

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	141 m ²
Site Reference	SAP VG 21-0282	Plot Reference	Plot 30
Address			

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

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

1a Target emission rate and dwelling emission rate			
Fuel for main heating system	Mains gas		
Target carbon dioxide emission rate	10.13 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	10.07 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	53.26 kWh _{PE} /m ²		
Dwelling primary energy	53.09 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	43.9 kWh/m ²		
Dwelling fabric energy efficiency	41.0 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	0.15	Exposed Floor (0.2)	OK
Roofs	0.16	0.09	Roof (1) (0.09)	OK
Windows, doors, and roof windows	1.6	1.3	Front (1.3)	OK
Rooflights	2.2	N/A	N/A	N/A

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))			
Name	Net area [m ²]	U-Value [W/m ² K]	
Exposed wall: Walls (1)	134.79	0.19	
Sheltered wall: Walls (2)	25.13	0.17	
Ground floor: Ground Floor, Ground Floor	60.41	0.13	
Upper floor: Exposed Floor, Exposed Floor	20.06	0.2	
Exposed roof: Roof (1)	80.47	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	8.34	West	0.7	1.3
Rear , Windows	12.46	East	0.7	1.3
Front Door, Door	2.14	West	N/A	1.3
Side RH, Windows	1.42	South	0.7	1.3
Side LH, Windows	0.71	North	0.7	1.3

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

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E3: Sill	Calculated by person with suitable expertise	0.021 (!)	E3-01
External wall	E4: Jamb	Calculated by person with suitable expertise	0.016 (!)	E4-01 RCD
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.092	Manufacturer Declaration
External wall	E10: Eaves (insulation at ceiling level)	Calculated by person with suitable expertise	0.058	E10-01
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.047	E16-01 RCD
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.001 (!)	E6-01 RCD
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.057	E12-01 RCD
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.088	E17-01 RCD
External wall	E20: Exposed floor (normal)	SAP table default	0.32	
External wall	E21: Exposed floor (inverted)	SAP table default	0.32	

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	3.24 kWp	
Orientation	East	
Pitch	30°	
Overshading	None or very little	
Manufacturer		
MCS certificate		
Technology type: Photovoltaic system (2)		
Peak power	2 kWp	
Orientation	West	
Pitch	30°	
Overshading	None or very little	
Manufacturer	PV	
MCS certificate		
10 Heat networks		
N/A		
11 Supporting documentary evidence		
N/A		
12 Declarations		
a. Assessor Declaration		
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.		
Signed:	Assessor ID:	
Name:	Date:	
b. Client Declaration		
N/A		

Summary for Input Data

Property Reference	SAP VG 21-0282		Issued on Date	15/11/2024
Assessment Reference	Plot 30	Prop Type Ref	SAP VG 21-0282	
Property				

SAP Rating	96 A	DER	10.07	TER	10.13
Environmental	90 B	% DER < TER			0.59
CO ₂ Emissions (t/year)	1.37	DFEE	41.01	TFEE	43.89
Compliance Check	See BREL	% DFEE < TFEE			6.56
% DPER < TPER	0.32	DPER	53.09	TPER	53.26

Assessor Details	Miss Victoria Gartside	Assessor ID	AL30-0001
Client			

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

Orientation	West	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	House, Detached	
Which Floor	0	
2.0 Number of Storeys	2	
3.0 Date Built	2023	
3.0 Property Age Band	L	
4.0 Sheltered Sides	0	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	190.54	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	Unheated Space Floor Area	Average Storey Height
Ground floor:	37.00 m	60.41 m ²	20.06 m ²	2.66 m
1st Storey:	37.00 m	80.47 m ²		2.34 m
2nd Storey:	32.20 m	60.31 m ²		2.28 m

8.0 Living Area	15.08	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	159.86	134.79	0.00	None	25.07	Enter Gross Area
	Garage Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.19	110.00	25.13	25.13	0.55	Garage Single 2 Inside	0.00	Enter Gross Area

9.2 Internal Walls	Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
	Studs	Plasterboard on timber frame	9.00	218.38

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	80.47	80.47	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	60.41

Summary for Input Data

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.13	None	0.00	75.00	60.41
Exposed Floor	Exposed Floor - Timber	Lowest occupied	Timber exposed floor, insulation between joists	0.20	None	0.00	20.00	20.06

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1		Plasterboard ceiling, carpeted chipboard floor	9.00	60.41

12.0 Opening Types

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

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Front	Windows	External Wall	West	8.34	0
Rear	Windows	External Wall	East	12.46	0
Front Door	Door	External Wall	West	2.14	0
Side RH	Windows	External Wall	South	1.42	0
Side LH	Windows	External Wall	North	0.71	0

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	17.30	0.02	0.02 MFF-150-E2-02	No
E3 Sill	Independently assessed	13.80	0.02	0.02 E3-01	No
E4 Jamb	Independently assessed	38.40	0.02	0.02 E4-01 RCD	No
E5 Ground floor (normal)	Independently assessed	37.00	0.09	0.09 Manufacturer Declaration	No
E10 Eaves (insulation at ceiling level)	Independently assessed	15.85	0.06	0.06 E10-01	No
E16 Corner (normal)	Independently assessed	27.66	0.05	0.05 E16-01 RCD	No
E6 Intermediate floor within a dwelling	Independently assessed	27.55	0.00	0.00 E6-01 RCD	No
E12 Gable (insulation at ceiling level)	Independently assessed	21.15	0.06	0.06 E12-01 RCD	No
E17 Corner (inverted – internal area greater than external area)	Independently assessed	7.66	-0.09	-0.09 E17-01 RCD	No
E20 Exposed floor (normal)	Table K1 - Default	9.45	0.32	0.32	No
E21 Exposed floor (inverted)	Table K1 - Default	9.45	0.32	0.32	No

Y-value W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present

19.1 Mechanical extract ventilation - Decentralised

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

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys

Number of open flues

Number of chimneys/flues attached to closed fire

Number of flues attached to solid fuel boiler

Number of flues attached to other heater

Number of blocked chimneys

Number of intermittent extract fans

Number of passive vents

Number of flueless gas fires

Summary for Input Data

21.0 Fixed Cooling System		No								
22.0 Pressure Testing		Yes								
Designed AP ₅₀	4.00	m³/(h.m²) @ 50 Pa								
Property Tested?	Yes									
Test Method	Blower Door									
22.0 Lighting		No								
No Fixed Lighting	No									
	Name Lighting 1	Efficacy 85.00	Power 10.00	Capacity 850.00	Count 26					
24.0 Main Heating 1		Database								
Percentage of Heat	100.00	%								
Database Ref. No.	18119									
Fuel Type	Mains gas									
SAP Code	0									
In Winter	88.50									
In Summer	87.00									
Model Name	ecoTEC sustain 28									
Manufacturer	Vaillant									
System Type	Combi boiler									
Controls SAP Code	2110									
Delayed Start Stat	Yes									
Burner Control	Modulating									
HETAS approved System	No									
Flue Type	Balanced									
Fan Assisted Flue	Yes									
Is MHS Pumped	Pump in heated space									
Heating Pump Age	2013 or later									
Heat Emitter	Radiators and Underfloor									
Underfloor Heating	Yes - Pipes in thin screed									
Flow Temperature	Unknown									
Flow Temperature Value	45.00									
Boiler Interlock	Yes									
Combi boiler type	Standard Combi									
25.0 Main Heating 2		None								
26.0 Heat Networks		None								
	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									
27.0 Secondary Heating		None								
28.0 Water Heating		Main Heating 1								
SAP Code	901									
Flue Gas Heat Recovery System	No									
Waste Water Heat Recovery Instantaneous System 1	No									
Waste Water Heat Recovery Instantaneous System 2	No									

Summary for Input Data

Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Immersion Heater	Single
Summer Immersion	No
Cold Water Source	From mains
Bath Count	1
Supplementary Immersion	No
Immersion Only Heating Hot Water	No

28.1 Showers

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

28.3 Waste Water Heat Recovery System

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

31.0 Thermal Store

None

32.0 Photovoltaic Unit

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

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

34.0 Small-scale Hydro

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

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

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout



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Property					
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Environmental	90 B	% DER < TER			0.59
CO ₂ Emissions (t/year)	1.37	DFEE	41.01	TFEE	43.89
Compliance Check	See BREL	% DFEE < TFEE			6.56
% DPER < TPER	0.32	DPER	53.09	TPER	53.26
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	60.4100 (1b)	x 2.6600 (2b)	= 160.6906 (1b) - (3b)
First floor	80.4700 (1c)	x 2.3400 (2c)	= 188.2998 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	140.8800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 348.9904 (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) = 0.1433 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3433 (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) = 0.3433 (21)

