

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 27
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	11.13 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	11.09 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	58.24 kWh _{PE} /m ²		
Dwelling primary energy	57.88 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	42.7 kWh/m ²		
Dwelling fabric energy efficiency	39.4 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	North	0.7	1.3
Rear , Windows	1.42	South	0.7	1.3
Front Door, Door	2.14	North	N/A	1.1 (!)
Side L, Windows	4.56	East	0.7	1.3
Side , Windows	6.5	West	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	2.9 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 27	Prop Type Ref	SAP VG 21-0282
Property			

SAP Rating	94 A	DER	11.09	TER	11.13
Environmental	90 B	% DER < TER			0.36
CO ₂ Emissions (t/year)	1.25	DFEE	39.42	TFEE	42.72
Compliance Check	See BREL	% DFEE < TFEE			7.74
% DPER < TPER	0.61	DPER	57.88	TPER	58.24

Assessor Details	Miss Victoria Gartside	Assessor ID	AL30-0001
Client			

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

Orientation	North	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	House, Detached	
Which Floor	0	
2.0 Number of Storeys	2	
3.0 Date Built	2023	
3.0 Property Age Band	L	
4.0 Sheltered Sides	0	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	212.87	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

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

8.0 Living Area	14.85	m ²
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9.0 External Walls	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area (m ²)	Shelter Res	Shelter	Openings	Area Calculation Type
	External Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.19	110.00	154.31	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	North	10.47	0
Rear	Windows	External Wall	South	1.42	0
Front Door	Door	External Wall	North	2.14	0
Side L	Windows	External Wall	East	4.56	0
Side	Windows	External Wall	West	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
2.90	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

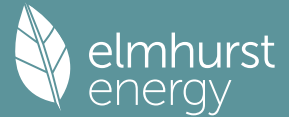
Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout



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Property							
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Environmental	90 B	% DER < TER				0.36	
CO ₂ Emissions (t/year)	1.25	DFEE	39.42	TFEE	42.72		
Compliance Check	See BREL	% DFEE < TFEE				7.74	
% DPER < TPER	0.61	DPER	57.88	TPER	58.24		
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

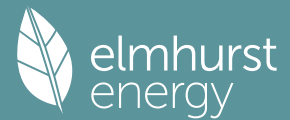
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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)

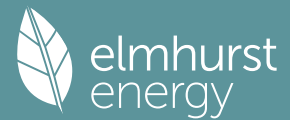
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	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				10.4700	10.6334	0.7300	0.7000	0.7700	39.4251 (74)			
East				4.5600	19.6403	0.7300	0.7000	0.7700	31.7151 (76)			
South				1.4200	46.7521	0.7300	0.7000	0.7700	23.5095 (78)			
West				6.5000	19.6403	0.7300	0.7000	0.7700	45.2079 (80)			
Solar gains	139.8576	264.3237	424.8877	622.4999	777.7235	805.5756	762.8711	643.2199	493.3831	309.7696	172.4167	116.4388 (83)
Total gains	745.3346	885.4280	1017.9946	1193.2634	1316.8633	1320.5529	1256.1105	1137.2422	1003.9300	842.3519	740.5763	708.0020 (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	0.9951	0.9889	0.9726	0.9151	0.7876	0.5988	0.4479	0.5106	0.7727	0.9541	0.9900	0.9961 (86)	
MIT	19.7634	19.9343	20.1938	20.5396	20.7870	20.9011	20.9257	20.9207	20.8350	20.4925	20.0719	19.7431 (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	0.9936	0.9857	0.9646	0.8910	0.7342	0.5166	0.3493	0.4060	0.6971	0.9360	0.9867	0.9949 (89)	
MIT 2	18.5161	18.7360	19.0658	19.4989	19.7767	19.8933	19.9096	19.9097	19.8380	19.4538	18.9231	18.4989 (90)	
Living area fraction									fLA = Living area / (4) =				0.1261 (91)
MIT	18.6734	18.8871	19.2080	19.6301	19.9041	20.0204	20.0378	20.0372	19.9637	19.5848	19.0680	18.6558 (92)	
Temperature adjustment												-0.1500	
adjusted MIT	18.5234	18.7371	19.0580	19.4801	19.7541	19.8704	19.8878	19.8872	19.8137	19.4348	18.9180	18.5058 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9908	0.9804	0.9551	0.8765	0.7204	0.5054	0.3392	0.3936	0.6816	0.9229	0.9816	0.9925 (94)
Useful gains	738.4445	868.0732	972.3013	1045.8621	948.7061	667.4666	424.7686	447.6224	684.3257	777.3816	726.9256	702.7267 (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	1914.7271	1856.9165	1680.1038	1395.0537	1059.0722	684.1634	426.7913	451.5925	745.4160	1161.7229	1562.6350	1902.5257 (97)
Space heating kWh	875.1543	664.5027	526.6050	251.4180	82.1124	0.0000	0.0000	0.0000	0.0000	285.9499	601.7108	892.6505 (98a)
Space heating requirement - total per year (kWh/year)												4180.1035
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	875.1543	664.5027	526.6050	251.4180	82.1124	0.0000	0.0000	0.0000	0.0000	285.9499	601.7108	892.6505 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4180.1035
Space heating per m2										(98c) / (4) =		35.5028 (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	875.1543	664.5027	526.6050	251.4180	82.1124	0.0000	0.0000	0.0000	0.0000	285.9499	601.7108	892.6505 (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)	988.8749	750.8505	595.0339	284.0881	92.7823	0.0000	0.0000	0.0000	0.0000	323.1072	679.8992	1008.6446 (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	88.1597	88.1189	88.0321	87.8248	87.4418	87.0000	87.0000	87.0000	87.0000	87.8707	88.0928	88.1683 (217)	
Fuel for water heating, kWh/month	286.3365	252.5246	266.5745	230.3473	221.1175	196.8213	191.7996	201.3696	205.7320	231.2011	250.1648	282.5926 (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)	-50.5110	-69.1519	-96.2836	-105.6496	-112.5805	-104.6328	-103.4370	-98.3736	-89.6734	-77.8279	-54.9205	-44.0213 (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)	-30.6360	-61.6494	-115.5496	-164.5213	-210.8506	-209.5017	-208.1443	-180.4526	-138.3425	-86.2846	-40.3910	-24.5368 (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													4723.2808 (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													2816.5815 (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													-2477.9235 (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	5384.1092 (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	4723.2808	0.2100	991.8890 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2816.5815	0.2100	591.4821 (264)
Space and water heating			1583.3711 (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	-1007.0632	0.1351	-136.0460
PV Unit electricity exported	-1470.8604	0.1273	-187.2340
Total			-323.2800 (269)
Total CO2, kg/year			1306.1070 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.0900 (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	4723.2808	1.1300	5337.3073 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2816.5815	1.1300	3182.7371 (278)
Space and water heating			8520.0443 (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	-1007.0632	1.4993	-1509.8916
PV Unit electricity exported	-1470.8604	0.4673	-687.3636
Total			-2197.2552 (283)
Total Primary energy kWh/year			6815.1361 (286)
Dwelling Primary energy Rate (DPER)			57.8800 (287)

