0.1443	34.7979 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1084.5672	0.1349	-146.3328
PV Unit electricity exported	-1825.2301	0.1260	-230.0461
Total			-376.3789 (269)
Total CO2, kg/year			1203.7910 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.2200 (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	4280.0800	1.1300	4836.4905 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3022.0278	1.1300	3414.8915 (278)
Space and water heating			8251.3819 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	241.0984	1.5338	369.8048 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1084.5672	1.4987	-1625.4088
PV Unit electricity exported	-1825.2301	0.4626	-844.4382
Total			-2469.8469 (283)
Total Primary energy kWh/year			6281.4405 (286)
Target Primary Energy Rate (TPER)			53.3500 (287)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 24			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	94 A	DER	10.22	TER	10.22		
Environmental	90 B	% DER < TER				0.00	
CO ₂ Emissions (t/year)	1.16	DFEE	35.09	TFEE	38.72		
Compliance Check	See BREL	% DFEE < TFEE				9.39	
% DPER < TPER	0.26	DPER	53.21	TPER	53.35		
Assessor Details	Miss Victoria Gartside				Assessor ID	AL30-0001	
Client							

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

1. Overall dwelling characteristics

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

2. Ventilation rate

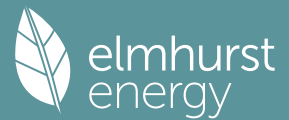
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1356 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3356 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3356 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4279	0.4195	0.4111	0.3692	0.3608	0.3188	0.3188	0.3104	0.3356	0.3608	0.3776	0.3944 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5916	0.5880	0.5845	0.5681	0.5651	0.5508	0.5508	0.5482	0.5563	0.5651	0.5713	0.5778 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.30)			22.9500	1.2357	28.3603		(27)
Door			2.1400	1.1000	2.3540		(26a)
Ground Floor			58.8700	0.1300	7.6531	75.0000	4415.2500 (28a)
External Wall	154.3100	25.0900	129.2200	0.1900	24.5518	110.0000	14214.2000 (29a)
Plane Roof	58.8700		58.8700	0.0900	5.2983	9.0000	529.8300 (30)
Total net area of external elements Aum(A, m ²)			272.0500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		68.2175		(33)
Studs			198.6000			9.0000	1787.4000 (32c)
Block			33.7000			75.0000	2527.5000 (32c)
Internal Floor 1			58.8700			18.0000	1059.6600 (32d)
Internal Ceiling 1			58.8700			9.0000	529.8300 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	25063.6700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							212.8730 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				17.7600	0.0240	0.4262	

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E3 Sill	14.9300	0.0210	0.3135
E4 Jamb	38.4000	0.0160	0.6144
E5 Ground floor (normal)	30.8000	0.0920	2.8336
E10 Eaves (insulation at ceiling level)	16.7000	0.0580	0.9686
E16 Corner (normal)	20.0400	0.0470	0.9419
E6 Intermediate floor within a dwelling	30.8000	0.0010	0.0308
E12 Gable (insulation at ceiling level)	14.1000	0.0570	0.8037
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.9328 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	75.1502 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	57.5761	57.2300	56.8909	55.2977	54.9997	53.6121	53.6121	53.3552	54.1466	54.9997	55.6027	56.2331
Average = Sum(39)m / 12 =	132.7263	132.3803	132.0411	130.4480	130.1499	128.7623	128.7623	128.5054	129.2968	130.1499	130.7529	131.3833
												130.4465
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1273	1.1243	1.1215	1.1079	1.1054	1.0936	1.0936	1.0914	1.0982	1.1054	1.1105	1.1159
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8541 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	31.1176	30.6554	30.0046	28.8047	27.9062	26.9099	26.3718	27.0180	27.7216	28.7877	30.0124	31.0124	(42b)
Hot water usage for other uses	43.8593	42.2644	40.6695	39.0746	37.4797	35.8849	35.8849	37.4797	39.0746	40.6695	42.2644	43.8593	(42c)
Average daily hot water use (litres/day)													68.7230 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	74.9769	72.9198	70.6742	67.8793	65.3860	62.7948	62.2566	64.4977	66.7963	69.4572	72.2767	74.8717	(44)
Energy content (annual)	118.7450	103.8369	108.6235	92.9234	88.0221	77.2135	75.2940	79.8617	82.3665	94.2528	102.9715	117.2309	(45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	100.9333	88.2613	92.3300	78.9849	74.8188	65.6315	63.9999	67.8824	70.0115	80.1149	87.5258	99.6463	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	100.9333	88.2613	92.3300	78.9849	74.8188	65.6315	63.9999	67.8824	70.0115	80.1149	87.5258	99.6463	(64)
12Total per year (kWh/year)													970.1405 (64)
Electric shower(s)	57.7196	51.4286	56.1581	53.5910	54.5966	52.0799	53.8158	54.5966	53.5910	56.1581	55.1021	57.7196	(64a)
Heat gains from water heating, kWh/month	39.6632	34.9225	37.1220	33.1440	32.3538	29.4278	29.4539	30.6198	30.9006	34.0682	35.6570	39.3415	(65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													656.5570 (64a)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	143.7758	159.1803	143.7758	148.5683	143.7758	148.5683	143.7758	143.7758	148.5683	143.7758	148.5683	143.7758	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	282.2411	285.1699	277.7895	262.0774	242.2438	223.6029	211.1497	208.2209	215.6013	231.3134	251.1471	269.7879	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	(71)
Water heating gains (Table 5)	53.3108	51.9680	49.8952	46.0333	43.4863	40.8720	39.5886	41.1556	42.9175	45.7906	49.5236	52.8783	(72)
Total internal gains	545.1398	562.1303	537.2726	522.4911	495.3180	478.8553	460.3262	458.9644	472.8993	486.6920	515.0511	532.2541	(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				1.4200	10.6334	0.7300	0.7000	0.7700	5.3471 (74)				
East				6.5000	19.6403	0.7300	0.7000	0.7700	45.2079 (76)				
South				10.4700	46.7521	0.7300	0.7000	0.7700	173.3411 (78)				
West				4.5600	19.6403	0.7300	0.7000	0.7700	31.7151 (80)				
Solar gains	255.6112	444.5844	626.8023	798.0274	906.4139	903.5223	869.7046	789.5138	686.8546	496.9184	307.9786	217.4980	(83)
Total gains	800.7510	1006.7148	1164.0749	1320.5185	1401.7319	1382.3776	1330.0308	1248.4782	1159.7538	983.6103	823.0297	749.7522	(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	52.4548	52.5919	52.7270	53.3709	53.4932	54.0696	54.0696	54.1777	53.8461	53.4932	53.2465	52.9910
alpha	4.4970	4.5061	4.5151	4.5581	4.5662	4.6046	4.6046	4.6118	4.5897	4.5662	4.5498	4.5327
util living area												
	0.9934	0.9817	0.9557	0.8848	0.7555	0.5726	0.4211	0.4654	0.7000	0.9234	0.9849	0.9950 (86)
MIT	19.5272	19.8147	20.1677	20.5733	20.8423	20.9660	20.9933	20.9895	20.9163	20.5364	19.9529	19.4820 (87)
Th 2	19.9786	19.9810	19.9833	19.9944	19.9964	20.0061	20.0061	20.0078	20.0023	19.9964	19.9922	19.9879 (88)
util rest of house												
	0.9916	0.9768	0.9438	0.8555	0.7002	0.4927	0.3284	0.3689	0.6216	0.8969	0.9800	0.9936 (89)
MIT 2	18.6448	18.9304	19.2759	19.6639	19.8940	19.9904	20.0042	20.0047	19.9582	19.6417	19.0779	18.6069 (90)
Living area fraction									fLA = Living area / (4) =			0.1261 (91)
MIT	18.7561	19.0419	19.3884	19.7786	20.0136	20.1135	20.1289	20.1289	20.0791	19.7546	19.1883	18.7173 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7561	19.0419	19.3884	19.7786	20.0136	20.1135	20.1289	20.1289	20.0791	19.7546	19.1883	18.7173 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9885	0.9708	0.9351	0.8483	0.7012	0.5017	0.3400	0.3809	0.6280	0.8892	0.9747	0.9911 (94)
Useful gains	791.5075	977.3227	1088.5598	1120.1813	982.8785	693.4779	452.2605	475.5980	728.3796	874.6097	802.2147	743.1076 (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	1918.7003	1872.1114	1701.7982	1419.0966	1082.0196	709.9251	454.3946	479.1811	773.0736	1191.4639	1580.5784	1907.3296 (97)
Space heating kWh	838.6315	601.2980	456.2494	215.2190	73.7610	0.0000	0.0000	0.0000	0.0000	235.7395	560.4218	866.1812 (98a)
Space heating requirement - total per year (kWh/year)												3847.5014
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	838.6315	601.2980	456.2494	215.2190	73.7610	0.0000	0.0000	0.0000	0.0000	235.7395	560.4218	866.1812 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3847.5014
Space heating per m2										(98c) / (4) =		32.6779 (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	1210.3659	952.8413	976.6409	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9074	0.9507	0.9344	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1098.2650	905.8376	912.6055	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1555.3144	1496.9300	1404.4719	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	329.0756	439.7727	365.9486	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	82.2689	109.9432	91.4871	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												283.6992 (107)
Energy for space heating												32.6779 (99)
Energy for space cooling												2.4095 (108)
Total												35.0875 (109)
Fabric Energy Efficiency (DFEE)												35.1 (109)

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

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	58.8700 (1b)	x	2.3900 (2b) = 140.6993 (1b) - (3b)
First floor	58.8700 (1c)	x	2.6200 (2c) = 154.2394 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	117.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	294.9387 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
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) = 40.0000 / (5) = 0.1356 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 5.0000 (17)
Infiltration rate 0.3856 (18)
Number of sides sheltered 0 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3856 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4917	0.4820	0.4724	0.4242	0.4145	0.3663	0.3663	0.3567	0.3856	0.4145	0.4338	0.4531	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													(23c)
Effective ac	0.6209	0.6162	0.6116	0.5900	0.5859	0.5671	0.5671	0.5636	0.5744	0.5859	0.5941	0.6027	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Semi-glazed door			2.1400	1.0000	2.1400			(26a)
TER Opening Type (Uw = 1.20)			22.9500	1.1450	26.2786			(27)
Ground Floor			58.8700	0.1300	7.6531			(28a)
External Wall	154.3100	25.0900	129.2200	0.1800	23.2596			(29a)
Plane Roof	58.8700		58.8700	0.1100	6.4757			(30)
Total net area of external elements Aum (A, m2)			272.0500					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 65.8070			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 212.8730 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	17.7600	0.0500	0.8880	
E3 Sill	14.9300	0.0500	0.7465	
E4 Jamb	38.4000	0.0500	1.9200	
E5 Ground floor (normal)	30.8000	0.1600	4.9280	
E10 Eaves (insulation at ceiling level)	16.7000	0.0600	1.0020	
E16 Corner (normal)	20.0400	0.0900	1.8036	
E6 Intermediate floor within a dwelling	30.8000	0.0000	0.0000	
E12 Gable (insulation at ceiling level)	14.1000	0.0600	0.8460	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 12.1341 (36)