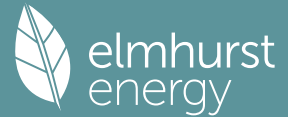
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4377	0.4291	0.4205	0.3776	0.3690	0.3261	0.3261	0.3175	0.3433	0.3690	0.3862	0.4033 (22b)
Effective ac	0.5958	0.5921	0.5884	0.5713	0.5681	0.5532	0.5532	0.5504	0.5589	0.5681	0.5746	0.5813 (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)			22.9300	1.2357	28.3356		(27)
Door			2.1400	1.3000	2.7820		(26a)
Ground Floor			60.4100	0.1300	7.8533	75.0000	4530.7500 (28a)
Exposed Floor			20.0600	0.2000	4.0120	20.0000	401.2000 (28b)
External Wall	159.8600	25.0700	134.7900	0.1900	25.6101	110.0000	14826.9000 (29a)
Garage Wall	25.1300		25.1300	0.1700	4.2721	110.0000	2764.3000 (29a)
Plane Roof	80.4700		80.4700	0.0900	7.2423	9.0000	724.2300 (30)
Total net area of external elements Aum(A, m ²)			345.9300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	80.1074		(33)
Studs			218.3800			9.0000	1965.4200 (32c)
Internal Floor 1			60.4100			18.0000	1087.3800 (32d)
Internal Ceiling 1			60.4100			9.0000	543.6900 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	26843.8700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							190.5442 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				17.3000	0.0240	0.4152	
E3 Sill				13.8000	0.0210	0.2898	

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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	45.9517	46.0734	46.1932	46.7645	46.8729	47.3845	47.3845	47.4805	47.1862	46.8729	46.6540	46.4274	
alpha	4.0634	4.0716	4.0795	4.1176	4.1249	4.1590	4.1590	4.1654	4.1457	4.1249	4.1103	4.0952	
util living area	0.9944	0.9874	0.9699	0.9147	0.8009	0.6272	0.4746	0.5330	0.7809	0.9526	0.9891	0.9955 (86)	
MIT	19.5973	19.7863	20.0733	20.4464	20.7254	20.8732	20.9127	20.9052	20.7936	20.4028	19.9348	19.5720 (87)	
Th 2	19.9587	19.9612	19.9636	19.9749	19.9771	19.9870	19.9870	19.9888	19.9831	19.9771	19.9728	19.9683 (88)	
util rest of house	0.9930	0.9842	0.9618	0.8920	0.7510	0.5449	0.3713	0.4256	0.7090	0.9353	0.9858	0.9944 (89)	
MIT 2	18.3100	18.5525	18.9170	19.3845	19.7045	19.8578	19.8865	19.8846	19.7885	19.3432	18.7520	18.2849 (90)	
Living area fraction									fLA = Living area / (4) =				0.1070 (91)
MIT	18.4478	18.6846	19.0408	19.4982	19.8138	19.9665	19.9963	19.9938	19.8961	19.4566	18.8786	18.4227 (92)	
Temperature adjustment												-0.1500	
adjusted MIT	18.2978	18.5346	18.8908	19.3482	19.6638	19.8165	19.8463	19.8438	19.7461	19.3066	18.7286	18.2727 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9895	0.9778	0.9507	0.8749	0.7335	0.5300	0.3564	0.4094	0.6895	0.9201	0.9798	0.9915 (94)
Useful gains	817.3868	977.5699	1108.5408	1196.8467	1095.9036	788.3279	506.1787	532.5887	798.0630	883.5543	810.1001	774.9066 (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	2271.4376	2206.6604	2000.1552	1665.9745	1266.8982	820.8933	510.8568	540.8432	892.2340	1385.0643	1858.5745	2260.1873 (97)
Space heating kWh	1081.8138	825.9488	663.3611	337.7720	127.2200	0.0000	0.0000	0.0000	0.0000	373.1234	754.9015	1105.0488 (98a)
Space heating requirement - total per year (kWh/year)												5269.1893
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	1081.8138	825.9488	663.3611	337.7720	127.2200	0.0000	0.0000	0.0000	0.0000	373.1234	754.9015	1105.0488 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5269.1893
Space heating per m2										(98c) / (4) =		37.4020 (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	1081.8138	825.9488	663.3611	337.7720	127.2200	0.0000	0.0000	0.0000	0.0000	373.1234	754.9015	1105.0488 (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)	1222.3884	933.2755	749.5606	381.6633	143.7514	0.0000	0.0000	0.0000	0.0000	421.6084	852.9961	1248.6427 (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	255.9696	225.6333	237.9402	205.0930	195.9970	173.5584	169.1155	177.5666	181.4273	205.9535	223.4399	252.6440 (64)	
Efficiency of water heater	88.2090	88.1738	88.0990	87.9273	87.5843	87.0000	87.0000	87.0000	87.0000	87.9606	88.1529	88.2170 (217)	
Fuel for water heating, kWh/month	290.1853	255.8961	270.0828	233.2530	223.7810	199.4924	194.3857	204.0995	208.5371	234.1428	253.4686	286.3893 (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	33.1347	26.5819	23.9340	17.5351	13.5446	11.0661	12.3559	16.0606	20.8611	27.3710	30.9154	34.0556 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-52.5111	-78.6467	-119.7985	-137.9065	-147.6891	-136.8960	-134.6397	-127.4065	-112.8662	-91.6474	-58.7698	-44.4379 (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)	-30.4728	-72.8869	-170.0866	-292.0138	-415.9300	-429.6967	-419.2602	-335.5278	-220.1547	-110.9914	-42.3058	-23.1829 (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													5953.8862 (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													2853.7136 (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)													267.4161 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

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PV generation	-3805.7250 (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	5355.2909 (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	5953.8862	0.2100	1250.3161 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2853.7136	0.2100	599.2799 (264)
Space and water heating			1849.5960 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	267.4161	0.1443	38.5964 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1243.2155	0.1341	-166.6809
PV Unit electricity exported	-2562.5095	0.1227	-314.4938
Total			-481.1748 (269)
Total CO2, kg/year			1418.9469 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.0700 (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	5953.8862	1.1300	6727.8914 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2853.7136	1.1300	3224.6964 (278)
Space and water heating			9952.5878 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	267.4161	1.5338	410.1717 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1243.2155	1.4955	-1859.2188
PV Unit electricity exported	-2562.5095	0.4504	-1154.0307
Total			-3013.2495 (283)
Total Primary energy kWh/year			7479.6108 (286)
Dwelling Primary energy Rate (DPER)			53.0900 (287)

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

1. Overall dwelling characteristics

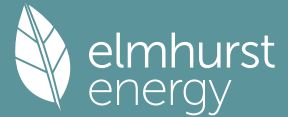
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	60.4100 (1b)	x 2.6600 (2b)	= 160.6906 (1b) - (3b)
First floor	80.4700 (1c)	x 2.3400 (2c)	= 188.2998 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	140.8800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 348.9904 (5)

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) = 0.1146 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3646 (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) = 0.3646 (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	0.4649	0.4558	0.4467	0.4011	0.3920	0.3464	0.3464	0.3373	0.3646	0.3920	0.4102	0.4284 (22b)
Effective ac	0.6081	0.6039	0.5998	0.5804	0.5768	0.5600	0.5600	0.5569	0.5665	0.5768	0.5841	0.5918 (25)

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Total internal gains
665.7588 683.6965 652.8859 629.5241 595.2352 569.7923 546.1443 546.6623 564.5897 587.6191 625.8908 650.5913 (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					0.7100	10.6334	0.6300	0.7000			0.7700	2.3073 (74)
East					12.4600	19.6403	0.6300	0.7000			0.7700	74.7889 (76)
South					1.4200	46.7521	0.6300	0.7000			0.7700	20.2890 (78)
West					8.3400	19.6403	0.6300	0.7000			0.7700	50.0593 (80)