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

1. Overall dwelling characteristics

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

2. Ventilation rate

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

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

	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)
												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	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				10.4700	10.6334	0.6300		0.7000		0.7700		34.0244 (74)
East				4.5600	19.6403	0.6300		0.7000		0.7700		27.3706 (76)
South				1.4200	46.7521	0.6300		0.7000		0.7700		20.2890 (78)
West				6.5000	19.6403	0.6300		0.7000		0.7700		39.0151 (80)
Solar gains	120.6991	228.1150	366.6839	537.2260	671.1860	695.2227	658.3682	555.1076	425.7964	267.3354	148.7980	100.4883 (83)
Total gains	736.7334	859.7970	970.4078	1118.6926	1221.0817	1221.0111	1162.4525	1059.9468	947.1274	810.6406	727.5980	702.6198 (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	0.9953	0.9902	0.9775	0.9330	0.8272	0.6491	0.4921	0.5548	0.8066	0.9611	0.9908	0.9962 (86)
MIT	19.3811	19.5939	19.9263	20.3870	20.7469	20.9383	20.9858	20.9763	20.8350	20.3552	19.7978	19.3582 (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	0.9939	0.9874	0.9708	0.9125	0.7774	0.5628	0.3833	0.4415	0.7337	0.9451	0.9877	0.9951 (89)
MIT 2	18.0544	18.3277	18.7507	19.3298	19.7432	19.9379	19.9706	19.9685	19.8504	19.3041	18.5992	18.0334 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.2217	18.4874	18.8990	19.4632	19.8698	20.0641	20.0986	20.0956	19.9746	19.4366	18.7503	18.2005 (91)
Temperature adjustment	0.0000											
adjusted MIT	18.2217	18.4874	18.8990	19.4632	19.8698	20.0641	20.0986	20.0956	19.9746	19.4366	18.7503	18.2005 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9905	0.9817	0.9615	0.9003	0.7723	0.5707	0.3967	0.4551	0.7340	0.9342	0.9823	0.9922 (94)
Useful gains	729.7687	844.0432	933.0790	1007.1571	942.9895	696.8843	461.1538	482.3791	695.2304	757.3359	714.6963	697.1581 (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	1926.3515	1873.8812	1704.4302	1429.8544	1102.6683	727.4743	465.7979	490.7742	786.2656	1192.6704	1581.7079	1912.4216 (97)
Space heating kWh	890.2576	692.0511	573.8853	304.3421	118.8010	0.0000	0.0000	0.0000	0.0000	323.8889	624.2483	904.1560 (98a)
Space heating requirement - total per year (kWh/year)	4431.6303											
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	890.2576	692.0511	573.8853	304.3421	118.8010	0.0000	0.0000	0.0000	0.0000	323.8889	624.2483	904.1560 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	4431.6303											
Space heating per m2	(98c) / (4) = 37.6391 (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	890.2576	692.0511	573.8853	304.3421	118.8010	0.0000	0.0000	0.0000	0.0000	323.8889	624.2483	904.1560 (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)	963.4823	748.9731	621.0880	329.3745	128.5725	0.0000	0.0000	0.0000	0.0000	350.5291	675.5934	978.5238 (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	86.8548	86.6476	86.2115	85.1971	83.2854	80.3000	80.3000	80.3000	80.3000	85.3015	86.4613	80.3000 (216)
Efficiency of water heater (217)m	288.8761	255.9957	273.4590	243.9754	242.3119	226.9240	224.4736	233.2471	235.6124	246.7620	258.1246	86.8951 (217)
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	285.7115 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
(221)m	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)											
(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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
(235c)m	-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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
(235d)m	Annual totals kWh/year											

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Space heating fuel - main system 1	4796.1367	(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	3015.4733	(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	5228.9112	(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	4796.1367	0.2100	1007.1887 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3015.4733	0.2100	633.2494 (264)
Space and water heating			1640.4381 (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			1310.7864 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.1300 (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	4796.1367	1.1300	5419.6345 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3015.4733	1.1300	3407.4848 (278)
Space and water heating			8827.1193 (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			6857.1779 (286)
Target Primary Energy Rate (TPER)			58.2400 (287)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 27			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	94 A	DER	11.09	TER	11.13		
Environmental	90 B	% DER < TER				0.36	
CO ₂ Emissions (t/year)	1.25	DFEE	39.42	TFEE	42.72		
Compliance Check	See BREL	% DFEE < TFEE				7.74	
% DPER < TPER	0.61	DPER	57.88	TPER	58.24		
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