Point Thermal Bridges

Total fabric heat loss (33) + (36) + (36a) = 77.9411 (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	
	60.4290	59.9722	59.5244	57.4212	57.0277	55.1960	55.1960	54.8567	55.9015	57.0277	57.8238	58.6560	(38)
Heat transfer coeff	138.3701	137.9133	137.4655	135.3624	134.9689	133.1371	133.1371	132.7979	133.8427	134.9689	135.7649	136.5971	(39)
Average = Sum(39)m / 12 =												135.3605	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	1.1752	1.1713	1.1675	1.1497	1.1463	1.1308	1.1308	1.1279	1.1368	1.1463	1.1531	1.1602	(40)
HLP (average)												1.1497	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

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

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	74.9769	72.9198	70.6742	67.8793	65.3860	62.7948	62.2566	64.4977	66.7963	69.4572	72.2767	74.8717	(44)
Energy conte	118.7450	103.8369	108.6235	92.9234	88.0221	77.2135	75.2940	79.8617	82.3665	94.2528	102.9715	117.2309	(45)
Energy content (annual)										Total = Sum(45)m =		1141.3417	

Distribution loss (46)m = 0.15 x (45)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (46)

Water storage loss:

Total storage loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (56)

If cylinder contains dedicated solar storage

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Total heat required for water heating calculated for each month	100.9333	88.2613	92.3300	78.9849	74.8188	65.6315	63.9999	67.8824	70.0115	80.1149	87.5258	99.6463	(62)

WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h	100.9333	88.2613	92.3300	78.9849	74.8188	65.6315	63.9999	67.8824	70.0115	80.1149	87.5258	99.6463	(64)
										Total per year (kWh/year) = Sum(64)m =		970.1405	(64)

12Total per year (kWh/year) 970.1405 (64)

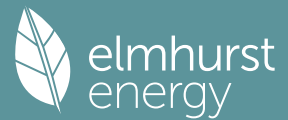
Electric shower(s) 57.7196 51.4286 56.1581 53.5910 54.5966 52.0799 53.8158 54.5966 53.5910 56.1581 55.1021 57.7196 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 656.5570 (64a)

Heat gains from water heating, kWh/month 39.6632 34.9225 37.1220 33.1440 32.3538 29.4278 29.4539 30.6198 30.9006 34.0682 35.6570 39.3415 (65)

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

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Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	143.7758	159.1803	143.7758	148.5683	143.7758	148.5683	143.7758	143.7758	148.5683	143.7758	148.5683	143.7758 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	282.2411	285.1699	277.7895	262.0774	242.2438	223.6029	211.1497	208.2209	215.6013	231.3134	251.1471	269.7879 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657 (71)
Water heating gains (Table 5)												
	53.3108	51.9680	49.8952	46.0333	43.4863	40.8720	39.5886	41.1556	42.9175	45.7906	49.5236	52.8783 (72)
Total internal gains												
	545.1398	562.1303	537.2726	522.4911	495.3180	478.8553	460.3262	458.9644	472.8993	486.6920	515.0511	532.2541 (73)

6. Solar gains

[Jan]		Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North		1.4200	10.6334	0.6300	0.7000	0.7700	4.6146 (74)
East		6.5000	19.6403	0.6300	0.7000	0.7700	39.0151 (76)
South		10.4700	46.7521	0.6300	0.7000	0.7700	149.5958 (78)
West		4.5600	19.6403	0.6300	0.7000	0.7700	27.3706 (80)
Solar gains							
	220.5960	383.6824	540.9390	688.7085	782.2476	779.7521	750.5670
Total gains							
	765.7358	945.8128	1078.2116	1211.1997	1277.5656	1258.6075	1210.8932

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	50.3153	50.4819	50.6464	51.4333	51.5832	52.2929	52.2929	52.4265	52.0173	51.5832	51.2808	50.9684
alpha	4.3544	4.3655	4.3764	4.4289	4.4389	4.4862	4.4862	4.4951	4.4678	4.4389	4.4187	4.3979
util living area												
	0.9945	0.9860	0.9676	0.9151	0.8089	0.6339	0.4740	0.5202	0.7543	0.9422	0.9880	0.9958 (86)
MIT												
	19.4101	19.6774	20.0236	20.4537	20.7710	20.9439	20.9877	20.9816	20.8762	20.4414	19.8499	19.3757 (87)
Th 2												
	19.9399	19.9430	19.9461	19.9605	19.9632	19.9758	19.9758	19.9781	19.9709	19.9632	19.9577	19.9520 (88)
util rest of house												
	0.9930	0.9821	0.9583	0.8907	0.7568	0.5482	0.3684	0.4119	0.6761	0.9203	0.9840	0.9946 (89)
MIT 2												
	18.4993	18.7663	19.1083	19.5289	19.8100	19.9492	19.9723	19.9725	19.9034	19.5284	18.9502	18.4742 (90)
Living area fraction												
									fLA = Living area / (4) =			
MIT	18.6142	18.8812	19.2237	19.6455	19.9312	20.0746	20.1004	20.0997	20.0261	19.6435	19.0637	0.1261 (91)
Temperature adjustment												
												0.0000
adjusted MIT												
	18.6142	18.8812	19.2237	19.6455	19.9312	20.0746	20.1004	20.0997	20.0261	19.6435	19.0637	18.5879 (93)

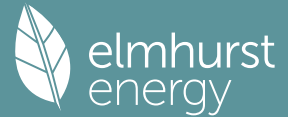
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9902	0.9768	0.9501	0.8819	0.7550	0.5570	0.3816	0.4252	0.6808	0.9118	0.9792	0.9923 (94)
Useful gains	758.1965	923.8285	1024.4456	1068.2087	964.5864	701.0287	462.0584	484.9037	725.4953	834.8040	764.5973	714.4239 (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												
	1980.6576	1928.1905	1749.0714	1454.5422	1110.9544	728.8758	466.0333	491.3180	793.1695	1220.5972	1624.2500	1965.3432 (97)
Space heating kWh												
	909.5111	674.9313	539.1216	278.1601	108.8978	0.0000	0.0000	0.0000	0.0000	287.0301	618.9499	930.6840 (98a)
Space heating requirement - total per year (kWh/year)												
												4347.2859
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												
	909.5111	674.9313	539.1216	278.1601	108.8978	0.0000	0.0000	0.0000	0.0000	287.0301	618.9499	930.6840 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												
												4347.2859
Space heating per m ²												
										(98c) / (4) =		36.9228 (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	1251.4887	985.2145	1009.2639	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.8630	0.9214	0.8999	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	1080.0872	907.7501	908.2198	0.0000	0.0000	0.0000	0.0000 (102)
Total gains												
	0.0000	0.0000	0.0000	0.0000	0.0000	1410.6479	1357.6783	1278.0598	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	238.0037	334.7466	275.1609	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												
									fc = cooled area / (4) =			
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	59.5009	83.6866	68.7902	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												
												211.9778 (107)
Energy for space heating												
												36.9228 (99)
Energy for space cooling												
												1.8004 (108)
Total												
												38.7231 (109)
Fabric Energy Efficiency (TFEE)												
												38.7 (109)

Full SAP Calculation Printout



Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024
Assessment Reference	Plot 24		Prop Type Ref	SAP VG 21-0282		
Property						
SAP Rating	94 A	DER	10.22	TER	10.22	
Environmental	90 B	% DER < TER				0.00
CO ₂ Emissions (t/year)	1.16	DFEE	35.09	TFEE	38.72	
Compliance Check	See BREL	% DFEE < TFEE				9.39
% DPER < TPER	0.26	DPER	53.21	TPER	53.35	
Assessor Details	Miss Victoria Gartside				Assessor ID	AL30-0001
Client						

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

1. Overall dwelling characteristics

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

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	5 * 10 = 50.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	50.0000 / (5) = 0.1695 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3695 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3695 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4711	0.4619	0.4527	0.4065	0.3972	0.3511	0.3511	0.3418	0.3695	0.3972	0.4157	0.4342 (22b)
Effective ac	0.6110	0.6067	0.6025	0.5826	0.5789	0.5616	0.5616	0.5584	0.5683	0.5789	0.5864	0.5943 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (U _w = 1.30)			22.9500	1.2357	28.3603		(27)
Door			2.1400	1.1000	2.3540		(26a)
Ground Floor			58.8700	0.1300	7.6531	75.0000	4415.2500 (28a)
External Wall	154.3100	25.0900	129.2200	0.1900	24.5518	110.0000	14214.2000 (29a)
Plane Roof	58.8700		58.8700	0.0900	5.2983	9.0000	529.8300 (30)
Total net area of external elements A _{um} (A, m ²)			272.0500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	68.2175			(33)
Studs			198.6000			9.0000	1787.4000 (32c)
Block			33.7000			75.0000	2527.5000 (32c)
Internal Floor 1			58.8700			18.0000	1059.6600 (32d)
Internal Ceiling 1			58.8700			9.0000	529.8300 (32e)
Heat capacity C _m = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =				25063.6700 (34)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							212.8730 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				17.7600	0.0240	0.4262	
E3 Sill				14.9300	0.0210	0.3135	
E4 Jamb				38.4000	0.0160	0.6144	