Solar gains	147.4446	281.8672	452.0308	646.4749	784.9650	801.2544	763.7076	660.2074	521.0124	330.8875	182.5668	122.1242 (83)
Total gains	813.2033	965.5636	1104.9168	1275.9990	1380.2002	1371.0467	1309.8519	1206.8697	1085.6022	918.5066	808.4576	772.7154 (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	44.9234	45.0546	45.1839	45.8014	45.9188	46.4734	46.4734	46.5775	46.2582	45.9188	45.6819	45.4368
alpha	3.9949	4.0036	4.0123	4.0534	4.0613	4.0982	4.0982	4.1052	4.0839	4.0613	4.0455	4.0291
util living area	0.9947	0.9890	0.9752	0.9318	0.8368	0.6744	0.5184	0.5761	0.8129	0.9597	0.9900	0.9957 (86)
MIT	19.1720	19.4067	19.7733	20.2691	20.6673	20.9039	20.9746	20.9614	20.7844	20.2439	19.6266	19.1436 (87)
Th 2	19.9375	19.9402	19.9429	19.9557	19.9581	19.9692	19.9692	19.9712	19.9649	19.9581	19.9532	19.9482 (88)
util rest of house	0.9933	0.9861	0.9684	0.9124	0.7907	0.5900	0.4062	0.4619	0.7442	0.9445	0.9869	0.9946 (89)
MIT 2	17.8012	18.1022	18.5686	19.1923	19.6580	19.9058	19.9589	19.9540	19.7994	19.1744	18.3929	17.7719 (90)
Living area fraction	17.9479	18.2418	18.6975	19.3075	19.7660	20.0126	20.0676	20.0618	19.9048	19.2888	18.5249	17.9187 (91)
MIT	17.9479	18.2418	18.6975	19.3075	19.7660	20.0126	20.0676	20.0618	19.9048	19.2888	18.5249	17.9187 (92)
Temperature adjustment												0.0000
adjusted MIT	17.9479	18.2418	18.6975	19.3075	19.7660	20.0126	20.0676	20.0618	19.9048	19.2888	18.5249	17.9187 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9892	0.9792	0.9572	0.8973	0.7809	0.5938	0.4174	0.4725	0.7396	0.9311	0.9804	0.9911 (94)
Useful gains	804.4493	945.4360	1057.6638	1144.9131	1077.7730	814.1570	546.6764	570.2663	802.8788	855.2233	792.6519	765.8572 (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	2265.3588	2208.0983	2012.9397	1694.3864	1309.8214	868.4517	556.3779	586.2212	935.7121	1410.9581	1864.8854	2251.3781 (97)
Space heating kWh	1086.9166	848.5091	710.7252	395.6208	172.6440	0.0000	0.0000	0.0000	0.0000	413.4667	772.0081	1105.2275 (98a)
Space heating requirement - total per year (kWh/year)												5505.1180
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	1086.9166	848.5091	710.7252	395.6208	172.6440	0.0000	0.0000	0.0000	0.0000	413.4667	772.0081	1105.2275 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5505.1180
Space heating per m2										(98c) / (4) =		39.0766 (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	1086.9166	848.5091	710.7252	395.6208	172.6440	0.0000	0.0000	0.0000	0.0000	413.4667	772.0081	1105.2275 (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)	1176.3167	918.2999	769.1832	428.1611	186.8441	0.0000	0.0000	0.0000	0.0000	447.4748	835.5066	1196.1337 (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	253.9084	224.4566	238.5308	210.2432	204.0781	184.2177	182.1958	189.3469	191.2995	212.8898	225.7915	251.2354 (64)
Efficiency of water heater	87.1329	86.9519	86.5702	85.7145	84.0251	80.3000	80.3000	80.3000	80.3000	85.7776	86.7965	87.1709 (217)
Fuel for water heating, kWh/month	291.4037	258.1388	275.5345	245.2833	242.8775	229.4119	226.8939	235.7994	238.2310	248.1882	260.1391	288.2102 (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	33.8261	27.1366	24.4335	17.9010	13.8272	11.2970	12.6137	16.3957	21.2964	27.9421	31.5605	34.7662 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-68.1884	-92.7136	-128.5377	-139.1590	-145.5898	-134.1983	-132.3903	-127.0355	-117.1151	-103.2778	-73.6764	-59.3493 (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)

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Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-49.6355	-102.9126	-201.9035	-299.5658	-392.7017	-393.4703	-388.9659	-330.9821	-244.7250	-146.0727	-65.8873	-39.3777	(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												5957.9200	(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												3040.1113	(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)												272.9960	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3977.4314	(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												5379.5959	(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	5957.9200	0.2100	1251.1632 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3040.1113	0.2100	638.4234 (264)
Space and water heating			1889.5866 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	272.9960	0.1443	39.4018 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1321.2313	0.1354	-178.8928
PV Unit electricity exported	-2656.2001	0.1263	-335.3513
Total			-514.2441 (269)
Total CO2, kg/year			1426.6735 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.1300 (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	5957.9200	1.1300	6732.4496 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3040.1113	1.1300	3435.3258 (278)
Space and water heating			10167.7754 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	272.9960	1.5338	418.7304 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1321.2313	1.5005	-1982.4481
PV Unit electricity exported	-2656.2001	0.4634	-1231.0110
Total			-3213.4591 (283)
Total Primary energy kWh/year			7503.1475 (286)
Target Primary Energy Rate (TPER)			53.2600 (287)

Full SAP Calculation Printout



Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 30			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	96 A		DER	10.07		TER	10.13
Environmental	90 B		% DER < TER				0.59
CO ₂ Emissions (t/year)	1.37		DFEE	41.01		TFEE	43.89
Compliance Check	See BREL		% DFEE < TFEE				6.56
% DPER < TPER	0.32		DPER	53.09		TPER	53.26
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	60.4100 (1b)	x 2.6600 (2b)	= 160.6906 (1b) - (3b)
First floor	80.4700 (1c)	x 2.3400 (2c)	= 188.2998 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	140.8800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 348.9904 (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) = 0.1146 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3146 (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) = 0.3146 (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	0.4011	0.3933	0.3854	0.3461	0.3382	0.2989	0.2989	0.2910	0.3146	0.3382	0.3539	0.3697 (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	0.5805	0.5773	0.5743	0.5599	0.5572	0.5447	0.5447	0.5423	0.5495	0.5572	0.5626	0.5683 (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)			22.9300	1.2357	28.3356		(27)
Door			2.1400	1.3000	2.7820		(26a)
Ground Floor			60.4100	0.1300	7.8533	75.0000	4530.7500 (28a)
Exposed Floor			20.0600	0.2000	4.0120	20.0000	401.2000 (28b)
External Wall	159.8600	25.0700	134.7900	0.1900	25.6101	110.0000	14826.9000 (29a)
Garage Wall	25.1300		25.1300	0.1700	4.2721	110.0000	2764.3000 (29a)
Plane Roof	80.4700		80.4700	0.0900	7.2423	9.0000	724.2300 (30)
Total net area of external elements Aum(A, m ²)			345.9300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	80.1074		(33)
Studs			218.3800			9.0000	1965.4200 (32c)
Internal Floor 1			60.4100			18.0000	1087.3800 (32d)
Internal Ceiling 1			60.4100			9.0000	543.6900 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	26843.8700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							190.5442 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 66.8492	Feb 66.4894	Mar 66.1367	Apr 64.4802	May 64.1703	Jun 62.7275	Jul 62.7275	Aug 62.4603	Sep 63.2832	Oct 64.1703	Nov 64.7972	Dec 65.4527 (38)
Heat transfer coeff	160.5063	160.1465	159.7938	158.1373	157.8273	156.3846	156.3846	156.1174	156.9403	157.8273	158.4543	159.1098 (39)
Average = Sum(39)m / 12 =												158.1358
HLP	Jan 1.1393	Feb 1.1368	Mar 1.1343	Apr 1.1225	May 1.1203	Jun 1.1101	Jul 1.1101	Aug 1.1082	Sep 1.1140	Oct 1.1203	Nov 1.1247	Dec 1.1294 (40)
HLP (average)												1.1225
Days in mont.	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												
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	2.9187 (42)
Hot water usage for baths	31.5834	31.1143	30.4538	29.2359	28.3239	27.3127	26.7665	27.4224	28.1366	29.2186	30.4616	31.4766 (42b)
Hot water usage for other uses	44.5208	42.9019	41.2829	39.6640	38.0451	36.4261	36.4261	38.0451	39.6640	41.2829	42.9019	44.5208 (42c)
Average daily hot water use (litres/day)												69.7562 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	76.1042	74.0162	71.7367	68.8999	66.3690	63.7388	63.1926	65.4675	67.8006	70.5016	73.3635	75.9974 (44)
Energy content (annual)	120.5304	105.3981	110.2566	94.3205	89.3454	78.3743	76.4260	81.0624	83.6049	95.6699	104.5197	118.9936 (45)
Distribution loss (46)m = 0.15 x (45)m	Total = Sum(45)m =											1158.5019
Water 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 (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	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	102.4508	89.5883	93.7182	80.1724	75.9436	66.6182	64.9621	68.9031	71.0642	81.3194	88.8418	101.1445 (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	102.4508	89.5883	93.7182	80.1724	75.9436	66.6182	64.9621	68.9031	71.0642	81.3194	88.8418	101.1445 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											984.7266 (64)
Electric shower(s)	58.5870	52.2015	57.0020	54.3963	55.4171	52.8625	54.6246	55.4171	54.3963	57.0020	55.9302	58.5870 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											666.4235 (64a)
Heat gains from water heating, kWh/month	40.2595	35.4475	37.6800	33.6422	32.8402	29.8702	29.8967	31.0800	31.3651	34.5804	36.1930	39.9329 (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	145.9370	145.9370	145.9370	145.9370	145.9370	145.9370	145.9370	145.9370	145.9370	145.9370	145.9370	145.9370	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	162.7975	180.2401	162.7975	168.2241	162.7975	168.2241	162.7975	162.7975	168.2241	162.7975	168.2241	162.7975	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	310.4104	313.6315	305.5144	288.2342	266.4210	245.9197	232.2236	229.0025	237.1196	254.3998	276.2129	296.7142	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5937	37.5937	37.5937	37.5937	37.5937	37.5937	37.5937	37.5937	37.5937	37.5937	37.5937	37.5937	(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)	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	(71)
Water heating gains (Table 5)	54.1122	52.7492	50.6452	46.7253	44.1400	41.4863	40.1837	41.7742	43.5627	46.4790	50.2680	53.6732	(72)
Total internal gains	594.1011	613.4018	585.7382	569.9646	540.1396	522.4112	501.9859	500.3553	515.6874	530.4573	561.4861	579.9660	(73)