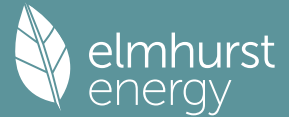
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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			10.4700	10.6334	0.7300	0.7000	0.7700	39.4251 (74)					
East			4.5600	19.6403	0.7300	0.7000	0.7700	31.7151 (76)					
South			1.4200	46.7521	0.7300	0.7000	0.7700	23.5095 (78)					
West			6.5000	19.6403	0.7300	0.7000	0.7700	45.2079 (80)					
Solar gains	139.8576	264.3237	424.8877	622.4999	777.7235	805.5756	762.8711	643.2199	493.3831	309.7696	172.4167	116.4388	(83)
Total gains	684.9974	826.4540	962.1603	1144.9911	1273.0415	1284.4309	1223.1973	1102.1843	966.2824	796.4616	687.4678	648.6930	(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	0.9965	0.9914	0.9772	0.9236	0.7990	0.6091	0.4559	0.5218	0.7869	0.9614	0.9925	0.9973 (86)
MIT	19.4102	19.6394	19.9889	20.4580	20.7989	20.9564	20.9907	20.9833	20.8625	20.3880	19.8194	19.3790 (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	0.9955	0.9889	0.9705	0.9014	0.7470	0.5267	0.3565	0.4161	0.7131	0.9458	0.9899	0.9965 (89)
MIT 2	18.5286	18.7582	19.1048	19.5623	19.8623	19.9856	20.0034	20.0026	19.9250	19.5075	18.9469	18.5045 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.6398	18.8693	19.2163	19.6753	19.9804	20.1080	20.1280	20.1263	20.0433	19.6185	19.0569	18.6148 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.6398	18.8693	19.2163	19.6753	19.9804	20.1080	20.1280	20.1263	20.0433	19.6185	19.0569	18.6148 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9935	0.9851	0.9638	0.8929	0.7461	0.5355	0.3689	0.4292	0.7165	0.9381	0.9865	0.9949 (94)
Useful gains	680.5541	814.1784	927.2941	1022.4175	949.8140	687.8413	451.2713	473.0039	692.3139	747.1946	678.2040	645.3667 (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	1903.2646	1849.2608	1679.0788	1405.6165	1077.6996	709.2254	454.2673	478.8517	768.4482	1173.7589	1563.3993	1893.8638 (97)
Space heating kWh	909.6966	695.5754	559.3278	275.9033	95.1469	0.0000	0.0000	0.0000	0.0000	317.3639	637.3406	928.8818 (98a)
Space heating requirement - total per year (kWh/year)	4419.2363											
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	909.6966	695.5754	559.3278	275.9033	95.1469	0.0000	0.0000	0.0000	0.0000	317.3639	637.3406	928.8818 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	4419.2363											
Space heating per m2	(98c) / (4) = 37.5339 (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	0.8850	0.9345	0.9029	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1071.2080	890.4396	881.7620	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1440.8312	1372.0597	1233.4790	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	266.1287	358.3253	261.6774	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	66.5322	89.5813	65.4194	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	221.5329 (107)											
Energy for space heating	37.5339 (99)											
Energy for space cooling	1.8815 (108)											
Total	39.4154 (109)											
Fabric Energy Efficiency (DFEE)	39.4 (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)

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

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Semi-glazed door			2.1400	1.0000	2.1400			(26a)
TER Opening Type (Uw = 1.20)			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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	74.9769	72.9198	70.6742	67.8793	65.3860	62.7948	62.2566	64.4977	66.7963	69.4572	72.2767	74.8717	(44)
Energy conte	118.7450	103.8369	108.6235	92.9234	88.0221	77.2135	75.2940	79.8617	82.3665	94.2528	102.9715	117.2309	(45)
Energy content (annual)										Total = Sum(45)m =		1141.3417	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	100.9333	88.2613	92.3300	78.9849	74.8188	65.6315	63.9999	67.8824	70.0115	80.1149	87.5258	99.6463	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	100.9333	88.2613	92.3300	78.9849	74.8188	65.6315	63.9999	67.8824	70.0115	80.1149	87.5258	99.6463	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		970.1405	(64)
Electric shower(s)	57.7196	51.4286	56.1581	53.5910	54.5966	52.0799	53.8158	54.5966	53.5910	56.1581	55.1021	57.7196	(64a)
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)

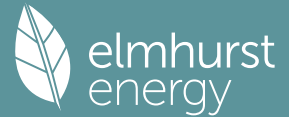
6. Solar gains

Solar gains	120.6991	228.1150	366.6839	537.2260	671.1860	695.2227	658.3682	555.1076	425.7964	267.3354	148.7980	100.4883 (83)
Total gains	665.8389	790.2453	903.9565	1059.7171	1166.5040	1174.0781	1118.6944	1014.0720	898.6957	754.0274	663.8490	632.7424 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)
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8. Space heating requirement8c. Space cooling requirement[illegible]

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024
Assessment Reference	Plot 27		Prop Type Ref	SAP VG 21-0282		
Property						
SAP Rating	94 A	DER	11.09	TER	11.13	
Environmental	90 B	% DER < TER				0.36
CO ₂ Emissions (t/year)	1.25	DFEE	39.42	TFEE	42.72	
Compliance Check	See BREL	% DFEE < TFEE				7.74
% DPER < TPER	0.61	DPER	57.88	TPER	58.24	
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

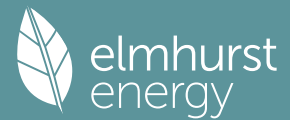
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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	

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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)
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)