elmhurst
energy

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	51.7178	51.8795	52.0389	52.8011	52.9462	53.6323	53.6323	53.7613	53.3659	52.9462	52.6535	52.3509	
alpha	4.4479	4.4586	4.4693	4.5201	4.5297	4.5755	4.5755	4.5841	4.5577	4.5297	4.5102	4.4901	
util living area	0.9913	0.9778	0.9493	0.8755	0.7448	0.5636	0.4145	0.4566	0.6878	0.9138	0.9812	0.9933 (86)	
MIT	19.8501	20.0634	20.3242	20.6224	20.8177	20.9079	20.9275	20.9250	20.8724	20.5992	20.1703	19.8196 (87)	
Th 2	19.9656	19.9685	19.9713	19.9846	19.9871	19.9988	19.9988	20.0009	19.9943	19.9871	19.9821	19.9768 (88)	
util rest of house	0.9889	0.9720	0.9359	0.8446	0.6886	0.4839	0.3225	0.3611	0.6088	0.8848	0.9751	0.9914 (89)	
MIT 2	18.6264	18.8982	19.2249	19.5917	19.8052	19.8976	19.9103	19.9114	19.8672	19.5762	19.0465	18.5963 (90)	
Living area fraction									fLA = Living area / (4) =				0.1261 (91)
MIT	18.7808	19.0451	19.3636	19.7217	19.9329	20.0250	20.0386	20.0393	19.9939	19.7052	19.1883	18.7506 (92)	
Temperature adjustment												-0.1500	
adjusted MIT	18.6308	18.8951	19.2136	19.5717	19.7829	19.8750	19.8886	19.8893	19.8439	19.5552	19.0383	18.6006 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9845	0.9638	0.9236	0.8300	0.6761	0.4737	0.3122	0.3501	0.5960	0.8695	0.9675	0.9878 (94)
Useful gains	847.7380	1027.0864	1126.6734	1136.0472	977.3759	671.8917	425.4489	449.4128	713.5968	895.1838	847.6286	799.2175 (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	1929.1734	1878.1232	1700.9093	1407.1210	1062.8538	684.7632	426.8979	451.8641	749.3558	1177.5630	1578.5412	1915.1299 (97)
Space heating kWh	804.5880	571.8968	427.2315	195.1732	63.5956	0.0000	0.0000	0.0000	0.0000	210.0901	526.2570	830.2388 (98a)
Space heating requirement - total per year (kWh/year)												3629.0709
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	804.5880	571.8968	427.2315	195.1732	63.5956	0.0000	0.0000	0.0000	0.0000	210.0901	526.2570	830.2388 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3629.0709
Space heating per m2										(98c) / (4) =		30.8228 (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	804.5880	571.8968	427.2315	195.1732	63.5956	0.0000	0.0000	0.0000	0.0000	210.0901	526.2570	830.2388	(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)	909.1389	646.2110	482.7474	220.5347	71.8594	0.0000	0.0000	0.0000	0.0000	237.3899	594.6407	938.1230	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	252.4334	222.5219	234.6712	202.3022	193.3491	171.2346	166.8657	175.1916	178.9868	203.1580	220.3773	249.1571	(64)
Efficiency of water heater	88.1371	88.0747	87.9623	87.7301	87.3665	87.0000	87.0000	87.0000	87.0000	87.7562	88.0519	88.1492	(216)
Fuel for water heating, kWh/month	286.4100	252.6514	266.7861	230.5960	221.3081	196.8213	191.7996	201.3696	205.7320	231.5028	250.2811	282.6538	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	29.2632	23.4760	21.1375	15.4863	11.9620	9.7731	10.9122	14.1840	18.4237	24.1729	27.3032	30.0765	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-47.1523	-65.0301	-91.1628	-100.7104	-107.8811	-100.4643	-99.3309	-94.2100	-85.4593	-73.5480	-51.4472	-41.0367	(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	-26.9992	-54.4952	-102.4089	-146.1699	-187.6680	-186.5897	-185.3899	-160.5795	-122.9001	-76.4169	-35.6478	-21.6112	(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												4100.6451	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.0000	
Water heating fuel used												2817.9119	(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)												236.1705	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2264.3094	(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	4976.4180 (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	4100.6451	0.2100	861.1355 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2817.9119	0.2100	591.7615 (264)
Space and water heating			1452.8970 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	236.1705	0.1443	34.0867 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-957.4332	0.1349	-129.1995
PV Unit electricity exported	-1306.8762	0.1272	-166.2553
Total			-295.4548 (269)
Total CO2, kg/year			1203.4581 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.2200 (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	4100.6451	1.1300	4633.7290 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2817.9119	1.1300	3184.2404 (278)
Space and water heating			7817.9694 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	236.1705	1.5338	362.2461 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-957.4332	1.4987	-1434.9492
PV Unit electricity exported	-1306.8762	0.4670	-610.3435
Total			-2045.2927 (283)
Total Primary energy kWh/year			6265.0236 (286)
Dwelling Primary energy Rate (DPER)			53.2100 (287)

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

1. Overall dwelling characteristics

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

2. Ventilation rate

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1356 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3856	(18)
Number of sides sheltered	0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3856 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000	(22)
Wind factor	1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1250 1.1750	(22a)
Adj infilt rate	0.4917 0.4820 0.4724 0.4242 0.4145 0.3663 0.3663 0.3567 0.3856 0.4145 0.4338 0.4531	(22b)
Effective ac	0.6209 0.6162 0.6116 0.5900 0.5859 0.5671 0.5671 0.5636 0.5744 0.5859 0.5941 0.6027	(25)

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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)			22.9500	1.1450	26.2786			(27)
Ground Floor			58.8700	0.1300	7.6531			(28a)
External Wall	154.3100	25.0900	129.2200	0.1800	23.2596			(29a)
Plane Roof	58.8700		58.8700	0.1100	6.4757			(30)
Total net area of external elements Aum(A, m2)			272.0500					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	65.8070		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 212.8730 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element	17.7600	0.0500	0.8880	
E2 Other lintels (including other steel lintels)	14.9300	0.0500	0.7465	
E3 Sill	38.4000	0.0500	1.9200	
E4 Jamb	30.8000	0.1600	4.9280	
E5 Ground floor (normal)	16.7000	0.0600	1.0020	
E10 Eaves (insulation at ceiling level)	20.0400	0.0900	1.8036	
E16 Corner (normal)	30.8000	0.0000	0.0000	
E6 Intermediate floor within a dwelling	14.1000	0.0600	0.8460	
E12 Gable (insulation at ceiling level)				

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

Point Thermal bridges	(36a) =	0.0000	12.1341 (36)
Total fabric heat loss	(33) + (36) + (36a) =	77.9411	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	60.4290	59.9722	59.5244	57.4212	57.0277	55.1960	55.1960	54.8567	55.9015	57.0277	57.8238	58.6560	(38)
Heat transfer coeff	138.3701	137.9133	137.4655	135.3624	134.9689	133.1371	133.1371	132.7979	133.8427	134.9689	135.7649	136.5971	(39)
Average = Sum(39)m / 12 =												135.3605	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1752	1.1713	1.1675	1.1497	1.1463	1.1308	1.1308	1.1279	1.1368	1.1463	1.1531	1.1602	(40)
HLP (average)												1.1497	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

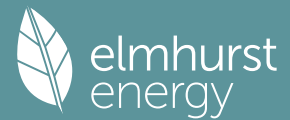
Assumed occupancy													2.8541 (42)
Hot water usage for mixer showers													
72.0744	70.9913	69.4129	66.3930	64.1645	61.6791	60.2665	61.8329	63.5500	66.2184	69.3032	71.7983	(42a)	
Hot water usage for baths													
31.1176	30.6554	30.0046	28.8047	27.9062	26.9099	26.3718	27.0180	27.7216	28.7877	30.0124	31.0124	(42b)	
Hot water usage for other uses													
43.8593	42.2644	40.6695	39.0746	37.4797	35.8849	35.8849	37.4797	39.0746	40.6695	42.2644	43.8593	(42c)	
Average daily hot water use (litres/day)												135.1732	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.0513	143.9111	140.0871	134.2724	129.5504	124.4739	122.5231	126.3306	130.3462	135.6756	141.5799	146.6699	(44)
Energy conte	232.8933	204.9275	215.3086	183.8122	174.3997	153.0552	148.1811	156.4237	160.7299	184.1106	201.7065	229.6496	(45)
Energy content (annual)										Total = Sum(45)m =		2245.1980	
Distribution loss (46)m = 0.15 x (45)m													
34.9340	30.7391	32.2963	27.5718	26.1600	22.9583	22.2272	23.4636	24.1095	27.6166	30.2560	34.4474	(46)	
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
283.8522	250.9549	266.2675	233.1272	225.3587	202.3703	199.1400	207.3826	210.0450	235.0695	251.0216	280.6085	(62)	
WWHRS	-32.9494	-29.1407	-30.5145	-25.2672	-23.5481	-20.1503	-18.8877	-20.0852	-20.8483	-24.5778	-27.8437	-32.3392	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	250.9027	221.8142	235.7530	207.8600	201.8105	182.2200	180.2523	187.2975	189.1967	210.4917	223.1779	248.2693	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2539.0459	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)
Heat gains from water heating, kWh/month	90.1767	79.6452	84.3298	73.4463	70.7276	63.2196	62.0099	64.7506	65.7715	73.9565	79.3962	89.0982	(65)

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

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	143.7758	159.1803	143.7758	148.5683	143.7758	148.5683	143.7758	143.7758	148.5683	143.7758	148.5683	143.7758	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	282.2411	285.1699	277.7895	262.0774	242.2438	223.6029	211.1497	208.2209	215.6013	231.3134	251.1471	269.7879	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	37.2707	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	(71)
Water heating gains (Table 5)	121.2053	118.5197	113.3466	102.0088	95.0640	87.8050	83.3467	87.0304	91.3493	99.4039	110.2725	119.7557	(72)
Total internal gains	616.0343	631.6821	603.7239	581.4666	549.8957	525.7884	504.0843	504.8392	521.3310	543.3052	578.8000	602.1315	(73)