6. Solar gains												
[Jan]					Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North					0.7100	10.6334	0.7300	0.7000		0.7700	2.6735 (74)	
East					12.4600	19.6403	0.7300	0.7000		0.7700	86.6602 (76)	
South					1.4200	46.7521	0.7300	0.7000		0.7700	23.5095 (78)	
West					8.3400	19.6403	0.7300	0.7000		0.7700	58.0053 (80)	
Solar gains	170.8485	326.6080	523.7818	749.0900	909.5626	928.4376	884.9310	765.0022	603.7128	383.4094	211.5457	141.5090 (83)
Total gains	764.9496	940.0098	1109.5200	1319.0546	1449.7022	1450.8488	1386.9169	1265.3576	1119.4002	913.8667	773.0318	721.4750 (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	46.4569	46.5613	46.6641	47.1529	47.2455	47.6814	47.6814	47.7630	47.5125	47.2455	47.0585	46.8647
alpha	4.0971	4.1041	4.1109	4.1435	4.1497	4.1788	4.1788	4.1842	4.1675	4.1497	4.1372	4.1243
util living area	0.9958	0.9898	0.9741	0.9220	0.8108	0.6367	0.4824	0.5433	0.7929	0.9590	0.9914	0.9967 (86)
MIT	19.1977	19.4512	19.8375	20.3425	20.7241	20.9271	20.9820	20.9710	20.8155	20.2783	19.6466	19.1605 (87)
Th 2	19.9689	19.9709	19.9730	19.9825	19.9843	19.9926	19.9926	19.9942	19.9894	19.9843	19.9807	19.9769 (88)
util rest of house	0.9947	0.9872	0.9671	0.9008	0.7621	0.5544	0.3783	0.4351	0.7226	0.9437	0.9887	0.9958 (89)
MIT 2	18.3212	18.5746	18.9575	19.4504	19.7931	19.9558	19.9870	19.9842	19.8804	19.4006	18.7775	18.2900 (90)
Living area fraction	18.4150	18.6684	19.0517	19.5459	19.8928	20.0598	20.0935	20.0898	19.9805	19.4946	18.8705	18.3832 (91)
Temperature adjustment	18.4150	18.6684	19.0517	19.5459	19.8928	20.0598	20.0935	20.0898	19.9805	19.4946	18.8705	18.3832 (92)
adjusted MIT	18.4150	18.6684	19.0517	19.5459	19.8928	20.0598	20.0935	20.0898	19.9805	19.4946	18.8705	18.3832 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9922	0.9824	0.9588	0.8898	0.7572	0.5603	0.3890	0.4459	0.7219	0.9340	0.9845	0.9938 (94)
Useful gains	759.0001	923.4971	1063.8294	1173.6957	1097.7185	812.8644	539.5268	564.1855	808.0726	853.5346	761.0652	717.0121 (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	2265.5465	2204.9683	2005.6760	1683.5071	1293.0466	853.8272	546.3311	576.0457	922.8827	1403.8059	1865.0903	2256.6862 (97)
Space heating kWh	1120.8705	861.1486	700.7339	367.0643	145.3241	0.0000	0.0000	0.0000	0.0000	409.4018	794.8981	1145.5175 (98a)
Space heating requirement - total per year (kWh/year)												5544.9586
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	1120.8705	861.1486	700.7339	367.0643	145.3241	0.0000	0.0000	0.0000	0.0000	409.4018	794.8981	1145.5175 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5544.9586
Space heating per m2										(98c) / (4) =		39.3594 (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	1470.0151	1157.2459	1186.4923	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8444	0.9042	0.8701	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1241.2185	1046.4121	1032.4097	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1621.7677	1550.3183	1411.5397	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	273.9954	374.9062	282.0727	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	68.4988	93.7266	70.5182	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												232.7436 (107)
Energy for space heating												39.3594 (99)
Energy for space cooling												1.6521 (108)
Total												41.0115 (109)
Fabric Energy Efficiency (DFEE)												41.0 (109)

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

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

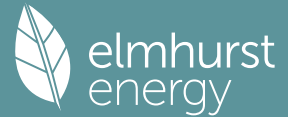
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	60.4100 (1b)	x 2.6600 (2b)	= 160.6906 (1b) - (3b)
First floor	80.4700 (1c)	x 2.3400 (2c)	= 188.2998 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	140.8800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	348.9904 (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)

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Number of passive vents
Number of flueless gas fires

0 * 10 = 0.0000 (7b)
0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =
Pressure test
Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered

Air changes per hour
40.0000 / (5) = 0.1146 (8)
Yes
Blower Door
5.0000 (17)
0.3646 (18)
0 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3646 (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	0.4649	0.4558	0.4467	0.4011	0.3920	0.3464	0.3464	0.3373	0.3646	0.3920	0.4102	0.4284	(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	0.6081	0.6039	0.5998	0.5804	0.5768	0.5600	0.5600	0.5569	0.5665	0.5768	0.5841	0.5918	(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)			22.9300	1.1450	26.2557			(27)
Ground Floor			60.4100	0.1300	7.8533			(28a)
Exposed Floor			20.0600	0.1300	2.6078			(28b)
External Wall	159.8600	25.0700	134.7900	0.1800	24.2622			(29a)
Garage Wall	25.1300		25.1300	0.1800	4.5234			(29a)
Plane Roof	80.4700		80.4700	0.1100	8.8517			(30)
Total net area of external elements Aum(A, m2)			345.9300					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 76.4941			(33)

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

190.5442 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	17.3000	0.0500	0.8650	
E3 Sill	13.8000	0.0500	0.6900	
E4 Jamb	38.4000	0.0500	1.9200	
E5 Ground floor (normal)	37.0000	0.1600	5.9200	
E10 Eaves (insulation at ceiling level)	15.8500	0.0600	0.9510	
E16 Corner (normal)	27.6600	0.0900	2.4894	
E6 Intermediate floor within a dwelling	27.5500	0.0000	0.0000	
E12 Gable (insulation at ceiling level)	21.1500	0.0600	1.2690	
E17 Corner (inverted - internal area greater than external area)	7.6600	-0.0900	-0.6894	
E20 Exposed floor (normal)	9.4500	0.3200	3.0240	
E21 Exposed floor (inverted)	9.4500	0.3200	3.0240	