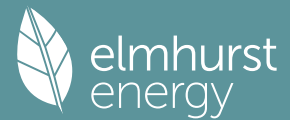
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071	142.7071 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	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				10.4700	10.6334	0.7300	0.7000	0.7700	39.4251 (74)			
East				4.5600	19.6403	0.7300	0.7000	0.7700	31.7151 (76)			
South				1.4200	46.7521	0.7300	0.7000	0.7700	23.5095 (78)			
West				6.5000	19.6403	0.7300	0.7000	0.7700	45.2079 (80)			
Solar gains	139.8576	264.3237	424.8877	622.4999	777.7235	805.5756	762.8711	643.2199	493.3831	309.7696	172.4167	116.4388 (83)
Total gains	745.3346	885.4280	1017.9946	1193.2634	1316.8633	1320.5529	1256.1105	1137.2422	1003.9300	842.3519	740.5763	708.0020 (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	0.9951	0.9889	0.9726	0.9151	0.7876	0.5988	0.4479	0.5106	0.7727	0.9541	0.9900	0.9961 (86)	
MIT	19.7634	19.9343	20.1938	20.5396	20.7870	20.9011	20.9257	20.9207	20.8350	20.4925	20.0719	19.7431 (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	0.9936	0.9857	0.9646	0.8910	0.7342	0.5166	0.3493	0.4060	0.6971	0.9360	0.9867	0.9949 (89)	
MIT 2	18.5161	18.7360	19.0658	19.4989	19.7767	19.8933	19.9096	19.9097	19.8380	19.4538	18.9231	18.4989 (90)	
Living area fraction									fLA = Living area / (4) =				0.1261 (91)
MIT	18.6734	18.8871	19.2080	19.6301	19.9041	20.0204	20.0378	20.0372	19.9637	19.5848	19.0680	18.6558 (92)	
Temperature adjustment												-0.1500	
adjusted MIT	18.5234	18.7371	19.0580	19.4801	19.7541	19.8704	19.8878	19.8872	19.8137	19.4348	18.9180	18.5058 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9908	0.9804	0.9551	0.8765	0.7204	0.5054	0.3392	0.3936	0.6816	0.9229	0.9816	0.9925 (94)
Useful gains	738.4445	868.0732	972.3013	1045.8621	948.7061	667.4666	424.7686	447.6224	684.3257	777.3816	726.9256	702.7267 (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	1914.7271	1856.9165	1680.1038	1395.0537	1059.0722	684.1634	426.7913	451.5925	745.4160	1161.7229	1562.6350	1902.5257 (97)
Space heating kWh	875.1543	664.5027	526.6050	251.4180	82.1124	0.0000	0.0000	0.0000	0.0000	285.9499	601.7108	892.6505 (98a)
Space heating requirement - total per year (kWh/year)												4180.1035
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	875.1543	664.5027	526.6050	251.4180	82.1124	0.0000	0.0000	0.0000	0.0000	285.9499	601.7108	892.6505 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4180.1035
Space heating per m2										(98c) / (4) =		35.5028 (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	875.1543	664.5027	526.6050	251.4180	82.1124	0.0000	0.0000	0.0000	0.0000	285.9499	601.7108	892.6505 (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)	988.8749	750.8505	595.0339	284.0881	92.7823	0.0000	0.0000	0.0000	0.0000	323.1072	679.8992	1008.6446 (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	88.1597	88.1189	88.0321	87.8248	87.4418	87.0000	87.0000	87.0000	87.0000	87.8707	88.0928	88.1683 (217)	
Fuel for water heating, kWh/month	286.3365	252.5246	266.5745	230.3473	221.1175	196.8213	191.7996	201.3696	205.7320	231.2011	250.1648	282.5926 (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)	-50.5110	-69.1519	-96.2836	-105.6496	-112.5805	-104.6328	-103.4370	-98.3736	-89.6734	-77.8279	-54.9205	-44.0213 (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)	-30.6360	-61.6494	-115.5496	-164.5213	-210.8506	-209.5017	-208.1443	-180.4526	-138.3425	-86.2846	-40.3910	-24.5368 (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													4723.2808 (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													2816.5815 (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													-2477.9235 (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	5384.1092 (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	4723.2808	0.2100	991.8890 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2816.5815	0.2100	591.4821 (264)
Space and water heating			1583.3711 (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	-1007.0632	0.1351	-136.0460
PV Unit electricity exported	-1470.8604	0.1273	-187.2340
Total			-323.2800 (269)
Total CO2, kg/year			1306.1070 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.0900 (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	4723.2808	1.1300	5337.3073 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2816.5815	1.1300	3182.7371 (278)
Space and water heating			8520.0443 (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	-1007.0632	1.4993	-1509.8916
PV Unit electricity exported	-1470.8604	0.4673	-687.3636
Total			-2197.2552 (283)
Total Primary energy kWh/year			6815.1361 (286)
Dwelling Primary energy Rate (DPER)			57.8800 (287)

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

1. Overall dwelling characteristics

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

2. Ventilation rate

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

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

	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)
	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	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				10.4700	10.6334	0.6300		0.7000		0.7700		34.0244 (74)
East				4.5600	19.6403	0.6300		0.7000		0.7700		27.3706 (76)
South				1.4200	46.7521	0.6300		0.7000		0.7700		20.2890 (78)
West				6.5000	19.6403	0.6300		0.7000		0.7700		39.0151 (80)
Solar gains	120.6991	228.1150	366.6839	537.2260	671.1860	695.2227	658.3682	555.1076	425.7964	267.3354	148.7980	100.4883 (83)
Total gains	736.7334	859.7970	970.4078	1118.6926	1221.0817	1221.0111	1162.4525	1059.9468	947.1274	810.6406	727.5980	702.6198 (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	0.9953	0.9902	0.9775	0.9330	0.8272	0.6491	0.4921	0.5548	0.8066	0.9611	0.9908	0.9962 (86)
MIT	19.3811	19.5939	19.9263	20.3870	20.7469	20.9383	20.9858	20.9763	20.8350	20.3552	19.7978	19.3582 (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	0.9939	0.9874	0.9708	0.9125	0.7774	0.5628	0.3833	0.4415	0.7337	0.9451	0.9877	0.9951 (89)
MIT 2	18.0544	18.3277	18.7507	19.3298	19.7432	19.9379	19.9706	19.9685	19.8504	19.3041	18.5992	18.0334 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.2217	18.4874	18.8990	19.4632	19.8698	20.0641	20.0986	20.0956	19.9746	19.4366	18.7503	18.2005 (91)
Temperature adjustment	0.0000											
adjusted MIT	18.2217	18.4874	18.8990	19.4632	19.8698	20.0641	20.0986	20.0956	19.9746	19.4366	18.7503	18.2005 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9905	0.9817	0.9615	0.9003	0.7723	0.5707	0.3967	0.4551	0.7340	0.9342	0.9823	0.9922 (94)
Useful gains	729.7687	844.0432	933.0790	1007.1571	942.9895	696.8843	461.1538	482.3791	695.2304	757.3359	714.6963	697.1581 (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	1926.3515	1873.8812	1704.4302	1429.8544	1102.6683	727.4743	465.7979	490.7742	786.2656	1192.6704	1581.7079	1912.4216 (97)
Space heating kWh	890.2576	692.0511	573.8853	304.3421	118.8010	0.0000	0.0000	0.0000	0.0000	323.8889	624.2483	904.1560 (98a)
Space heating requirement - total per year (kWh/year)												4431.6303
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	890.2576	692.0511	573.8853	304.3421	118.8010	0.0000	0.0000	0.0000	0.0000	323.8889	624.2483	904.1560 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4431.6303
Space heating per m2	(98c) / (4) =											37.6391 (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	890.2576	692.0511	573.8853	304.3421	118.8010	0.0000	0.0000	0.0000	0.0000	323.8889	624.2483	904.1560 (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)	963.4823	748.9731	621.0880	329.3745	128.5725	0.0000	0.0000	0.0000	0.0000	350.5291	675.5934	978.5238 (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	86.8548	86.6476	86.2115	85.1971	83.2854	80.3000	80.3000	80.3000	80.3000	85.3015	86.4613	80.3000 (216)
Fuel for water heating, kWh/month	288.8761	255.9957	273.4590	243.9754	242.3119	226.9240	224.4736	233.2471	235.6124	246.7620	258.1246	285.7115 (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	4796.1367	(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	3015.4733	(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	5228.9112	(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	4796.1367	0.2100	1007.1887 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3015.4733	0.2100	633.2494 (264)
Space and water heating			1640.4381 (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			1310.7864 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.1300 (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	4796.1367	1.1300	5419.6345 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3015.4733	1.1300	3407.4848 (278)
Space and water heating			8827.1193 (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			6857.1779 (286)
Target Primary Energy Rate (TPER)			58.2400 (287)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 27			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	94 A	DER	11.09	TER	11.13		
Environmental	90 B	% DER < TER				0.36	
CO ₂ Emissions (t/year)	1.25	DFEE	39.42	TFEE	42.72		
Compliance Check	See BREL	% DFEE < TFEE				7.74	
% DPER < TPER	0.61	DPER	57.88	TPER	58.24		
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