6. Solar gains

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[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W	
North	1.4200				10.6334		0.6300		0.7000	0.7700	4.6146 (74)	
East	6.5000				19.6403		0.6300		0.7000	0.7700	39.0151 (76)	
South	10.4700				46.7521		0.6300		0.7000	0.7700	149.5958 (78)	
West	4.5600				19.6403		0.6300		0.7000	0.7700	27.3706 (80)	
Solar gains	220.5960	383.6824	540.9390	688.7085	782.2476	779.7521	750.5670	681.3612	592.7649	428.8473	265.7898	187.7038 (83)
Total gains	836.6303	1015.3645	1144.6630	1270.1752	1332.1433	1305.5405	1254.6513	1186.2004	1114.0959	972.1525	844.5898	789.8353 (84)
7. Mean internal temperature (heating season)												
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan 50.3153	Feb 50.4819	Mar 50.6464	Apr 51.4333	May 51.5832	Jun 52.2929	Jul 52.2929	Aug 52.4265	Sep 52.0173	Oct 51.5832	Nov 51.2808	Dec 50.9684
alpha	4.3544	4.3655	4.3764	4.4289	4.4389	4.4862	4.4862	4.4951	4.4678	4.4389	4.4187	4.3979
util living area	0.9923	0.9819	0.9604	0.9027	0.7911	0.6157	0.4586	0.5020	0.7333	0.9304	0.9840	0.9940 (86)
MIT	19.4806	19.7435	20.0812	20.4932	20.7921	20.9500	20.9892	20.9840	20.8898	20.4846	19.9113	19.4458 (87)
Th 2	19.9399	19.9430	19.9461	19.9605	19.9632	19.9758	19.9758	19.9781	19.9709	19.9632	19.9577	19.9520 (88)
util rest of house	0.9902	0.9769	0.9494	0.8760	0.7372	0.5309	0.3559	0.3966	0.6540	0.9052	0.9787	0.9923 (89)
MIT 2	18.1810	18.5162	18.9415	19.4515	19.7868	19.9457	19.9719	19.9719	19.8951	19.4549	18.7420	18.1450 (90)
Living area fraction	fLA = Living area / (4) = 0.1261 (91)											
MIT	18.3449	18.6710	19.0853	19.5829	19.9136	20.0724	20.1002	20.0995	20.0205	19.5848	18.8895	18.3091 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.3449	18.6710	19.0853	19.5829	19.9136	20.0724	20.1002	20.0995	20.0205	19.5848	18.8895	18.3091 (93)
8. Space heating requirement												
Utilisation	Jan 0.9853	Feb 0.9687	Mar 0.9377	Apr 0.8645	May 0.7344	Jun 0.5393	Jul 0.3687	Aug 0.4095	Sep 0.6582	Oct 0.8937	Nov 0.9711	Dec 0.9882 (94)
Useful gains	824.3558	983.5518	1073.3913	1098.0685	978.2987	704.0563	462.5524	485.7735	733.3170	868.8336	820.1608	780.5394 (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	1943.3943	1899.1973	1730.0419	1446.0640	1108.5761	728.5740	466.0120	491.2908	792.4213	1212.6618	1600.5968	1927.2630 (97)
Space heating kWh	832.5646	615.3137	488.5480	250.5568	96.9264	0.0000	0.0000	0.0000	0.0000	255.8082	561.9139	853.1624 (98a)
Space heating requirement - total per year (kWh/year)	3954.7940											
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	832.5646	615.3137	488.5480	250.5568	96.9264	0.0000	0.0000	0.0000	0.0000	255.8082	561.9139	853.1624 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	3954.7940											
Space heating per m2	(98c) / (4) = 33.5892 (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)
Space heating requirement	Jan 832.5646	Feb 615.3137	Mar 488.5480	Apr 250.5568	May 96.9264	Jun 0.0000	Jul 0.0000	Aug 0.0000	Sep 0.0000	Oct 255.8082	Nov 561.9139	Dec 853.1624 (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)	901.0440	665.9239	528.7316	271.1653	104.8987	0.0000	0.0000	0.0000	0.0000	276.8487	608.1319	923.3359 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating	250.9027	221.8142	235.7530	207.8600	201.8105	182.2200	180.2523	187.2975	189.1967	210.4917	223.1779	248.2693 (64)
Water heating requirement	86.7485	86.4468	85.9054	84.7828	82.9020	80.3000	80.3000	80.3000	80.3000	84.8003	86.2734	86.8045 (216)
Efficiency of water heater (217)m	289.2300	256.5903	274.4334	245.1677	243.4325	226.9240	224.4736	233.2471	235.6124	248.2203	258.6868	286.0098 (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	29.8738	23.9658	21.5786	15.8094	12.2116	9.9770	11.1399	14.4800	18.8081	24.6772	27.8729	30.7040 (232)
Lighting	Electricity generated by PVs (Appendix M) (negative quantity)											
Electricity generated by PVs (Appendix M) (negative quantity)	(233a)m	-52.8854	-73.4638	-104.0484	-115.1827	-122.6494	-113.8542	-112.3551	-106.7623	-96.7544	-83.0538	-57.7134 -45.8442 (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 (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 (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 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	(233b)m	-33.3119	-69.6518	-137.6948	-205.7783	-271.1523	-272.1759	-269.0570	-228.3129	-167.9596	-99.3653	-44.3881 -26.3822 (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 (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 (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 (235d)
Annual totals kWh/year												

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Space heating fuel - main system 1	4280.0800 (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	3022.0278 (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)	241.0984 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2909.7972 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4719.4090 (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	4280.0800	0.2100	898.8168 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3022.0278	0.2100	634.6258 (264)
Space and water heating			1533.4427 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	241.0984	0.1443	34.7979 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1084.5672	0.1349	-146.3328
PV Unit electricity exported	-1825.2301	0.1260	-230.0461
Total			-376.3789 (269)
Total CO2, kg/year			1203.7910 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.2200 (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	4280.0800	1.1300	4836.4905 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3022.0278	1.1300	3414.8915 (278)
Space and water heating			8251.3819 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	241.0984	1.5338	369.8048 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1084.5672	1.4987	-1625.4088
PV Unit electricity exported	-1825.2301	0.4626	-844.4382
Total			-2469.8469 (283)
Total Primary energy kWh/year			6281.4405 (286)
Target Primary Energy Rate (TPER)			53.3500 (287)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024
Assessment Reference	Plot 24		Prop Type Ref	SAP VG 21-0282		
Property						
SAP Rating	94 A	DER	10.22	TER	10.22	
Environmental	90 B	% DER < TER				0.00
CO ₂ Emissions (t/year)	1.16	DFEE	35.09	TFEE	38.72	
Compliance Check	See BREL	% DFEE < TFEE				9.39
% DPER < TPER	0.26	DPER	53.21	TPER	53.35	
Assessor Details	Miss Victoria Gartside				Assessor ID	AL30-0001
Client						

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

1. Overall dwelling characteristics

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

2. Ventilation rate

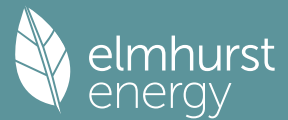
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	5 * 10 = 50.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	50.0000 / (5) = 0.1695 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3695 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3695 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4711	0.4619	0.4527	0.4065	0.3972	0.3511	0.3511	0.3418	0.3695	0.3972	0.4157	0.4342 (22b)
Effective ac	0.6110	0.6067	0.6025	0.5826	0.5789	0.5616	0.5616	0.5584	0.5683	0.5789	0.5864	0.5943 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (U _w = 1.30)			22.9500	1.2357	28.3603		(27)
Door			2.1400	1.1000	2.3540		(26a)
Ground Floor			58.8700	0.1300	7.6531	75.0000	4415.2500 (28a)
External Wall	154.3100	25.0900	129.2200	0.1900	24.5518	110.0000	14214.2000 (29a)
Plane Roof	58.8700		58.8700	0.0900	5.2983	9.0000	529.8300 (30)
Total net area of external elements A _{um} (A, m ²)			272.0500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	68.2175			(33)
Studs			198.6000			9.0000	1787.4000 (32c)
Block			33.7000			75.0000	2527.5000 (32c)
Internal Floor 1			58.8700			18.0000	1059.6600 (32d)
Internal Ceiling 1			58.8700			9.0000	529.8300 (32e)
Heat capacity C _m = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =				25063.6700 (34)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							212.8730 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				17.7600	0.0240	0.4262	
E3 Sill				14.9300	0.0210	0.3135	
E4 Jamb				38.4000	0.0160	0.6144	