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

19.4630 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 95.9571 (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	70.0283	69.5450	69.0713	66.8465	66.4302	64.4924	64.4924	64.1336	65.2388	66.4302	67.2723	68.1527	(38)
Heat transfer coeff	165.9854	165.5022	165.0285	162.8036	162.3873	160.4496	160.4496	160.0907	161.1960	162.3873	163.2294	164.1098	(39)
Average = Sum(39)m / 12 =												162.8016	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1782	1.1748	1.1714	1.1556	1.1527	1.1389	1.1389	1.1364	1.1442	1.1527	1.1586	1.1649	(40)
HLP (average)												1.1556	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9187 (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	31.5834	31.1143	30.4538	29.2359	28.3239	27.3127	26.7665	27.4224	28.1366	29.2186	30.4616	31.4766	(42b)
Hot water usage for other uses	44.5208	42.9019	41.2829	39.6640	38.0451	36.4261	36.4261	38.0451	39.6640	41.2829	42.9019	44.5208	(42c)
Average daily hot water use (litres/day)												69.7562	(43)
Daily hot water use	76.1042	74.0162	71.7367	68.8999	66.3690	63.7388	63.1926	65.4675	67.8006	70.5016	73.3635	75.9974	(44)
Energy conte	120.5304	105.3981	110.2566	94.3205	89.3454	78.3743	76.4260	81.0624	83.6049	95.6699	104.5197	118.9936	(45)
Energy content (annual)												1158.5019	
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	102.4508	89.5883	93.7182	80.1724	75.9436	66.6182	64.9621	68.9031	71.0642	81.3194	88.8418	101.1445	(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	102.4508	89.5883	93.7182	80.1724	75.9436	66.6182	64.9621	68.9031	71.0642	81.3194	88.8418	101.1445	(64)
12Total per year (kWh/year)												984.7266	(64)
Electric shower(s)												985	(64)

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58.5870	52.2015	57.0020	54.3963	55.4171	52.8625	54.6246	55.4171	54.3963	57.0020	55.9302	58.5870 (64a)
Heat gains from water heating, kWh/month											
40.2595	35.4475	37.6800	33.6422	32.8402	29.8702	29.8967	31.0800	31.3651	34.5804	36.1930	39.9329 (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
	145.9370	145.9370	145.9370	145.9370	145.9370	145.9370	145.9370	145.9370	145.9370	145.9370	145.9370	145.9370 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	162.7975	180.2401	162.7975	168.2241	162.7975	168.2241	162.7975	162.7975	168.2241	162.7975	168.2241	162.7975 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	310.4104	313.6315	305.5144	288.2342	266.4210	245.9197	232.2236	229.0025	237.1196	254.3998	276.2129	296.7142 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	37.5937	37.5937	37.5937	37.5937	37.5937	37.5937	37.5937	37.5937	37.5937	37.5937	37.5937	37.5937 (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)												
	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496 (71)
Water heating gains (Table 5)												
	54.1122	52.7492	50.6452	46.7253	44.1400	41.4863	40.1837	41.7742	43.5627	46.4790	50.2680	53.6732 (72)
Total internal gains												
	594.1011	613.4018	585.7382	569.9646	540.1396	522.4112	501.9859	500.3553	515.6874	530.4573	561.4861	579.9660 (73)

6. Solar gains

[Jan]													
				Area	Solar flux		g		FF		Access		Gains
				m2	Table 6a		Specific data		Specific data		factor		W
					W/m2		or Table 6b		or Table 6c		Table 6d		
North				0.7100	10.6334		0.6300		0.7000		0.7700		2.3073 (74)
East				12.4600	19.6403		0.6300		0.7000		0.7700		74.7889 (76)
South				1.4200	46.7521		0.6300		0.7000		0.7700		20.2890 (78)
West				8.3400	19.6403		0.6300		0.7000		0.7700		50.0593 (80)
Solar gains	147.4446	281.8672	452.0308	646.4749	784.9650	801.2544	763.7076	660.2074	521.0124	330.8875	182.5668	122.1242	(83)
Total gains	741.5457	895.2690	1037.7691	1216.4395	1325.1046	1323.6656	1265.6935	1160.5628	1036.6998	861.3449	744.0530	702.0902	(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	44.9234	45.0546	45.1839	45.8014	45.9188	46.4734	46.4734	46.5775	46.2582	45.9188	45.6819	45.4368
util living area	3.9949	4.0036	4.0123	4.0534	4.0613	4.0982	4.0982	4.1052	4.0839	4.0613	4.0455	4.0291
	0.9962	0.9915	0.9799	0.9406	0.8511	0.6911	0.5340	0.5948	0.8305	0.9671	0.9926	0.9970 (86)
MIT	19.1067	19.3441	19.7167	20.2272	20.6419	20.8947	20.9718	20.9567	20.7642	20.1985	19.5687	19.0788 (87)
Th 2	19.9375	19.9402	19.9429	19.9557	19.9581	19.9692	19.9692	19.9712	19.9649	19.9581	19.9532	19.9482 (88)
util rest of house	0.9952	0.9893	0.9742	0.9232	0.8072	0.6068	0.4195	0.4786	0.7646	0.9542	0.9902	0.9962 (89)
MIT 2	18.2077	18.4459	18.8168	19.3221	19.7039	19.9144	19.9602	19.9559	19.8216	19.3046	18.6801	18.1876 (90)
Living area fraction	18.3039	18.5420	18.9131	19.4190	19.8043	20.0194	20.0684	20.0630	19.9225	19.4003	18.7752	18.2830 (92)
MIT	18.3039	18.5420	18.9131	19.4190	19.8043	20.0194	20.0684	20.0630	19.9225	19.4003	18.7752	18.2830 (93)
Temperature adjustment												0.0000
adjusted MIT	18.3039	18.5420	18.9131	19.4190	19.8043	20.0194	20.0684	20.0630	19.9225	19.4003	18.7752	18.2830 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9929	0.9850	0.9667	0.9120	0.7997	0.6113	0.4311	0.4896	0.7615	0.9449	0.9863	0.9943 (94)
Ext temp.	736.2670	881.8259	1003.1800	1109.3426	1059.6258	809.1377	545.5941	568.2622	789.4078	813.9041	733.8667	698.0593 (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	2324.4435	2257.7842	2048.5212	1712.5312	1316.0321	869.5372	556.5101	586.4200	938.5648	1429.0588	1905.7353	2311.1610 (97)
Space heating requirement - total per year (kWh/year)	1181.6034	924.6440	777.7338	434.2958	190.7663	0.0000	0.0000	0.0000	0.0000	457.6750	843.7454	1200.1477 (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)	1181.6034	924.6440	777.7338	434.2958	190.7663	0.0000	0.0000	0.0000	0.0000	457.6750	843.7454	1200.1477 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6010.6114
Space heating per m2												42.6648 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7943	0.8659	0.8266	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1197.9413	1028.1320	1005.7509	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1473.1119	1408.6286	1289.0522	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	198.1229	283.0895	210.7762	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction												
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 (104)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	49.5307	70.7724	52.6941	0.0000	0.0000	0.0000	0.0000 (105)

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Space cooling requirement	172.9971 (107)
Energy for space heating	42.6648 (99)
Energy for space cooling	1.2280 (108)
Total	43.8927 (109)
Fabric Energy Efficiency (TFEE)	43.9 (109)

Full SAP Calculation Printout



Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024
Assessment Reference	Plot 30		Prop Type Ref	SAP VG 21-0282		
Property						
SAP Rating	96 A		DER	10.07	TER	10.13
Environmental	90 B		% DER < TER			0.59
CO ₂ Emissions (t/year)	1.37		DFEE	41.01	TFEE	43.89
Compliance Check	See BREL		% DFEE < TFEE			6.56
% DPER < TPER	0.32		DPER	53.09	TPER	53.26
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	60.4100 (1b)	x 2.6600 (2b)	= 160.6906 (1b) - (3b)
First floor	80.4700 (1c)	x 2.3400 (2c)	= 188.2998 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	140.8800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 348.9904 (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) = 0.1433 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3433 (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) = 0.3433 (21)

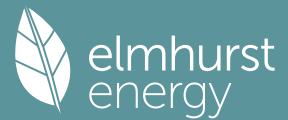
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4377	0.4291	0.4205	0.3776	0.3690	0.3261	0.3261	0.3175	0.3433	0.3690	0.3862	0.4033 (22b)
Effective ac	0.5958	0.5921	0.5884	0.5713	0.5681	0.5532	0.5532	0.5504	0.5589	0.5681	0.5746	0.5813 (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)			22.9300	1.2357	28.3356		(27)
Door			2.1400	1.3000	2.7820		(26a)
Ground Floor			60.4100	0.1300	7.8533	75.0000	4530.7500 (28a)
Exposed Floor			20.0600	0.2000	4.0120	20.0000	401.2000 (28b)
External Wall	159.8600	25.0700	134.7900	0.1900	25.6101	110.0000	14826.9000 (29a)
Garage Wall	25.1300		25.1300	0.1700	4.2721	110.0000	2764.3000 (29a)
Plane Roof	80.4700		80.4700	0.0900	7.2423	9.0000	724.2300 (30)
Total net area of external elements Aum(A, m ²)			345.9300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	80.1074		(33)
Studs			218.3800			9.0000	1965.4200 (32c)
Internal Floor 1			60.4100			18.0000	1087.3800 (32d)
Internal Ceiling 1			60.4100			9.0000	543.6900 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	26843.8700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							190.5442 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				17.3000	0.0240	0.4152	
E3 Sill				13.8000	0.0210	0.2898	