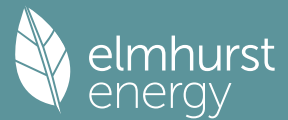
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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 (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	
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 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				10.4700	10.6334		0.7300		0.7000		0.7700		39.4251 (74)
East				4.5600	19.6403		0.7300		0.7000		0.7700		31.7151 (76)
South				1.4200	46.7521		0.7300		0.7000		0.7700		23.5095 (78)
West				6.5000	19.6403		0.7300		0.7000		0.7700		45.2079 (80)
Solar gains	139.8576	264.3237	424.8877	622.4999	777.7235	805.5756	762.8711	643.2199	493.3831	309.7696	172.4167		116.4388 (83)
Total gains	820.2552	942.6485	1081.4393	1238.3101	1352.3176	1339.9048	1275.0504	1158.4776	1029.5533	886.3731	794.1899		777.7181 (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	0.9928	0.9859	0.9661	0.9055	0.7757	0.5916	0.4416	0.5021	0.7611	0.9457	0.9870	0.9943 (86)
MIT	19.8197	19.9760	20.2363	20.5624	20.7962	20.9026	20.9261	20.9215	20.8411	20.5194	20.1113	19.7960 (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	0.9908	0.9820	0.9565	0.8796	0.7214	0.5098	0.3443	0.3988	0.6846	0.9251	0.9827	0.9927 (89)
MIT 2	18.5878	18.7886	19.1181	19.5248	19.7854	19.8942	19.9097	19.9100	19.8429	19.4853	18.9727	18.5663 (90)
Living area fraction									FLA = Living area / (4) =			0.1261 (91)
MIT	18.7432	18.9383	19.2591	19.6556	19.9129	20.0214	20.0379	20.0376	19.9688	19.6157	19.1163	18.7214 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.5932	18.7883	19.1091	19.5056	19.7629	19.8714	19.8879	19.8876	19.8188	19.4657	18.9663	18.5714 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9869	0.9758	0.9461	0.8648	0.7080	0.4989	0.3332	0.3867	0.6695	0.9112	0.9765	0.9895 (94)
Useful gains	809.5433	919.7948	1023.0990	1070.9374	957.3907	668.4505	424.9100	447.9509	689.2562	807.6760	775.5640	769.5197 (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	1924.1150	1863.7917	1686.9338	1398.4157	1060.2206	684.2967	426.8134	451.6421	746.0812	1165.7920	1569.0269	1911.2439 (97)
Space heating kWh	829.2413	634.3659	493.8931	235.7844	76.5055	0.0000	0.0000	0.0000	0.0000	266.4384	571.2933	849.4428 (98a)
Space heating requirement - total per year (kWh/year)												3956.9646
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	829.2413	634.3659	493.8931	235.7844	76.5055	0.0000	0.0000	0.0000	0.0000	266.4384	571.2933	849.4428 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3956.9646
Space heating per m2										(98c) / (4) =		33.6076 (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	829.2413	634.3659	493.8931	235.7844	76.5055	0.0000	0.0000	0.0000	0.0000	266.4384	571.2933	849.4428 (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)	936.9959	716.7976	558.0713	266.4231	86.4469	0.0000	0.0000	0.0000	0.0000	301.0603	645.5291	959.8224 (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	88.1453	88.1055	88.0112	87.8009	87.4201	87.0000	87.0000	87.0000	87.0000	87.8448	88.0773	87.0000 (216)
Fuel for water heating, kWh/month	286.3832	252.5629	266.6378	230.4100	221.1725	196.8213	191.7996	201.3696	205.7320	231.2694	250.2090	282.6343 (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	-50.5110	-69.1519	-96.2836	-105.6496	-112.5805	-104.6328	-103.4370	-98.3736	-89.6734	-77.8279	-54.9205	-44.0213 (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	-30.6360	-61.6494	-115.5496	-164.5213	-210.8506	-209.5017	-208.1443	-180.4526	-138.3425	-86.2846	-40.3910	-24.5368 (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												4471.1464 (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												2817.0016 (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												-2477.9235 (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	5132.3949 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4471.1464	3.6400	162.7497 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2817.0016	3.6400	102.5389 (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	-1007.0632	16.4900	-166.0647
PV Unit electricity exported	-1470.8604	5.5900	-82.2211
Total			-248.2858 (252)
Total energy cost			162.1287 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.3586 (257)
SAP value		94.1863
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	4471.1464	0.2100	938.9408 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2817.0016	0.2100	591.5703 (264)
Space and water heating			1530.5111 (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	-1007.0632	0.1351	-136.0460
PV Unit electricity exported	-1470.8604	0.1273	-187.2340
Total			-323.2800 (269)
Total CO2, kg/year			1253.2470 (272)
CO2 emissions per m2			10.6400 (273)
EI value			89.6808
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

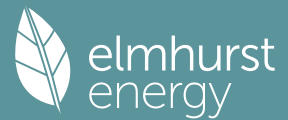
1. Overall dwelling characteristics

	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)

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

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Windows (Uw = 1.30)			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)

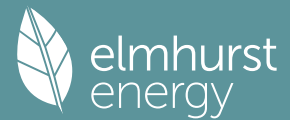
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8541 (42)
Hot water usage for mixer showers													
Hot water usage for baths	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 other uses	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)
Average daily hot water use (litres/day)	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)
												135.1732	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	147.0513	143.9111	140.0871	134.2724	129.5504	124.4739	122.5231	126.3306	130.3462	135.6756	141.5799	146.6699	(44)
Energy content (annual)	232.8933	204.9275	215.3086	183.8122	174.3997	153.0552	148.1811	156.4237	160.7299	184.1106	201.7065	229.6496	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2245.1980	
Water storage loss:	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)
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)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	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)
	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					10.4700	10.6334	0.7300	0.7000			0.7700	39.4251 (74)	
East					4.5600	19.6403	0.7300	0.7000			0.7700	31.7151 (76)	
South					1.4200	46.7521	0.7300	0.7000			0.7700	23.5095 (78)	
West					6.5000	19.6403	0.7300	0.7000			0.7700	45.2079 (80)	