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E5 Ground floor (normal)	30.8000	0.0920	2.8336
E10 Eaves (insulation at ceiling level)	16.7000	0.0580	0.9686
E16 Corner (normal)	20.0400	0.0470	0.9419
E6 Intermediate floor within a dwelling	30.8000	0.0010	0.0308
E12 Gable (insulation at ceiling level)	14.1000	0.0570	0.8037
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.9328 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	75.1502 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	59.4675	59.0480	58.6368	56.7056	56.3442	54.6622	54.6622	54.3507	55.3101	56.3442	57.0752	57.8394 (38)
Average = Sum(39)m / 12 =	134.6177	134.1982	133.7870	131.8558	131.4945	129.8124	129.8124	129.5009	130.4603	131.4945	132.2254	132.9896 (39)
												131.8541
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1433	1.1398	1.1363	1.1199	1.1168	1.1025	1.1025	1.0999	1.1080	1.1168	1.1230	1.1295 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.8541 (42)
Hot water usage for mixer showers												
	72.0744	70.9913	69.4129	66.3930	64.1645	61.6791	60.2665	61.8329	63.5500	66.2184	69.3032	71.7983 (42a)
Hot water usage for baths												
	31.1176	30.6554	30.0046	28.8047	27.9062	26.9099	26.3718	27.0180	27.7216	28.7877	30.0124	31.0124 (42b)
Hot water usage for other uses												
	43.8593	42.2644	40.6695	39.0746	37.4797	35.8849	35.8849	37.4797	39.0746	40.6695	42.2644	43.8593 (42c)
Average daily hot water use (litres/day)												135.1732 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	147.0513	143.9111	140.0871	134.2724	129.5504	124.4739	122.5231	126.3306	130.3462	135.6756	141.5799	146.6699 (44)
Energy conte	232.8933	204.9275	215.3086	183.8122	174.3997	153.0552	148.1811	156.4237	160.7299	184.1106	201.7065	229.6496 (45)
Energy content (annual)												Total = Sum(45)m = 2245.1980
Distribution loss (46)m = 0.15 x (45)m												
	34.9340	30.7391	32.2963	27.5718	26.1600	22.9583	22.2272	23.4636	24.1095	27.6166	30.2560	34.4474 (46)
Water storage loss:												
Total storage loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	19.5402	17.5944	19.3626	18.4900	18.9494	18.1794	18.6846	18.7678	18.2569	19.0475	18.6707	19.5074 (61)
Total heat required for water heating calculated for each month												
	252.4334	222.5219	234.6712	202.3022	193.3491	171.2346	166.8657	175.1916	178.9868	203.1580	220.3773	249.1571 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h												
	252.4334	222.5219	234.6712	202.3022	193.3491	171.2346	166.8657	175.1916	178.9868	203.1580	220.3773	249.1571 (64)
Electric shower(s)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
	82.3220	72.5370	76.4308	65.7401	62.7253	55.4357	53.9414	56.7028	58.0069	65.9786	71.7351	81.2354 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	33.4324	29.6943	24.1491	18.2824	13.6663	11.5377	12.4669	16.2049	21.7502	27.6168	32.2329	34.3616 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	421.2554	425.6267	414.6112	391.1603	361.5578	333.7357	315.1488	310.7775	321.7930	345.2439	374.8464	402.6685 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657 (71)
Water heating gains (Table 5)												
	110.6479	107.9419	102.7295	91.3056	84.3081	76.9940	72.5018	76.2135	80.5652	88.6810	99.6321	109.1873 (72)
Total internal gains												
	680.3975	678.3248	656.5516	615.8102	574.5941	534.3292	512.1793	515.2577	536.1702	576.6035	621.7732	661.2792 (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	1.4200		10.6334		0.7300		0.7000		0.7700		5.3471 (74)	
East	6.5000		19.6403		0.7300		0.7000		0.7700		45.2079 (76)	
South	10.4700		46.7521		0.7300		0.7000		0.7700		173.3411 (78)	
West	4.5600		19.6403		0.7300		0.7000		0.7700		31.7151 (80)	
Solar gains	255.6112	444.5844	626.8023	798.0274	906.4139	903.5223	869.7046	789.5138	686.8546	496.9184	307.9786	217.4980 (83)
Total gains	936.0088	1122.9093	1283.3539	1413.8375	1481.0080	1437.8515	1381.8839	1304.7715	1223.0248	1073.5219	929.7519	878.7773 (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	51.7178	51.8795	52.0389	52.8011	52.9462	53.6323	53.6323	53.7613	53.3659	52.9462	52.6535	52.3509
alpha	4.4479	4.4586	4.4693	4.5201	4.5297	4.5755	4.5755	4.5841	4.5577	4.5297	4.5102	4.4901
util living area	0.9881	0.9733	0.9404	0.8646	0.7332	0.5570	0.4090	0.4497	0.6773	0.9027	0.9766	0.9908 (86)
MIT	19.9053	20.1029	20.3620	20.6411	20.8249	20.9090	20.9278	20.9255	20.8760	20.6213	20.2079	19.8717 (87)
Th 2	19.9656	19.9685	19.9713	19.9846	19.9871	19.9988	19.9988	20.0009	19.9943	19.9871	19.9821	19.9768 (88)
util rest of house	0.9848	0.9664	0.9252	0.8322	0.6765	0.4779	0.3181	0.3553	0.5983	0.8713	0.9693	0.9882 (89)
MIT 2	18.6963	18.9473	19.2703	19.6121	19.8117	19.8983	19.9104	19.9116	19.8699	19.6006	19.0933	18.6624 (90)
Living area fraction									FLA = Living area / (4) =			0.1261 (91)
MIT	18.8488	19.0930	19.4080	19.7419	19.9395	20.0258	20.0387	20.0395	19.9968	19.7293	19.2339	18.8149 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.6988	18.9430	19.2580	19.5919	19.7895	19.8758	19.8887	19.8895	19.8468	19.5793	19.0839	18.6649 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9793	0.9573	0.9122	0.8177	0.6644	0.4678	0.3079	0.3446	0.5857	0.8558	0.9606	0.9837 (94)
Useful gains	916.6449	1074.9551	1170.6424	1156.0465	984.0014	672.6194	425.5440	449.5985	716.3405	918.7701	893.1168	864.4230 (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	1938.3274	1884.5462	1706.8546	1409.7847	1063.7236	684.8619	426.9129	451.8924	749.7240	1180.7330	1584.5729	1923.6846 (97)
Space heating kWh	760.1318	544.0452	398.9419	182.6915	59.3133	0.0000	0.0000	0.0000	0.0000	194.9004	497.8484	788.0906 (98a)
Space heating requirement - total per year (kWh/year)												3425.9632
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	760.1318	544.0452	398.9419	182.6915	59.3133	0.0000	0.0000	0.0000	0.0000	194.9004	497.8484	788.0906 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3425.9632
Space heating per m2										(98c) / (4) =		29.0977 (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	760.1318	544.0452	398.9419	182.6915	59.3133	0.0000	0.0000	0.0000	0.0000	194.9004	497.8484	788.0906 (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)	858.9060	614.7403	450.7818	206.4311	67.0207	0.0000	0.0000	0.0000	0.0000	220.2265	562.5406	890.4979 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	252.4334	222.5219	234.6712	202.3022	193.3491	171.2346	166.8657	175.1916	178.9868	203.1580	220.3773	249.1571 (64)
Efficiency of water heater (217)m	88.1212	88.0593	87.9385	87.7054	87.3475	87.0000	87.0000	87.0000	87.0000	87.7280	88.0343	87.0000 (216)
Fuel for water heating, kWh/month	286.4615	252.6955	266.8585	230.6610	221.3561	196.8213	191.7996	201.3696	205.7320	231.5771	250.3312	282.6994 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	29.2632	23.4760	21.1375	15.4863	11.9620	9.7731	10.9122	14.1840	18.4237	24.1729	27.3032	30.0765 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-47.1523	-65.0301	-91.1628	-100.7104	-107.8811	-100.4643	-99.3309	-94.2100	-85.4593	-73.5480	-51.4472	-41.0367 (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	-26.9992	-54.4952	-102.4089	-146.1699	-187.6680	-186.5897	-185.3899	-160.5795	-122.9001	-76.4169	-35.6478	-21.6112 (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												3871.1449 (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												2818.3629 (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)												236.1705 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2264.3094 (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	4747.3688 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3871.1449	3.6400	140.9097 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2818.3629	3.6400	102.5884 (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	236.1705	16.4900	38.9445 (250)
Additional standing charges			92.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-957.4332	16.4900	-157.8807
PV Unit electricity exported	-1306.8762	5.5900	-73.0544
Total			-230.9351 (252)
Total energy cost			157.6889 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.3488 (257)
SAP value		94.3455
SAP rating (Section 12)		94 (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	3871.1449	0.2100	812.9404 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2818.3629	0.2100	591.8562 (264)
Space and water heating			1404.7966 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	236.1705	0.1443	34.0867 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-957.4332	0.1349	-129.1995
PV Unit electricity exported	-1306.8762	0.1272	-166.2553
Total			-295.4548 (269)
Total CO2, kg/year			1155.3577 (272)
CO2 emissions per m2			9.8100 (273)
EI value			90.4868
EI rating			90 (274)
EI band			B

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

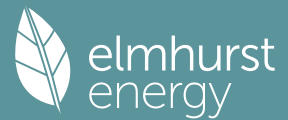
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	58.8700 (1b)	x 2.3900 (2b)	= 140.6993 (1b) - (3b)
First floor	58.8700 (1c)	x 2.6200 (2c)	= 154.2394 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	117.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 294.9387 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	5 * 10 = 50.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	50.0000 / (5) = 0.1695 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3695 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)

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Infiltration rate adjusted to include shelter factor

(21) = (18) x (20) = 0.3695 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
	0.4711	0.4619	0.4527	0.4065	0.3972	0.3511	0.3511	0.3418	0.3695	0.3972	0.4157	0.4342	(22b)
Effective ac	0.6110	0.6067	0.6025	0.5826	0.5789	0.5616	0.5616	0.5584	0.5683	0.5789	0.5864	0.5943	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Windows (Uw = 1.30)			22.9500	1.2357	28.3603			(27)
Door			2.1400	1.1000	2.3540			(26a)
Ground Floor			58.8700	0.1300	7.6531	75.0000	4415.2500	(28a)
External Wall	154.3100	25.0900	129.2200	0.1900	24.5518	110.0000	14214.2000	(29a)
Plane Roof	58.8700		58.8700	0.0900	5.2983	9.0000	529.8300	(30)
Total net area of external elements Aum(A, m2)			272.0500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	68.2175			(33)
Studs			198.6000			9.0000	1787.4000	(32c)
Block			33.7000			75.0000	2527.5000	(32c)
Internal Floor 1			58.8700			18.0000	1059.6600	(32d)
Internal Ceiling 1			58.8700			9.0000	529.8300	(32e)
Heat capacity Cm = Sum(A x k)								
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K					(28)...(30) + (32) + (32a)...(32e) =		25063.6700	(34)
							212.8730	(35)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8541 (42)
Hot water usage for mixer showers													
	72.0744	70.9913	69.4129	66.3930	64.1645	61.6791	60.2665	61.8329	63.5500	66.2184	69.3032	71.7983	(42a)
Hot water usage for baths													
	31.1176	30.6554	30.0046	28.8047	27.9062	26.9099	26.3718	27.0180	27.7216	28.7877	30.0124	31.0124	(42b)
Hot water usage for other uses													
	43.8593	42.2644	40.6695	39.0746	37.4797	35.8849	35.8849	37.4797	39.0746	40.6695	42.2644	43.8593	(42c)
Average daily hot water use (litres/day)													135.1732 (43)
Daily hot water use													
	147.0513	143.9111	140.0871	134.2724	129.5504	124.4739	122.5231	126.3306	130.3462	135.6756	141.5799	146.6699	(44)
Energy conte	232.8933	204.9275	215.3086	183.8122	174.3997	153.0552	148.1811	156.4237	160.7299	184.1106	201.7065	229.6496	(45)
Energy content (annual)													
Distribution loss	(46)m = 0.15 x (45)m												
	34.9340	30.7391	32.2963	27.5718	26.1600	22.9583	22.2272	23.4636	24.1095	27.6166	30.2560	34.4474	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	19.5402	17.5944	19.3626	18.4900	18.9494	18.1794	18.6846	18.7678	18.2569	19.0475	18.6707	19.5074	(61)
Total heat required for water heating calculated for each month													
	252.4334	222.5219	234.6712	202.3022	193.3491	171.2346	166.8657	175.1916	178.9868	203.1580	220.3773	249.1571	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	252.4334	222.5219	234.6712	202.3022	193.3491	171.2346	166.8657	175.1916	178.9868	203.1580	220.3773	249.1571	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Heat gains from water heating, kWh/month													
	82.3220	72.5370	76.4308	65.7401	62.7253	55.4357	53.9414	56.7028	58.0069	65.9786	71.7351	81.2354	(65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)

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

Metabolic gains (Table 5), Watts													
(66)m	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	33.4324	29.6943	24.1491	18.2824	13.6663	11.5377	12.4669	16.2049	21.7502	27.6168	32.2329	34.3616	(67)