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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	45.9517	46.0734	46.1932	46.7645	46.8729	47.3845	47.3845	47.4805	47.1862	46.8729	46.6540	46.4274	
alpha	4.0634	4.0716	4.0795	4.1176	4.1249	4.1590	4.1590	4.1654	4.1457	4.1249	4.1103	4.0952	
util living area	0.9944	0.9874	0.9699	0.9147	0.8009	0.6272	0.4746	0.5330	0.7809	0.9526	0.9891	0.9955 (86)	
MIT	19.5973	19.7863	20.0733	20.4464	20.7254	20.8732	20.9127	20.9052	20.7936	20.4028	19.9348	19.5720 (87)	
Th 2	19.9587	19.9612	19.9636	19.9749	19.9771	19.9870	19.9870	19.9888	19.9831	19.9771	19.9728	19.9683 (88)	
util rest of house	0.9930	0.9842	0.9618	0.8920	0.7510	0.5449	0.3713	0.4256	0.7090	0.9353	0.9858	0.9944 (89)	
MIT 2	18.3100	18.5525	18.9170	19.3845	19.7045	19.8578	19.8865	19.8846	19.7885	19.3432	18.7520	18.2849 (90)	
Living area fraction									fLA = Living area / (4) =				0.1070 (91)
MIT	18.4478	18.6846	19.0408	19.4982	19.8138	19.9665	19.9963	19.9938	19.8961	19.4566	18.8786	18.4227 (92)	
Temperature adjustment												-0.1500	
adjusted MIT	18.2978	18.5346	18.8908	19.3482	19.6638	19.8165	19.8463	19.8438	19.7461	19.3066	18.7286	18.2727 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9895	0.9778	0.9507	0.8749	0.7335	0.5300	0.3564	0.4094	0.6895	0.9201	0.9798	0.9915 (94)
Useful gains	817.3868	977.5699	1108.5408	1196.8467	1095.9036	788.3279	506.1787	532.5887	798.0630	883.5543	810.1001	774.9066 (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	2271.4376	2206.6604	2000.1552	1665.9745	1266.8982	820.8933	510.8568	540.8432	892.2340	1385.0643	1858.5745	2260.1873 (97)
Space heating kWh	1081.8138	825.9488	663.3611	337.7720	127.2200	0.0000	0.0000	0.0000	0.0000	373.1234	754.9015	1105.0488 (98a)
Space heating requirement - total per year (kWh/year)												5269.1893
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	1081.8138	825.9488	663.3611	337.7720	127.2200	0.0000	0.0000	0.0000	0.0000	373.1234	754.9015	1105.0488 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5269.1893
Space heating per m2										(98c) / (4) =		37.4020 (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	1081.8138	825.9488	663.3611	337.7720	127.2200	0.0000	0.0000	0.0000	0.0000	373.1234	754.9015	1105.0488 (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)	1222.3884	933.2755	749.5606	381.6633	143.7514	0.0000	0.0000	0.0000	0.0000	421.6084	852.9961	1248.6427 (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	255.9696	225.6333	237.9402	205.0930	195.9970	173.5584	169.1155	177.5666	181.4273	205.9535	223.4399	252.6440 (64)	
Efficiency of water heater	88.2090	88.1738	88.0990	87.9273	87.5843	87.0000	87.0000	87.0000	87.0000	87.9606	88.1529	88.2170 (217)	
Fuel for water heating, kWh/month	290.1853	255.8961	270.0828	233.2530	223.7810	199.4924	194.3857	204.0995	208.5371	234.1428	253.4686	286.3893 (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	33.1347	26.5819	23.9340	17.5351	13.5446	11.0661	12.3559	16.0606	20.8611	27.3710	30.9154	34.0556 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-52.5111	-78.6467	-119.7985	-137.9065	-147.6891	-136.8960	-134.6397	-127.4065	-112.8662	-91.6474	-58.7698	-44.4379 (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)	-30.4728	-72.8869	-170.0866	-292.0138	-415.9300	-429.6967	-419.2602	-335.5278	-220.1547	-110.9914	-42.3058	-23.1829 (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													5953.8862 (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													2853.7136 (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)													267.4161 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

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PV generation	-3805.7250 (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	5355.2909 (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	5953.8862	0.2100	1250.3161 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2853.7136	0.2100	599.2799 (264)
Space and water heating			1849.5960 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	267.4161	0.1443	38.5964 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1243.2155	0.1341	-166.6809
PV Unit electricity exported	-2562.5095	0.1227	-314.4938
Total			-481.1748 (269)
Total CO2, kg/year			1418.9469 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.0700 (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	5953.8862	1.1300	6727.8914 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2853.7136	1.1300	3224.6964 (278)
Space and water heating			9952.5878 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	267.4161	1.5338	410.1717 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1243.2155	1.4955	-1859.2188
PV Unit electricity exported	-2562.5095	0.4504	-1154.0307
Total			-3013.2495 (283)
Total Primary energy kWh/year			7479.6108 (286)
Dwelling Primary energy Rate (DPER)			53.0900 (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	60.4100 (1b)	x 2.6600 (2b)	= 160.6906 (1b) - (3b)
First floor	80.4700 (1c)	x 2.3400 (2c)	= 188.2998 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	140.8800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 348.9904 (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) = 0.1146 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3646 (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) = 0.3646 (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	0.4649	0.4558	0.4467	0.4011	0.3920	0.3464	0.3464	0.3373	0.3646	0.3920	0.4102	0.4284 (22b)
Effective ac	0.6081	0.6039	0.5998	0.5804	0.5768	0.5600	0.5600	0.5569	0.5665	0.5768	0.5841	0.5918 (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)			22.9300	1.1450	26.2557			(27)
Ground Floor			60.4100	0.1300	7.8533			(28a)
Exposed Floor			20.0600	0.1300	2.6078			(28b)
External Wall	159.8600	25.0700	134.7900	0.1800	24.2622			(29a)
Garage Wall	25.1300		25.1300	0.1800	4.5234			(29a)
Plane Roof	80.4700		80.4700	0.1100	8.8517			(30)
Total net area of external elements Aum(A, m2)			345.9300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	76.4941			(33)

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

190.5442 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	17.3000	0.0500	0.8650	
E3 Sill	13.8000	0.0500	0.6900	
E4 Jamb	38.4000	0.0500	1.9200	
E5 Ground floor (normal)	37.0000	0.1600	5.9200	
E10 Eaves (insulation at ceiling level)	15.8500	0.0600	0.9510	
E16 Corner (normal)	27.6600	0.0900	2.4894	
E6 Intermediate floor within a dwelling	27.5500	0.0000	0.0000	
E12 Gable (insulation at ceiling level)	21.1500	0.0600	1.2690	
E17 Corner (inverted - internal area greater than external area)	7.6600	-0.0900	-0.6894	
E20 Exposed floor (normal)	9.4500	0.3200	3.0240	
E21 Exposed floor (inverted)	9.4500	0.3200	3.0240	

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

19.4630 (36)

Point Thermal Bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 95.9571 (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	70.0283	69.5450	69.0713	66.8465	66.4302	64.4924	64.4924	64.1336	65.2388	66.4302	67.2723	68.1527	(38)
Heat transfer coeff	165.9854	165.5022	165.0285	162.8036	162.3873	160.4496	160.4496	160.0907	161.1960	162.3873	163.2294	164.1098	(39)
Average = Sum(39)m / 12 =												162.8016	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1782	1.1748	1.1714	1.1556	1.1527	1.1389	1.1389	1.1364	1.1442	1.1527	1.1586	1.1649	(40)
HLP (average)												1.1556	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