Solar gains	139.8576	264.3237	424.8877	622.4999	777.7235	805.5756	762.8711	643.2199	493.3831	309.7696	172.4167	116.4388 (83)	
Total gains	820.2552	942.6485	1081.4393	1238.3101	1352.3176	1339.9048	1275.0504	1158.4776	1029.5533	886.3731	794.1899	777.7181 (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	0.9928	0.9859	0.9661	0.9055	0.7757	0.5916	0.4416	0.5021	0.7611	0.9457	0.9870	0.9943 (86)
MIT	19.8197	19.9760	20.2363	20.5624	20.7962	20.9026	20.9261	20.9215	20.8411	20.5194	20.1113	19.7960 (87)
Th 2	19.9636	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	0.9908	0.9820	0.9565	0.8796	0.7214	0.5098	0.3443	0.3988	0.6846	0.9251	0.9827	0.9927 (89)
MIT 2	18.5878	18.7886	19.1181	19.5248	19.7854	19.8942	19.9097	19.9100	19.8429	19.4853	18.9727	18.5663 (90)
Living area fraction												0.1261 (91)
MIT	18.7432	18.9383	19.2591	19.6556	19.9129	20.0214	20.0379	20.0376	19.9688	19.6157	19.1163	18.7214 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.5932	18.7883	19.1091	19.5056	19.7629	19.8714	19.8879	19.8876	19.8188	19.4657	18.9663	18.5714 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9869	0.9758	0.9461	0.8648	0.7080	0.4989	0.3332	0.3867	0.6695	0.9112	0.9765	0.9895 (94)
Useful gains	809.5433	919.7948	1023.0990	1070.9374	957.3907	668.4505	424.9100	447.9509	689.2562	807.6760	775.5640	769.5197 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	16.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1924.1150	1863.7917	1686.9338	1398.4157	1060.2206	684.2967	426.8134	451.6421	746.0812	1165.7920	1569.0269	1911.2439 (97)
Space heating kWh	829.2413	634.3659	493.8931	235.7844	76.5055	0.0000	0.0000	0.0000	0.0000	266.4384	571.2933	849.4428 (98a)
Space heating requirement - total per year (kWh/year)												3956.9646
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	829.2413	634.3659	493.8931	235.7844	76.5055	0.0000	0.0000	0.0000	0.0000	266.4384	571.2933	849.4428 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3956.9646
Space heating per m2										(98c) / (4) =		33.6076 (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	829.2413	634.3659	493.8931	235.7844	76.5055	0.0000	0.0000	0.0000	0.0000	266.4384	571.2933	849.4428 (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)	936.9959	716.7976	558.0713	266.4231	86.4469	0.0000	0.0000	0.0000	0.0000	301.0603	645.5291	959.8224 (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	88.1453	88.1055	88.0112	87.8009	87.4201	87.0000	87.0000	87.0000	87.0000	87.8448	88.0773	87.0000 (216)
Fuel for water heating, kWh/month	286.3832	252.5629	266.6378	230.4100	221.1725	196.8213	191.7996	201.3696	205.7320	231.2694	250.2090	282.6343 (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	-50.5110	-69.1519	-96.2836	-105.6496	-112.5805	-104.6328	-103.4370	-98.3736	-89.6734	-77.8279	-54.9205	-44.0213 (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	-30.6360	-61.6494	-115.5496	-164.5213	-210.8506	-209.5017	-208.1443	-180.4526	-138.3425	-86.2846	-40.3910	-24.5368 (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												4471.1464 (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												2817.0016 (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												-2477.9235 (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												5132.3949 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4471.1464	5.6000	250.3842 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2817.0016	5.6000	157.7521 (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	-1007.0632	26.0600	-262.4407
PV Unit electricity exported	-1470.8604	5.8100	-85.4570
Total			-347.8976 (252)
Total energy cost			243.1963 (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	4471.1464	0.2100	938.9408 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2817.0016	0.2100	591.5703 (264)
Space and water heating			1530.5111 (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	-1007.0632	0.1351	-136.0460
PV Unit electricity exported	-1470.8604	0.1273	-187.2340
Total			-323.2800 (269)
Total CO2, kg/year			1253.2470 (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	4471.1464	1.1300	5052.3955 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2817.0016	1.1300	3183.2118 (278)
Space and water heating			8235.6072 (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	-1007.0632	1.4993	-1509.8916
PV Unit electricity exported	-1470.8604	0.4673	-687.3636
Total			-2197.2552 (283)
Total Primary energy kWh/year			6530.6990 (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 -£ 21 -136 kg (10.9%)

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	£507	£507	£0
Space heating	£372	£372	£0
Water heating	£158	£158	£0
Lighting	£62	£62	£0
Generated (PV)	-£348	-£348	£0
Total cost of fuels	£243	£243	£0
Total cost of uses	£244	£244	£0
Delivered energy	44 kWh/m²	44 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.3 tonnes	1.3 tonnes	0.0 tonnes
CO2 emissions per m²	11 kg/m²	11 kg/m²	0 kg/m²
Primary energy	55 kWh/m²	55 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