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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	421.2554	425.6267	414.6112	391.1603	361.5578	333.7357	315.1488	310.7775	321.7930	345.2439	374.8464	402.6685 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657 (71)
Water heating gains (Table 5)	110.6479	107.9419	102.7295	91.3056	84.3081	76.9940	72.5018	76.2135	80.5652	88.6810	99.6321	109.1873 (72)
Total internal gains	680.3975	678.3248	656.5516	615.8102	574.5941	534.3292	512.1793	515.2577	536.1702	576.6035	621.7732	661.2792 (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					1.4200	10.6334	0.7300	0.7000	0.7700	5.3471 (74)		
East					6.5000	19.6403	0.7300	0.7000	0.7700	45.2079 (76)		
South					10.4700	46.7521	0.7300	0.7000	0.7700	173.3411 (78)		
West					4.5600	19.6403	0.7300	0.7000	0.7700	31.7151 (80)		
Solar gains	255.6112	444.5844	626.8023	798.0274	906.4139	903.5223	869.7046	789.5138	686.8546	496.9184	307.9786	217.4980 (83)
Total gains	936.0088	1122.9093	1283.3539	1413.8375	1481.0080	1437.8515	1381.8839	1304.7715	1223.0248	1073.5219	929.7519	878.7773 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)											
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	51.7178	51.8795	52.0389	52.8011	52.9462	53.6323	53.6323	53.7613	53.3659	52.9462	52.6535	52.3509
alpha	4.4479	4.4586	4.4693	4.5201	4.5297	4.5755	4.5755	4.5841	4.5577	4.5297	4.5102	4.4901
util living area	0.9881	0.9733	0.9404	0.8646	0.7332	0.5570	0.4090	0.4497	0.6773	0.9027	0.9766	0.9908 (86)
MIT	19.9053	20.1029	20.3620	20.6411	20.8249	20.9090	20.9278	20.9255	20.8760	20.6213	20.2079	19.8717 (87)
Th 2	19.9656	19.9685	19.9713	19.9846	19.9871	19.9988	19.9988	20.0009	19.9943	19.9871	19.9821	19.9768 (88)
util rest of house	0.9848	0.9664	0.9252	0.8322	0.6765	0.4779	0.3181	0.3553	0.5983	0.8713	0.9693	0.9882 (89)
MIT 2	18.6963	18.9473	19.2703	19.6121	19.8117	19.8983	19.9104	19.9116	19.8699	19.6006	19.0933	18.6624 (90)
Living area fraction	18.8488	19.0930	19.4080	19.7419	19.9395	20.0258	20.0387	20.0395	19.9968	19.7293	19.2339	18.8149 (92)
MIT	18.8488	19.0930	19.4080	19.7419	19.9395	20.0258	20.0387	20.0395	19.9968	19.7293	19.2339	18.8149 (92)
Temperature adjustment	18.6988	18.9430	19.2580	19.5919	19.7895	19.8758	19.8887	19.8895	19.8468	19.5793	19.0839	-0.1500
adjusted MIT	18.6988	18.9430	19.2580	19.5919	19.7895	19.8758	19.8887	19.8895	19.8468	19.5793	19.0839	18.6649 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	916.6449	1074.9551	1170.6424	1156.0465	984.0014	672.6194	425.5440	449.5985	716.3405	918.7701	893.1168	864.4230 (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	1938.3274	1884.5462	1706.8546	1409.7847	1063.7236	684.8619	426.9129	451.8924	749.7240	1180.7330	1584.5729	1923.6846 (97)
Space heating kWh	760.1318	544.0452	398.9419	182.6915	59.3133	0.0000	0.0000	0.0000	0.0000	194.9004	497.8484	788.0906 (98a)
Space heating requirement - total per year (kWh/year)	3425.9632											
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	760.1318	544.0452	398.9419	182.6915	59.3133	0.0000	0.0000	0.0000	0.0000	194.9004	497.8484	788.0906 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	3425.9632											
Space heating per m2	(98c) / (4) = 29.0977 (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	760.1318	544.0452	398.9419	182.6915	59.3133	0.0000	0.0000	0.0000	0.0000	194.9004	497.8484	788.0906 (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)	858.9060	614.7403	450.7818	206.4311	67.0207	0.0000	0.0000	0.0000	0.0000	220.2265	562.5406	890.4979 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	252.4334	222.5219	234.6712	202.3022	193.3491	171.2346	166.8657	175.1916	178.9868	203.1580	220.3773	249.1571 (64)
Efficiency of water heater (217)m	88.1212	88.0593	87.9385	87.7054	87.3475	87.0000	87.0000	87.0000	87.0000	87.7280	88.0343	88.1350 (217)
Fuel for water heating, kWh/month	286.4615	252.6955	266.8585	230.6610	221.3561	196.8213	191.7996	201.3696	205.7320	231.5771	250.3312	282.6994 (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)

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Lighting	29.2632	23.4760	21.1375	15.4863	11.9620	9.7731	10.9122	14.1840	18.4237	24.1729	27.3032	30.0765 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-47.1523	-65.0301	-91.1628	-100.7104	-107.8811	-100.4643	-99.3309	-94.2100	-85.4593	-73.5480	-51.4472	-41.0367 (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	(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	(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	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-26.9992	-54.4952	-102.4089	-146.1699	-187.6680	-186.5897	-185.3899	-160.5795	-122.9001	-76.4169	-35.6478	-21.6112 (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	(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	(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	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1												3871.1449 (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												2818.3629 (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)												236.1705 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2264.3094 (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												4747.3688 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3871.1449	5.6000	216.7841 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2818.3629	5.6000	157.8283 (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	236.1705	26.0600	61.5460 (250)
Additional standing charges			99.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-957.4332	26.0600	-249.5071
PV Unit electricity exported	-1306.8762	5.8100	-75.9295
Total			-325.4366 (252)
Total energy cost			232.1335 (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	3871.1449	0.2100	812.9404 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2818.3629	0.2100	591.8562 (264)
Space and water heating			1404.7966 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	236.1705	0.1443	34.0867 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-957.4332	0.1349	-129.1995
PV Unit electricity exported	-1306.8762	0.1272	-166.2553
Total			-295.4548 (269)
Total CO2, kg/year			1155.3577 (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	3871.1449	1.1300	4374.3937 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2818.3629	1.1300	3184.7501 (278)
Space and water heating			7559.1438 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	236.1705	1.5338	362.2461 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-957.4332	1.4987	-1434.9492
PV Unit electricity exported	-1306.8762	0.4670	-610.3435
Total			-2045.2927 (283)
Total Primary energy kWh/year			6006.1981 (286)

SAP 10 EPC IMPROVEMENTS

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Current energy efficiency rating:
Current environmental impact rating:

A 94
B 90

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

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

Measures omitted - SAP change or cost saving too small:
N Solar water heating + 0.5 -£ 20 -136 kg (11.8%)

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

Potential energy efficiency rating: A 94
Potential environmental impact rating: B 90

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

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

	Current	Potential	Saving
Electricity	£84	£84	£0
Mains gas	£474	£474	£0
Space heating	£338	£338	£0
Water heating	£158	£158	£0
Lighting	£62	£62	£0
Generated (PV)	-£325	-£325	£0
Total cost of fuels	£233	£233	£0
Total cost of uses	£233	£233	£0
Delivered energy	40 kWh/m²	40 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.2 tonnes	1.2 tonnes	0.0 tonnes
CO2 emissions per m²	10 kg/m²	10 kg/m²	0 kg/m²
Primary energy	51 kWh/m²	51 kWh/m²	0 kWh/m²

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	58.8700 (1b)	x 2.3900 (2b)	= 140.6993 (1b) - (3b)
First floor	58.8700 (1c)	x 2.6200 (2c)	= 154.2394 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	117.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	294.9387 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	5 * 10 = 50.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	50.0000 / (5) =	0.1695 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50		4.0000 (17)
Infiltration rate		0.3695 (18)
Number of sides sheltered		0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3695 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4711	0.4619	0.4527	0.4065	0.3972	0.3511	0.3511	0.3418	0.3695	0.3972	0.4157	0.4342 (22b)
Effective ac	0.6110	0.6067	0.6025	0.5826	0.5789	0.5616	0.5616	0.5584	0.5683	0.5789	0.5864	0.5943 (25)

3. Heat losses and heat loss parameter

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Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Windows (Uw = 1.30)			22.9500	1.2357	28.3603			(27)					
Door			2.1400	1.1000	2.3540			(26a)					
Ground Floor			58.8700	0.1300	7.6531	75.0000	4415.2500	(28a)					
External Wall	154.3100	25.0900	129.2200	0.1900	24.5518	110.0000	14214.2000	(29a)					
Plane Roof	58.8700		58.8700	0.0900	5.2983	9.0000	529.8300	(30)					
Total net area of external elements Aum(A, m2)			272.0500					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		68.2175			(33)					
Studs			198.6000			9.0000	1787.4000	(32c)					
Block			33.7000			75.0000	2527.5000	(32c)					
Internal Floor 1			58.8700			18.0000	1059.6600	(32d)					
Internal Ceiling 1			58.8700			9.0000	529.8300	(32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	25063.6700	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							212.8730	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value		Total						
E2 Other lintels (including other steel lintels)				17.7600	0.0240		0.4262						
E3 Sill				14.9300	0.0210		0.3135						
E4 Jamb				38.4000	0.0160		0.6144						
E5 Ground floor (normal)				30.8000	0.0920		2.8336						
E10 Eaves (insulation at ceiling level)				16.7000	0.0580		0.9686						
E16 Corner (normal)				20.0400	0.0470		0.9419						
E6 Intermediate floor within a dwelling				30.8000	0.0010		0.0308						
E12 Gable (insulation at ceiling level)				14.1000	0.0570		0.8037						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								6.9328 (36)					
Point Thermal bridges								(36a) = 0.0000					
Total fabric heat loss						(33) + (36) + (36a) =	75.1502	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 59.4675	Feb 59.0480	Mar 58.6368	Apr 56.7056	May 56.3442	Jun 54.6622	Jul 54.6622	Aug 54.3507	Sep 55.3101	Oct 56.3442	Nov 57.0752	Dec 57.8394	(38)
Heat transfer coeff	134.6177	134.1982	133.7870	131.8558	131.4945	129.8124	129.8124	129.5009	130.4603	131.4945	132.2254	132.9896	(39)
Average = Sum(39)m / 12 =												131.8541	
HLP	Jan 1.1433	Feb 1.1398	Mar 1.1363	Apr 1.1199	May 1.1168	Jun 1.1025	Jul 1.1025	Aug 1.0999	Sep 1.1080	Oct 1.1168	Nov 1.1230	Dec 1.1295	(40)
HLP (average)												1.1199	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)													

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

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

Metabolic gains (Table 5), Watts													
(66)m	Jan 171.2486	Feb 171.2486	Mar 171.2486	Apr 171.2486	May 171.2486	Jun 171.2486	Jul 171.2486	Aug 171.2486	Sep 171.2486	Oct 171.2486	Nov 171.2486	Dec 171.2486	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
33.4324	29.6943	24.1491	18.2824	13.6663	11.5377	12.4669	16.2049	21.7502	27.6168	32.2329	34.3616	34.3616	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
421.2554	425.6267	414.6112	391.1603	361.5578	333.7357	315.1488	310.7775	321.7930	345.2439	374.8464	402.6685	402.6685	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	(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)													
-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	(71)
Water heating gains (Table 5)													
110.6479	107.9419	102.7295	91.3056	84.3081	76.9940	72.5018	76.2135	80.5652	88.6810	99.6321	109.1873	109.1873	(72)
Total internal gains	680.3975	678.3248	656.5516	615.8102	574.5941	534.3292	512.1793	515.2577	536.1702	576.6035	621.7732	661.2792	(73)