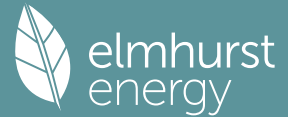
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9187 (42)
Hot water usage for mixer showers													
73.1575	72.0581	70.4560	67.3908	65.1287	62.6060	61.1722	62.7621	64.5050	67.2135	70.3446	72.8772	(42a)	
Hot water usage for baths													
31.5834	31.1143	30.4538	29.2359	28.3239	27.3127	26.7665	27.4224	28.1366	29.2186	30.4616	31.4766	(42b)	
Hot water usage for other uses													
44.5208	42.9019	41.2829	39.6640	38.0451	36.4261	36.4261	38.0451	39.6640	41.2829	42.9019	44.5208	(42c)	
Average daily hot water use (litres/day)												137.2050 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.2617	146.0743	142.1928	136.2907	131.4977	126.3449	124.3648	128.2296	132.3056	137.7151	143.7081	148.8746	(44)
Energy conte	236.3940	208.0078	218.5450	186.5751	177.0212	155.3558	150.4084	158.7750	163.1460	186.8781	204.7386	233.1017	(45)
Energy content (annual)										Total = Sum(45)m =		2278.9466	
Distribution loss (46)m = 0.15 x (45)m													
35.4591	31.2012	32.7817	27.9863	26.5532	23.3034	22.5613	23.8163	24.4719	28.0317	30.7108	34.9653	(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	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													
287.3529	254.0352	269.5039	235.8902	227.9801	204.6708	201.3674	209.7339	212.4611	237.8370	254.0536	284.0606	(62)	
WWHRS	-33.4446	-29.5786	-30.9731	-25.6469	-23.9020	-20.4531	-19.1715	-20.3870	-21.1616	-24.9472	-28.2621	-32.8252 (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													
253.9084	224.4566	238.5308	210.2432	204.0781	184.2177	182.1958	189.3469	191.2995	212.8898	225.7915	251.2354	(64)	
										Total per year (kWh/year) = Sum(64)m =		2568.1937 (64)	
12Total per year (kWh/year)												2568 (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)	
												0.0000 (64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													
Heat gains from water heating, kWh/month													
91.3407	80.6695	85.4059	74.3650	71.5993	63.9846	62.7505	65.5324	66.5748	74.8767	80.4043	90.2460	(65)	

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

Metabolic gains (Table 5), Watts													
(66)m	145.9370	145.9370	145.9370	145.9370	145.9370	145.9370	145.9370	145.9370	145.9370	145.9370	145.9370	145.9370	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
162.7975	180.2401	162.7975	168.2241	162.7975	168.2241	162.7975	162.7975	168.2241	162.7975	168.2241	162.7975	162.7975	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
310.4104	313.6315	305.5144	288.2342	266.4210	245.9197	232.2236	229.0025	237.1196	254.3998	276.2129	296.7142	296.7142	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
37.5937	37.5937	37.5937	37.5937	37.5937	37.5937	37.5937	37.5937	37.5937	37.5937	37.5937	37.5937	37.5937	(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)													
-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	(71)
Water heating gains (Table 5)													
122.7698	120.0438	114.7929	103.2847	96.2356	88.8674	84.3421	88.0812	92.4650	100.6407	111.6727	121.2984	121.2984	(72)

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Total internal gains
665.7588 683.6965 652.8859 629.5241 595.2352 569.7923 546.1443 546.6623 564.5897 587.6191 625.8908 650.5913 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific FF or Table 6c	Access factor Table 6d	Gains W
North	0.7100	10.6334	0.6300	0.7000	0.7700	2.3073 (74)
East	12.4600	19.6403	0.6300	0.7000	0.7700	74.7889 (76)
South	1.4200	46.7521	0.6300	0.7000	0.7700	20.2890 (78)
West	8.3400	19.6403	0.6300	0.7000	0.7700	50.0593 (80)

Solar gains 147.4446 281.8672 452.0308 646.4749 784.9650 801.2544 763.7076 660.2074 521.0124 330.8875 182.5668 122.1242 (83)
Total gains 813.2033 965.5636 1104.9168 1275.9990 1380.2002 1371.0467 1309.8519 1206.8697 1085.6022 918.5066 808.4576 772.7154 (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	44.9234	45.0546	45.1839	45.8014	45.9188	46.4734	46.4734	46.5775	46.2582	45.9188	45.6819	45.4368
alpha	3.9949	4.0036	4.0123	4.0534	4.0613	4.0982	4.0982	4.1052	4.0839	4.0613	4.0455	4.0291
util living area	0.9947	0.9890	0.9752	0.9318	0.8368	0.6744	0.5184	0.5761	0.8129	0.9597	0.9900	0.9957 (86)
MIT	19.1720	19.4067	19.7733	20.2691	20.6673	20.9039	20.9746	20.9614	20.7844	20.2439	19.6266	19.1436 (87)
Th 2	19.9375	19.9402	19.9429	19.9557	19.9581	19.9692	19.9692	19.9712	19.9649	19.9581	19.9532	19.9482 (88)
util rest of house	0.9933	0.9861	0.9684	0.9124	0.7907	0.5900	0.4062	0.4619	0.7442	0.9445	0.9869	0.9946 (89)
MIT 2	17.8012	18.1022	18.5686	19.1923	19.6580	19.9058	19.9589	19.9540	19.7994	19.1744	18.3929	17.7719 (90)
Living area fraction	17.9479	18.2418	18.6975	19.3075	19.7660	20.0126	20.0676	20.0618	19.9048	19.2888	18.5249	17.9187 (91)
MIT	17.9479	18.2418	18.6975	19.3075	19.7660	20.0126	20.0676	20.0618	19.9048	19.2888	18.5249	17.9187 (92)
Temperature adjustment												0.0000
adjusted MIT	17.9479	18.2418	18.6975	19.3075	19.7660	20.0126	20.0676	20.0618	19.9048	19.2888	18.5249	17.9187 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9892	0.9792	0.9572	0.8973	0.7809	0.5938	0.4174	0.4725	0.7396	0.9311	0.9804	0.9911 (94)
Useful gains	804.4493	945.4360	1057.6638	1144.9131	1077.7730	814.1570	546.6764	570.2663	802.8788	855.2233	792.6519	765.8572 (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	2265.3588	2208.0983	2012.9397	1694.3864	1309.8214	868.4517	556.3779	586.2212	935.7121	1410.9581	1864.8854	2251.3781 (97)
Space heating kWh	1086.9166	848.5091	710.7252	395.6208	172.6440	0.0000	0.0000	0.0000	0.0000	413.4667	772.0081	1105.2275 (98a)
Space heating requirement - total per year (kWh/year)												5505.1180
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	1086.9166	848.5091	710.7252	395.6208	172.6440	0.0000	0.0000	0.0000	0.0000	413.4667	772.0081	1105.2275 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5505.1180
Space heating per m2										(98c) / (4) =		39.0766 (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	1086.9166	848.5091	710.7252	395.6208	172.6440	0.0000	0.0000	0.0000	0.0000	413.4667	772.0081	1105.2275 (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)	1176.3167	918.2999	769.1832	428.1611	186.8441	0.0000	0.0000	0.0000	0.0000	447.4748	835.5066	1196.1337 (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	253.9084	224.4566	238.5308	210.2432	204.0781	184.2177	182.1958	189.3469	191.2995	212.8898	225.7915	251.2354 (64)
Efficiency of water heater	87.1329	86.9519	86.5702	85.7145	84.0251	80.3000	80.3000	80.3000	80.3000	85.7776	86.7965	87.1709 (217)
Fuel for water heating, kWh/month	291.4037	258.1388	275.5345	245.2833	242.8775	229.4119	226.8939	235.7994	238.2310	248.1882	260.1391	288.2102 (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	33.8261	27.1366	24.4335	17.9010	13.8272	11.2970	12.6137	16.3957	21.2964	27.9421	31.5605	34.7662 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-68.1884	-92.7136	-128.5377	-139.1590	-145.5898	-134.1983	-132.3903	-127.0355	-117.1151	-103.2778	-73.6764	-59.3493 (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)

elmhurst
energy

13a. Primary energy - Individual heating systems including micro-CHP			
	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	5957.9200	1.1300	6732.4496 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	3040.1113	1.1300	3435.3258 (278)
Space and water heating			10167.7754 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	272.9960	1.5338	418.7304 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1321.2313	1.5005	-1982.4481
PV Unit electricity exported	-2656.2001	0.4634	-1231.0110
Total			-3213.4591 (283)
Total Primary energy kWh/year			7503.1475 (286)
Target Primary Energy Rate (TPER)			53.2600 (287)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024
Assessment Reference	Plot 30		Prop Type Ref	SAP VG 21-0282		
Property						
SAP Rating	96 A	DER	10.07	TER	10.13	
Environmental	90 B	% DER < TER				0.59
CO ₂ Emissions (t/year)	1.37	DFEE	41.01	TFEE	43.89	
Compliance Check	See BREL	% DFEE < TFEE				6.56
% DPER < TPER	0.32	DPER	53.09	TPER	53.26	
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	60.4100 (1b)	x 2.6600 (2b)	= 160.6906 (1b) - (3b)
First floor	80.4700 (1c)	x 2.3400 (2c)	= 188.2998 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	140.8800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 348.9904 (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) = 0.1433 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3433 (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) = 0.3433 (21)