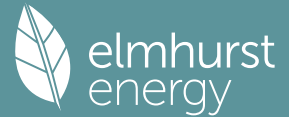
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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	(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 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													2245.1980
34.9340	30.7391	32.2963	27.5718	26.1600	22.9583	22.2272	23.4636	24.1095	27.6166	30.2560	34.4474	(46)	
Water storage loss:													
Total storage loss													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	(62)	
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	252.4334	222.5219	234.6712	202.3022	193.3491	171.2346	166.8657	175.1916	178.9868	203.1580	220.3773	249.1571	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
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	(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	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	(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	10.4700				10.6334	0.7300	0.7000	0.7700	39.4251 (74)			
East	4.5600				19.6403	0.7300	0.7000	0.7700	31.7151 (76)			
South	1.4200				46.7521	0.7300	0.7000	0.7700	23.5095 (78)			
West	6.5000				19.6403	0.7300	0.7000	0.7700	45.2079 (80)			
Solar gains	139.8576	264.3237	424.8877	622.4999	777.7235	805.5756	762.8711	643.2199	493.3831	309.7696	172.4167	116.4388 (83)
Total gains	820.2552	942.6485	1081.4393	1238.3101	1352.3176	1339.9048	1275.0504	1158.4776	1029.5533	886.3731	794.1899	777.7181 (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
	0.9928	0.9859	0.9661	0.9055	0.7757	0.5916	0.4416	0.5021	0.7611	0.9457	0.9870	0.9943 (86)
MIT	19.8197	19.9760	20.2363	20.5624	20.7962	20.9026	20.9261	20.9215	20.8411	20.5194	20.1113	19.7960 (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	0.9908	0.9820	0.9565	0.8796	0.7214	0.5098	0.3443	0.3988	0.6846	0.9251	0.9827	0.9927 (89)
MIT 2	18.5878	18.7886	19.1181	19.5248	19.7854	19.8942	19.9097	19.9100	19.8429	19.4853	18.9727	18.5663 (90)
Living area fraction	18.7432	18.9383	19.2591	19.6556	19.9129	20.0214	20.0379	20.0376	19.9688	19.6157	19.1163	18.7214 (92)
MIT	18.7432	18.9383	19.2591	19.6556	19.9129	20.0214	20.0379	20.0376	19.9688	19.6157	19.1163	18.7214 (92)
Temperature adjustment	18.5932	18.7883	19.1091	19.5056	19.7629	19.8714	19.8879	19.8876	19.8188	19.4657	18.9663	-0.1500
adjusted MIT	18.5932	18.7883	19.1091	19.5056	19.7629	19.8714	19.8879	19.8876	19.8188	19.4657	18.9663	18.5714 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9869	0.9758	0.9461	0.8648	0.7080	0.4989	0.3332	0.3867	0.6695	0.9112	0.9765	0.9895 (94)
Useful gains	809.5433	919.7948	1023.0990	1070.9374	957.3907	668.4505	424.9100	447.9509	689.2562	807.6760	775.5640	769.5197 (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	1924.1150	1863.7917	1686.9338	1398.4157	1060.2206	684.2967	426.8134	451.6421	746.0812	1165.7920	1569.0269	1911.2439 (97)
Space heating kWh	829.2413	634.3659	493.8931	235.7844	76.5055	0.0000	0.0000	0.0000	0.0000	266.4384	571.2933	849.4428 (98a)
Space heating requirement - total per year (kWh/year)												3956.9646
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	829.2413	634.3659	493.8931	235.7844	76.5055	0.0000	0.0000	0.0000	0.0000	266.4384	571.2933	849.4428 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3956.9646
Space heating per m2										(98c) / (4) =		33.6076 (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
	829.2413	634.3659	493.8931	235.7844	76.5055	0.0000	0.0000	0.0000	0.0000	266.4384	571.2933	849.4428 (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)	936.9959	716.7976	558.0713	266.4231	86.4469	0.0000	0.0000	0.0000	0.0000	301.0603	645.5291	959.8224 (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	88.1453	88.1055	88.0112	87.8009	87.4201	87.0000	87.0000	87.0000	87.0000	87.8448	88.0773	87.0000 (216)
Fuel for water heating, kWh/month	286.3832	252.5629	266.6378	230.4100	221.1725	196.8213	191.7996	201.3696	205.7320	231.2694	250.2090	282.6343 (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)	-50.5110	-69.1519	-96.2836	-105.6496	-112.5805	-104.6328	-103.4370	-98.3736	-89.6734	-77.8279	-54.9205	-44.0213 (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)	-30.6360	-61.6494	-115.5496	-164.5213	-210.8506	-209.5017	-208.1443	-180.4526	-138.3425	-86.2846	-40.3910	-24.5368 (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												4471.1464	(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												2817.0016	(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												-2477.9235	(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												5132.3949	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4471.1464	3.6400	162.7497 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2817.0016	3.6400	102.5389 (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	-1007.0632	16.4900	-166.0647
PV Unit electricity exported	-1470.8604	5.5900	-82.2211
Total			-248.2858 (252)
Total energy cost			162.1287 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.3586 (257)
SAP value		94.1863
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	4471.1464	0.2100	938.9408 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2817.0016	0.2100	591.5703 (264)
Space and water heating			1530.5111 (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	-1007.0632	0.1351	-136.0460
PV Unit electricity exported	-1470.8604	0.1273	-187.2340
Total			-323.2800 (269)
Total CO2, kg/year			1253.2470 (272)
CO2 emissions per m2			10.6400 (273)
EI value			89.6808
EI rating			90 (274)
EI band			B

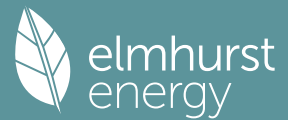
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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)

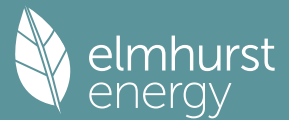
3. Heat losses and heat loss parameter

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				10.4700	10.6334		0.7300		0.7000		0.7700		39.4251 (74)
East				4.5600	19.6403		0.7300		0.7000		0.7700		31.7151 (76)
South				1.4200	46.7521		0.7300		0.7000		0.7700		23.5095 (78)
West				6.5000	19.6403		0.7300		0.7000		0.7700		45.2079 (80)
Solar gains	139.8576	264.3237	424.8877	622.4999	777.7235	805.5756	762.8711	643.2199	493.3831	309.7696	172.4167	116.4388	(83)
Total gains	820.2552	942.6485	1081.4393	1238.3101	1352.3176	1339.9048	1275.0504	1158.4776	1029.5533	886.3731	794.1899	777.7181	(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	0.9928	0.9859	0.9661	0.9055	0.7757	0.5916	0.4416	0.5021	0.7611	0.9457	0.9870	0.9943	(86)
MIT	19.8197	19.9760	20.2363	20.5624	20.7962	20.9026	20.9261	20.9215	20.8411	20.5194	20.1113	19.7960	(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	0.9908	0.9820	0.9565	0.8796	0.7214	0.5098	0.3443	0.3988	0.6846	0.9251	0.9827	0.9927	(89)
MIT 2	18.5878	18.7886	19.1181	19.5248	19.7854	19.8942	19.9097	19.9100	19.8429	19.4853	18.9727	18.5663	(90)
Living area fraction	fLA = Living area / (4) =												0.1261 (91)
MIT	18.7432	18.9383	19.2591	19.6556	19.9129	20.0214	20.0379	20.0376	19.9688	19.6157	19.1163	18.7214	(92)
Temperature adjustment													-0.1500
adjusted MIT	18.5932	18.7883	19.1091	19.5056	19.7629	19.8714	19.8879	19.8876	19.8188	19.4657	18.9663	18.5714	(93)