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6. Solar gains

[Jan]	Area m2				Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North	1.4200				10.6334	0.7300	0.7000	0.7700	5.3471 (74)			
East	6.5000				19.6403	0.7300	0.7000	0.7700	45.2079 (76)			
South	10.4700				46.7521	0.7300	0.7000	0.7700	173.3411 (78)			
West	4.5600				19.6403	0.7300	0.7000	0.7700	31.7151 (80)			
Solar gains	255.6112	444.5844	626.8023	798.0274	906.4139	903.5223	869.7046	789.5138	686.8546	496.9184	307.9786	217.4980 (83)
Total gains	936.0088	1122.9093	1283.3539	1413.8375	1481.0080	1437.8515	1381.8839	1304.7715	1223.0248	1073.5219	929.7519	878.7773 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	51.7178	51.8795	52.0389	52.8011	52.9462	53.6323	53.6323	53.7613	53.3659	52.9462	52.6535	52.3509
util living area	4.4479	4.4586	4.4693	4.5201	4.5297	4.5755	4.5755	4.5841	4.5577	4.5297	4.5102	4.4901
	0.9881	0.9733	0.9404	0.8646	0.7332	0.5570	0.4090	0.4497	0.6773	0.9027	0.9766	0.9908 (86)
MIT	19.9053	20.1029	20.3620	20.6411	20.8249	20.9090	20.9278	20.9255	20.8760	20.6213	20.2079	19.8717 (87)
Th 2	19.9656	19.9685	19.9713	19.9846	19.9871	19.9988	19.9988	20.0009	19.9943	19.9871	19.9821	19.9768 (88)
util rest of house	0.9848	0.9664	0.9252	0.8322	0.6765	0.4779	0.3181	0.3553	0.5983	0.8713	0.9693	0.9882 (89)
MIT 2	18.6963	18.9473	19.2703	19.6121	19.8117	19.8983	19.9104	19.9116	19.8699	19.6006	19.0933	18.6624 (90)
Living area fraction	18.8488	19.0930	19.4080	19.7419	19.9395	20.0258	20.0387	20.0395	19.9968	19.7293	19.2339	18.8149 (92)
MIT	18.6988	18.9430	19.2580	19.5919	19.7895	19.8758	19.8887	19.8895	19.8468	19.5793	19.0839	-0.1500
Temperature adjustment												18.6649 (93)
adjusted MIT												

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9793	0.9573	0.9122	0.8177	0.6644	0.4678	0.3079	0.3446	0.5857	0.8558	0.9606	0.9837 (94)
Useful gains	916.6449	1074.9551	1170.6424	1156.0465	984.0014	672.6194	425.5440	449.5985	716.3405	918.7701	893.1168	864.4230 (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	1938.3274	1884.5462	1706.8546	1409.7847	1063.7236	684.8619	426.9129	451.8924	749.7240	1180.7330	1584.5729	1923.6846 (97)
Space heating kWh	760.1318	544.0452	398.9419	182.6915	59.3133	0.0000	0.0000	0.0000	0.0000	194.9004	497.8484	788.0906 (98a)
Space heating requirement - total per year (kWh/year)												3425.9632
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	760.1318	544.0452	398.9419	182.6915	59.3133	0.0000	0.0000	0.0000	0.0000	194.9004	497.8484	788.0906 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3425.9632
Space heating per m2										(98c) / (4) =		29.0977 (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
	760.1318	544.0452	398.9419	182.6915	59.3133	0.0000	0.0000	0.0000	0.0000	194.9004	497.8484	788.0906 (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)	858.9060	614.7403	450.7818	206.4311	67.0207	0.0000	0.0000	0.0000	0.0000	220.2265	562.5406	890.4979 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	252.4334	222.5219	234.6712	202.3022	193.3491	171.2346	166.8657	175.1916	178.9868	203.1580	220.3773	249.1571 (64)
Efficiency of water heater	88.1212	88.0593	87.9385	87.7054	87.3475	87.0000	87.0000	87.0000	87.0000	87.7280	88.0343	87.0000 (216)
Fuel for water heating, kWh/month	286.4615	252.6955	266.8585	230.6610	221.3561	196.8213	191.7996	201.3696	205.7320	231.5771	250.3312	282.6994 (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	29.2632	23.4760	21.1375	15.4863	11.9620	9.7731	10.9122	14.1840	18.4237	24.1729	27.3032	30.0765 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-47.1523	-65.0301	-91.1628	-100.7104	-107.8811	-100.4643	-99.3309	-94.2100	-85.4593	-73.5480	-51.4472	-41.0367 (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)	-26.9992	-54.4952	-102.4089	-146.1699	-187.6680	-186.5897	-185.3899	-160.5795	-122.9001	-76.4169	-35.6478	-21.6112 (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)

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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	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1											3871.1449	(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											2818.3629	(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)											236.1705	(232)

Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation											-2264.3094	(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											4747.3688	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3871.1449	3.6400	140.9097	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2818.3629	3.6400	102.5884	(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	236.1705	16.4900	38.9445	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-957.4332	16.4900	-157.8807	
PV Unit electricity exported	-1306.8762	5.5900	-73.0544	
Total			-230.9351	(252)
Total energy cost			157.6889	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		0.3488	(257)
SAP value		94.3455	
SAP rating (Section 12)		94	(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	3871.1449	0.2100	812.9404	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2818.3629	0.2100	591.8562	(264)
Space and water heating			1404.7966	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	236.1705	0.1443	34.0867	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-957.4332	0.1349	-129.1995	
PV Unit electricity exported	-1306.8762	0.1272	-166.2553	
Total			-295.4548	(269)
Total CO2, kg/year			1155.3577	(272)
CO2 emissions per m2			9.8100	(273)
EI value			90.4868	
EI rating			90	(274)
EI band			B	

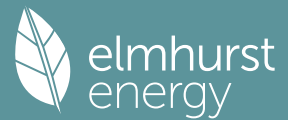
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	58.8700 (1b)	x 2.3900 (2b)	= 140.6993 (1b) - (3b)	
First floor	58.8700 (1c)	x 2.6200 (2c)	= 154.2394 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	117.7400		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n) =	294.9387 (5)	

2. Ventilation rate

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											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) =	0.1695 (8)
Pressure test											Yes	
Pressure Test Method											Blower Door	
Measured/design AP50											4.0000 (17)	
Infiltration rate											0.3695 (18)	
Number of sides sheltered											0 (19)	
Shelter factor											(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.3695 (21)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4711	0.4619	0.4527	0.4065	0.3972	0.3511	0.3511	0.3418	0.3695	0.3972	0.4157	0.4342 (22b)
Effective ac	0.6110	0.6067	0.6025	0.5826	0.5789	0.5616	0.5616	0.5584	0.5683	0.5789	0.5864	0.5943 (25)

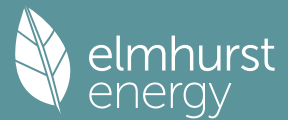
3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Windows (Uw = 1.30)			22.9500	1.2357	28.3603			(27)					
Door			2.1400	1.1000	2.3540			(26a)					
Ground Floor			58.8700	0.1300	7.6531	75.0000	4415.2500	(28a)					
External Wall	154.3100	25.0900	129.2200	0.1900	24.5518	110.0000	14214.2000	(29a)					
Plane Roof	58.8700		58.8700	0.0900	5.2983	9.0000	529.8300	(30)					
Total net area of external elements Aum(A, m2)			272.0500					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	68.2175			(33)					
Studs			198.6000			9.0000	1787.4000	(32c)					
Block			33.7000			75.0000	2527.5000	(32c)					
Internal Floor 1			58.8700			18.0000	1059.6600	(32d)					
Internal Ceiling 1			58.8700			9.0000	529.8300	(32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	25063.6700	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							212.8730	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
E2 Other lintels (including other steel lintels)				17.7600	0.0240	0.4262							
E3 Sill				14.9300	0.0210	0.3135							
E4 Jamb				38.4000	0.0160	0.6144							
E5 Ground floor (normal)				30.8000	0.0920	2.8336							
E10 Eaves (insulation at ceiling level)				16.7000	0.0580	0.9686							
E16 Corner (normal)				20.0400	0.0470	0.9419							
E6 Intermediate floor within a dwelling				30.8000	0.0010	0.0308							
E12 Gable (insulation at ceiling level)				14.1000	0.0570	0.8037							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.9328	(36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	75.1502	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	59.4675	59.0480	58.6368	56.7056	56.3442	54.6622	54.6622	54.3507	55.3101	56.3442	57.0752	57.8394	(38)
Average = Sum(39)m / 12 =	134.6177	134.1982	133.7870	131.8558	131.4945	129.8124	129.8124	129.5009	130.4603	131.4945	132.2254	132.9896	(39)
												131.8541	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1433	1.1398	1.1363	1.1199	1.1168	1.1025	1.1025	1.0999	1.1080	1.1168	1.1230	1.1295	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8541 (42)											
Hot water usage for mixer showers	72.0744 70.9913 69.4129 66.3930 64.1645 61.6791 60.2665 61.8329 63.5500 66.2184 69.3032 71.7983 (42a)											
Hot water usage for baths	31.1176 30.6554 30.0046 28.8047 27.9062 26.9099 26.3718 27.0180 27.7216 28.7877 30.0124 31.0124 (42b)											
Hot water usage for other uses	43.8593 42.2644 40.6695 39.0746 37.4797 35.8849 35.8849 37.4797 39.0746 40.6695 42.2644 43.8593 (42c)											
Average daily hot water use (litres/day)	34.9340 30.7391 32.2963 27.5718 26.1600 22.9583 22.2272 23.4636 24.1095 27.6166 30.2560 34.4474 (43)											
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	147.0513	143.9111	140.0871	134.2724	129.5504	124.4739	122.5231	126.3306	130.3462	135.6756	141.5799	146.6699
Energy content (annual)	232.8933	204.9275	215.3086	183.8122	174.3997	153.0552	148.1811	156.4237	160.7299	184.1106	201.7065	229.6496
Distribution loss (46)m = 0.15 x (45)m	Total = Sum(45)m = 2245.1980											
Water storage loss:												
Total storage loss												
If cylinder contains dedicated solar storage												
Primary loss												
Combi loss												
Total heat required for water heating calculated for each month												
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	252.4334	222.5219	234.6712	202.3022	193.3491	171.2346	166.8657	175.1916	178.9868	203.1580	220.3773	249.1571	(64)
Total per year (kWh/year) = Sum(64)m =													2470.2488 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month	82.3220	72.5370	76.4308	65.7401	62.7253	55.4357	53.9414	56.7028	58.0069	65.9786	71.7351	81.2354	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	171.2486	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.4324	29.6943	24.1491	18.2824	13.6663	11.5377	12.4669	16.2049	21.7502	27.6168	32.2329	34.3616	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	421.2554	425.6267	414.6112	391.1603	361.5578	333.7357	315.1488	310.7775	321.7930	345.2439	374.8464	402.6685	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	54.9790	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	-114.1657	(71)
Water heating gains (Table 5)	110.6479	107.9419	102.7295	91.3056	84.3081	76.9940	72.5018	76.2135	80.5652	88.6810	99.6321	109.1873	(72)
Total internal gains	680.3975	678.3248	656.5516	615.8102	574.5941	534.3292	512.1793	515.2577	536.1702	576.6035	621.7732	661.2792	(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				1.4200	10.6334		0.7300		0.7000		0.7700		5.3471 (74)
East				6.5000	19.6403		0.7300		0.7000		0.7700		45.2079 (76)
South				10.4700	46.7521		0.7300		0.7000		0.7700		173.3411 (78)
West				4.5600	19.6403		0.7300		0.7000		0.7700		31.7151 (80)
Solar gains	255.6112	444.5844	626.8023	798.0274	906.4139	903.5223	869.7046	789.5138	686.8546	496.9184	307.9786	217.4980	(83)
Total gains	936.0088	1122.9093	1283.3539	1413.8375	1481.0080	1437.8515	1381.8839	1304.7715	1223.0248	1073.5219	929.7519	878.7773	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	51.7178	51.8795	52.0389	52.8011	52.9462	53.6323	53.6323	53.7613	53.3659	52.9462	52.6535	52.3509	
alpha	4.4479	4.4586	4.4693	4.5201	4.5297	4.5755	4.5755	4.5841	4.5577	4.5297	4.5102	4.4901	
util living area	0.9881	0.9733	0.9404	0.8646	0.7332	0.5570	0.4090	0.4497	0.6773	0.9027	0.9766	0.9908	(86)
MIT	19.9053	20.1029	20.3620	20.6411	20.8249	20.9090	20.9278	20.9255	20.8760	20.6213	20.2079	19.8717	(87)
Th 2	19.9656	19.9685	19.9713	19.9846	19.9871	19.9988	19.9988	20.0009	19.9943	19.9871	19.9821	19.9768	(88)
util rest of house	0.9848	0.9664	0.9252	0.8322	0.6765	0.4779	0.3181	0.3553	0.5983	0.8713	0.9693	0.9882	(89)
MIT 2	18.6963	18.9473	19.2703	19.6121	19.8117	19.8983	19.9104	19.9116	19.8699	19.6006	19.0933	18.6624	(90)
Living area fraction	fLA = Living area / (4) =												0.1261 (91)
MIT	18.8488	19.0930	19.4080	19.7419	19.9395	20.0258	20.0387	20.0395	19.9968	19.7293	19.2339	18.8149	(92)
Temperature adjustment													-0.1500
adjusted MIT	18.6988	18.9430	19.2580	19.5919	19.7895	19.8758	19.8887	19.8895	19.8468	19.5793	19.0839	18.6649	(93)

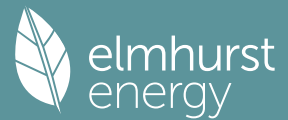
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9793	0.9573	0.9122	0.8177	0.6644	0.4678	0.3079	0.3446	0.5857	0.8558	0.9606	0.9837	(94)
Ext temp.	916.6449	1074.9551	1170.6424	1156.0465	984.0014	672.6194	425.5440	449.5985	716.3405	918.7701	893.1168	864.4230	(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	1938.3274	1884.5462	1706.8546	1409.7847	1063.7236	684.8619	426.9129	451.8924	749.7240	1180.7330	1584.5729	1923.6846	(97)
Space heating requirement - total per year (kWh/year)	760.1318	544.0452	398.9419	182.6915	59.3133	0.0000	0.0000	0.0000	0.0000	194.9004	497.8484	788.0906	(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)
Space heating contribution - total per year (kWh/year)	760.1318	544.0452	398.9419	182.6915	59.3133	0.0000	0.0000	0.0000	0.0000	194.9004	497.8484	788.0906	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)													3425.9632
Space heating per m2													(98c) / (4) = 29.0977 (99)

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

-----												0.0000 (201)
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)	760.1318	544.0452	398.9419	182.6915	59.3133	0.0000	0.0000	0.0000	0.0000	194.9004	497.8484	788.0906 (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)	858.9060	614.7403	450.7818	206.4311	67.0207	0.0000	0.0000	0.0000	0.0000	220.2265	562.5406	890.4979 (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	252.4334	222.5219	234.6712	202.3022	193.3491	171.2346	166.8657	175.1916	178.9868	203.1580	220.3773	249.1571 (64)
Efficiency of water heater (217)m	88.1212	88.0593	87.9385	87.7054	87.3475	87.0000	87.0000	87.0000	87.0000	87.7280	88.0343	87.0000 (216)
Fuel for water heating, kWh/month	286.4615	252.6955	266.8585	230.6610	221.3561	196.8213	191.7996	201.3696	205.7320	231.5771	250.3312	88.1350 (217)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	282.6994 (219)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	0.0000 (221)
Lighting	29.2632	23.4760	21.1375	15.4863	11.9620	9.7731	10.9122	14.1840	18.4237	24.1729	27.3032	7.3041 (231)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-47.1523	-65.0301	-91.1628	-100.7104	-107.8811	-100.4643	-99.3309	-94.2100	-85.4593	-73.5480	-51.4472	30.0765 (232)
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	-41.0367 (233a)
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	-51.4472 (234a)
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 (235a)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-26.9992	-54.4952	-102.4089	-146.1699	-187.6680	-186.5897	-185.3899	-160.5795	-122.9001	-76.4169	-35.6478	0.0000 (235c)
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	-21.6112 (233b)
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 (234b)
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 (235b)
Annual totals kWh/year												
Space heating fuel - main system 1												3871.1449 (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												2818.3629 (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)												236.1705 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2264.3094 (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												4747.3688 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3871.1449	5.6000	216.7841 (240)	
Total CO2 associated with community systems			0.0000 (473)	
Water heating (other fuel)	2818.3629	5.6000	157.8283 (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	236.1705	26.0600	61.5460 (250)	
Additional standing charges			99.0000 (251)	
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-957.4332	26.0600	-249.5071	
PV Unit electricity exported	-1306.8762	5.8100	-75.9295	
Total			-325.4366 (252)	
Total energy cost			232.1335 (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	3871.1449	0.2100	812.9404 (261)	
Total CO2 associated with community systems			0.0000 (373)	
Water heating (other fuel)	2818.3629	0.2100	591.8562 (264)	
Space and water heating			1404.7966 (265)	
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)	
Energy for lighting	236.1705	0.1443	34.0867 (268)	
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-957.4332	0.1349	-129.1995	
PV Unit electricity exported	-1306.8762	0.1272	-166.2553	
Total			-295.4548 (269)	
Total CO2, kg/year			1155.3577 (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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Full SAP Calculation Printout



Space heating - main system 1	3871.1449	1.1300	4374.3937 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2818.3629	1.1300	3184.7501 (278)
Space and water heating			7559.1438 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	236.1705	1.5338	362.2461 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-957.4332	1.4987	-1434.9492
PV Unit electricity exported	-1306.8762	0.4670	-610.3435
Total			-2045.2927 (283)
Total Primary energy kWh/year			6006.1981 (286)

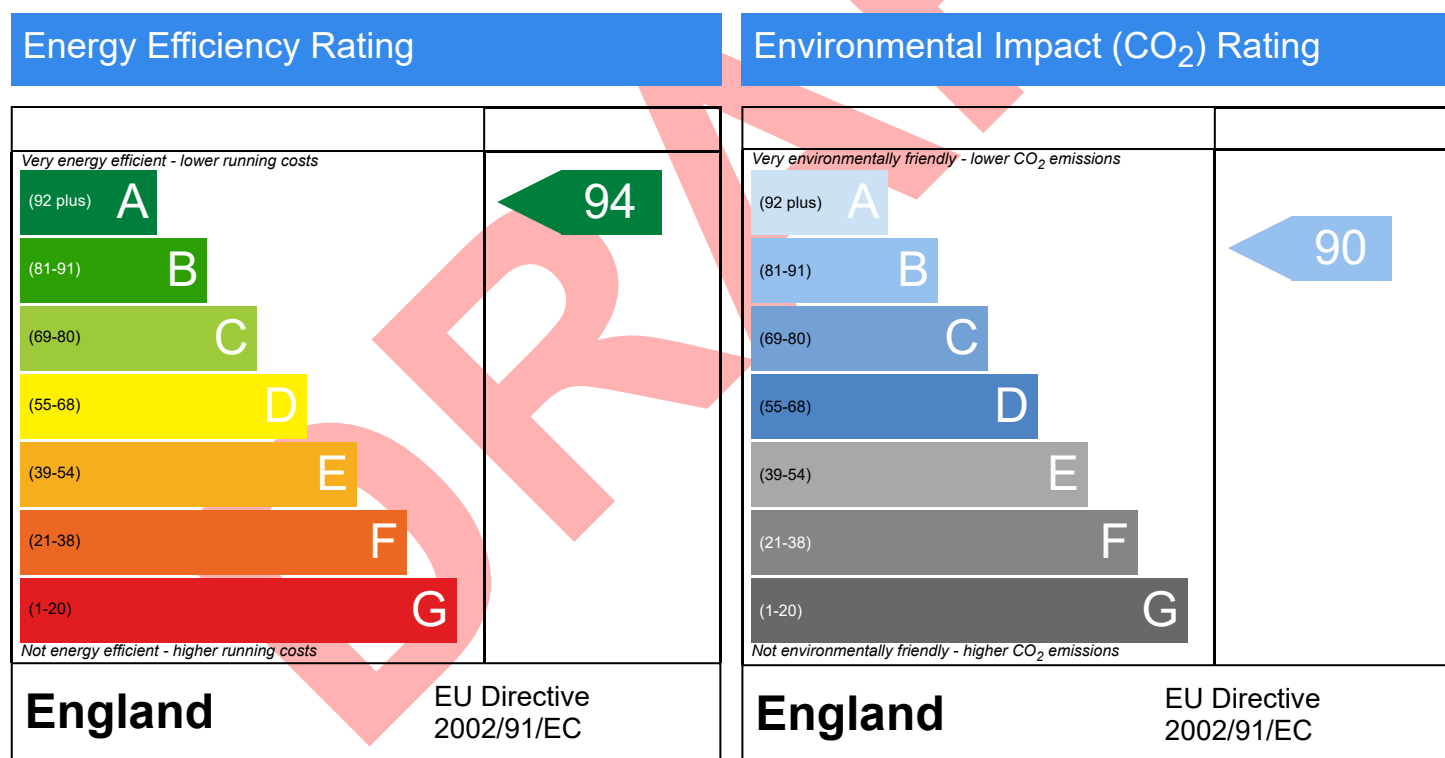
Predicted Energy Assessment



Dwelling type: House, Detached
Date of assessment: 15/11/2024
Produced by: Victoria Gartside
Total floor area: 117.74 m²
DRRN:

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.