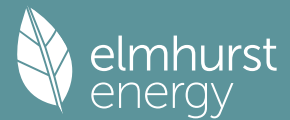
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9869	0.9758	0.9461	0.8648	0.7080	0.4989	0.3332	0.3867	0.6695	0.9112	0.9765	0.9895	(94)
Ext temp.	809.5433	919.7948	1023.0990	1070.9374	957.3907	668.4505	424.9100	447.9509	689.2562	807.6760	775.5640	769.5197	(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	1924.1150	1863.7917	1686.9338	1398.4157	1060.2206	684.2967	426.8134	451.6421	746.0812	1165.7920	1569.0269	1911.2439	(97)
Space heating requirement - total per year (kWh/year)	829.2413	634.3659	493.8931	235.7844	76.5055	0.0000	0.0000	0.0000	0.0000	266.4384	571.2933	849.4428	(98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)	829.2413	634.3659	493.8931	235.7844	76.5055	0.0000	0.0000	0.0000	0.0000	266.4384	571.2933	849.4428	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)													3956.9646
Space heating per m2													(98c) / (4) = 33.6076 (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)	829.2413	634.3659	493.8931	235.7844	76.5055	0.0000	0.0000	0.0000	0.0000	266.4384	571.2933	849.4428	(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)	936.9959	716.7976	558.0713	266.4231	86.4469	0.0000	0.0000	0.0000	0.0000	301.0603	645.5291	959.8224	(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	88.1453	88.1055	88.0112	87.8009	87.4201	87.0000	87.0000	87.0000	87.0000	87.8448	88.0773	87.0000	(216)
Fuel for water heating, kWh/month	286.3832	252.5629	266.6378	230.4100	221.1725	196.8213	191.7996	201.3696	205.7320	231.2694	250.2090	282.6343	(217)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	29.2632	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	-50.5110	-69.1519	-96.2836	-105.6496	-112.5805	-104.6328	-103.4370	-98.3736	-89.6734	-77.8279	-54.9205	-44.0213	(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	-30.6360	-61.6494	-115.5496	-164.5213	-210.8506	-209.5017	-208.1443	-180.4526	-138.3425	-86.2846	-40.3910	-24.5368	(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												4471.1464	(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												2817.0016	(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												-2477.9235	(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												5132.3949	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4471.1464	5.6000	250.3842	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2817.0016	5.6000	157.7521	(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	-1007.0632	26.0600	-262.4407	
PV Unit electricity exported	-1470.8604	5.8100	-85.4570	
Total			-347.8976	(252)
Total energy cost			243.1963	(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	4471.1464	0.2100	938.9408	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2817.0016	0.2100	591.5703	(264)
Space and water heating			1530.5111	(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	-1007.0632	0.1351	-136.0460	
PV Unit electricity exported	-1470.8604	0.1273	-187.2340	
Total			-323.2800	(269)
Total CO2, kg/year			1253.2470	(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	4471.1464	1.1300	5052.3955 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2817.0016	1.1300	3183.2118 (278)
Space and water heating			8235.6072 (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	-1007.0632	1.4993	-1509.8916
PV Unit electricity exported	-1470.8604	0.4673	-687.3636
Total			-2197.2552 (283)
Total Primary energy kWh/year			6530.6990 (286)

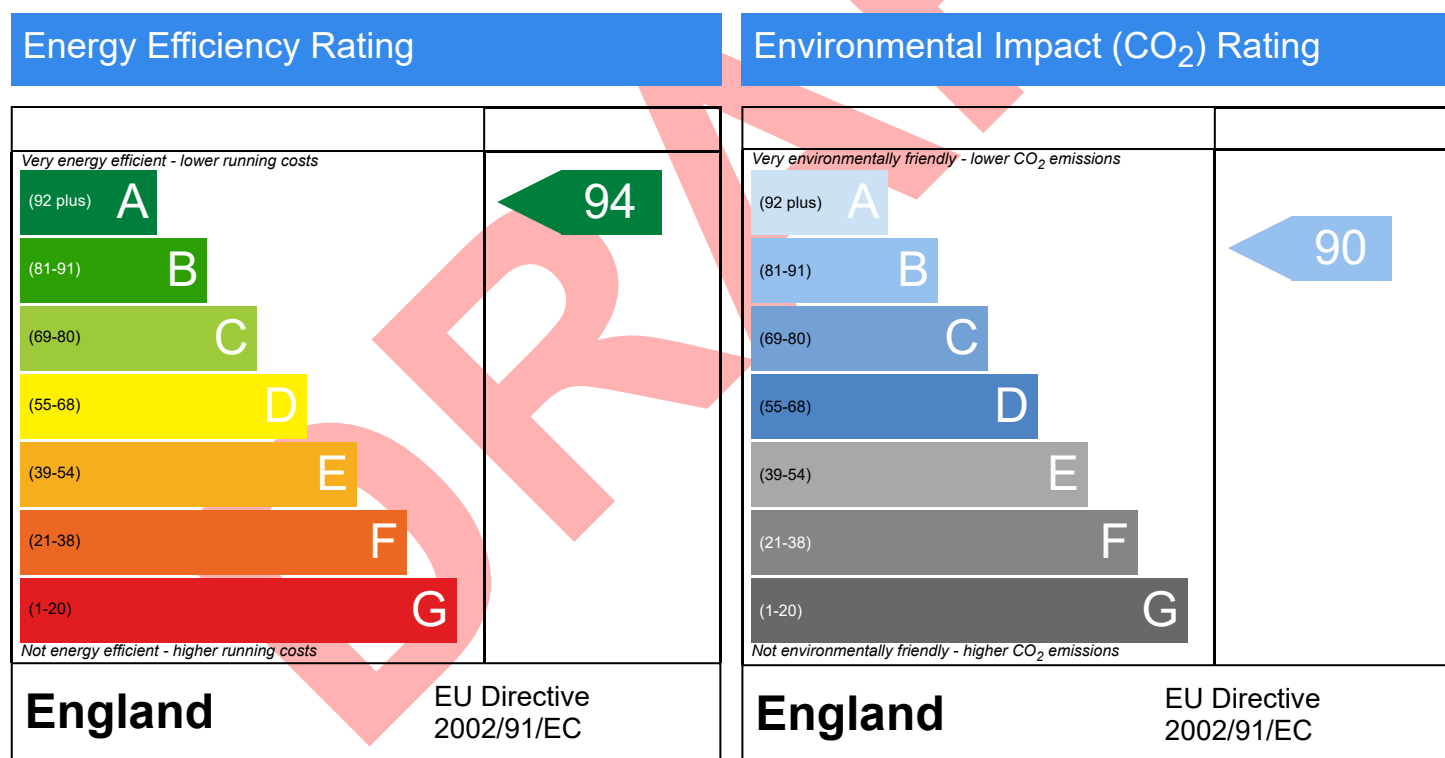
Predicted Energy Assessment



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.