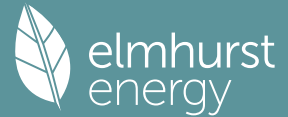
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4377	0.4291	0.4205	0.3776	0.3690	0.3261	0.3261	0.3175	0.3433	0.3690	0.3862	0.4033 (22b)
Effective ac	0.5958	0.5921	0.5884	0.5713	0.5681	0.5532	0.5532	0.5504	0.5589	0.5681	0.5746	0.5813 (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)			22.9300	1.2357	28.3356		(27)
Door			2.1400	1.3000	2.7820		(26a)
Ground Floor			60.4100	0.1300	7.8533	75.0000	4530.7500 (28a)
Exposed Floor			20.0600	0.2000	4.0120	20.0000	401.2000 (28b)
External Wall	159.8600	25.0700	134.7900	0.1900	25.6101	110.0000	14826.9000 (29a)
Garage Wall	25.1300		25.1300	0.1700	4.2721	110.0000	2764.3000 (29a)
Plane Roof	80.4700		80.4700	0.0900	7.2423	9.0000	724.2300 (30)
Total net area of external elements Aum(A, m ²)			345.9300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	80.1074		(33)
Studs			218.3800			9.0000	1965.4200 (32c)
Internal Floor 1			60.4100			18.0000	1087.3800 (32d)
Internal Ceiling 1			60.4100			9.0000	543.6900 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	26843.8700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							190.5442 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				17.3000	0.0240	0.4152	
E3 Sill				13.8000	0.0210	0.2898	

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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	45.9517	46.0734	46.1932	46.7645	46.8729	47.3845	47.3845	47.4805	47.1862	46.8729	46.6540	46.4274
alpha	4.0634	4.0716	4.0795	4.1176	4.1249	4.1590	4.1590	4.1654	4.1457	4.1249	4.1103	4.0952
util living area	0.9924	0.9849	0.9644	0.9075	0.7925	0.6230	0.4708	0.5275	0.7734	0.9462	0.9866	0.9939 (86)
MIT	19.6484	19.8225	20.1109	20.4660	20.7338	20.8745	20.9131	20.9060	20.7985	20.4257	19.9690	19.6196 (87)
Th 2	19.9587	19.9612	19.9636	19.9749	19.9771	19.9870	19.9870	19.9888	19.9831	19.9771	19.9728	19.9683 (88)
util rest of house	0.9904	0.9810	0.9552	0.8835	0.7418	0.5408	0.3681	0.4210	0.7008	0.9271	0.9825	0.9923 (89)
MIT 2	18.3751	18.5983	18.9635	19.4071	19.7128	19.8587	19.8866	19.8850	19.7928	19.3703	18.7951	18.3456 (90)
Living area fraction									fLA = Living area / (4) =			0.1070 (91)
MIT	18.5113	18.7293	19.0863	19.5205	19.8221	19.9675	19.9965	19.9943	19.9005	19.4833	18.9208	18.4820 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.3613	18.5793	18.9363	19.3705	19.6721	19.8175	19.8465	19.8443	19.7505	19.3333	18.7708	18.3320 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9860	0.9738	0.9430	0.8662	0.7246	0.5261	0.3534	0.4049	0.6815	0.9111	0.9756	0.9887 (94)	
Useful gains	888.4204	1027.0116	1158.1209	1220.7996	1104.9303	789.3431	506.3557	532.9817	802.6831	912.1236	856.6851	841.1904 (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	2281.7474	2213.8945	2007.5032	1669.5254	1268.2185	821.0431	510.8861	540.9066	892.9203	1389.3043	1865.3226	2269.7114 (97)	
Space heating kWh	1036.6353	797.5853	631.9404	323.0825	121.4864	0.0000	0.0000	0.0000	0.0000	355.0225	726.2190	1062.8196 (98a)	
Space heating requirement - total per year (kWh/year)												5054.7910	
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	1036.6353	797.5853	631.9404	323.0825	121.4864	0.0000	0.0000	0.0000	0.0000	355.0225	726.2190	1062.8196 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												5054.7910	
Space heating per m2										(98c) / (4) =		35.8801 (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	1036.6353	797.5853	631.9404	323.0825	121.4864	0.0000	0.0000	0.0000	0.0000	355.0225	726.2190	1062.8196 (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)	1171.3393	901.2263	714.0569	365.0650	137.2728	0.0000	0.0000	0.0000	0.0000	401.1553	820.5864	1200.9261 (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	255.9696	225.6333	237.9402	205.0930	195.9970	173.5584	169.1155	177.5666	181.4273	205.9535	223.4399	252.6440 (64)	
Efficiency of water heater (217)m	88.1989	88.1648	88.0846	87.9114	87.5679	87.0000	87.0000	87.0000	87.0000	87.9433	88.1424	88.2079 (217)	
Fuel for water heating, kWh/month	290.2187	255.9222	270.1270	233.2950	223.8228	199.4924	194.3857	204.0995	208.5371	234.1889	253.4987	286.4187 (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	33.1347	26.5819	23.9340	17.5351	13.5446	11.0661	12.3559	16.0606	20.8611	27.3710	30.9154	34.0556 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-52.5111	-78.6467	-119.7985	-137.9065	-147.6891	-136.8960	-134.6397	-127.4065	-112.8662	-91.6474	-58.7698	-44.4379 (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	-30.4728	-72.8869	-170.0866	-292.0138	-415.9300	-429.6967	-419.2602	-335.5278	-220.1547	-110.9914	-42.3058	-23.1829 (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												5711.6283 (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												2854.0066 (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)												267.4161 (232)	
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3805.7250 (233)	

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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	5113.3260 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	5711.6283	3.6400	207.9033 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2854.0066	3.6400	103.8858 (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	267.4161	16.4900	44.0969 (250)
Additional standing charges			92.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1243.2155	16.4900	-205.0062
PV Unit electricity exported	-2562.5095	5.5900	-143.2443
Total			-348.2505 (252)
Total energy cost			113.8169 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	0.2204 (257)
SAP value	96.4268
SAP rating (Section 12)	96 (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	5711.6283	0.2100	1199.4419 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2854.0066	0.2100	599.3414 (264)
Space and water heating			1798.7833 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	267.4161	0.1443	38.5964 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1243.2155	0.1341	-166.6809
PV Unit electricity exported	-2562.5095	0.1227	-314.4938
Total			-481.1748 (269)
Total CO2, kg/year			1368.1342 (272)
CO2 emissions per m2			9.7100 (273)
EI value			90.1372
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

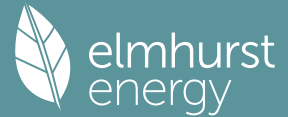
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	60.4100 (1b)	x 2.6600 (2b)	= 160.6906 (1b) - (3b)
First floor	80.4700 (1c)	x 2.3400 (2c)	= 188.2998 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	140.8800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 348.9904 (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) = 0.1433 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)

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Infiltration rate 0.3433 (18)
Number of sides sheltered 0 (19)
Shelter factor (20) = $1 - [0.075 \times (19)] = 1.0000$ (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3433 (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 infiltr 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	0.4377	0.4291	0.4205	0.3776	0.3690	0.3261	0.3261	0.3175	0.3433	0.3690	0.3862	0.4033	(22b)
	0.5958	0.5921	0.5884	0.5713	0.5681	0.5532	0.5532	0.5504	0.5589	0.5681	0.5746	0.5813	(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)			22.9300	1.2357	28.3356			(27)
Door			2.1400	1.3000	2.7820			(26a)
Ground Floor			60.4100	0.1300	7.8533	75.0000	4530.7500	(28a)
Exposed Floor			20.0600	0.2000	4.0120	20.0000	401.2000	(28b)
External Wall	159.8600	25.0700	134.7900	0.1900	25.6101	110.0000	14826.9000	(29a)
Garage Wall	25.1300		25.1300	0.1700	4.2721	110.0000	2764.3000	(29a)
Plane Roof	80.4700		80.4700	0.0900	7.2423	9.0000	724.2300	(30)
Total net area of external elements Aum(A, m2)			345.9300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	80.1074			(33)
Studs			218.3800			9.0000	1965.4200	(32c)
Internal Floor 1			60.4100			18.0000	1087.3800	(32d)
Internal Ceiling 1			60.4100			9.0000	543.6900	(32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
List of Thermal Bridges (28)...(30) + (32) + (32a)...(32e) = 26843.8700 (34)
Total fabric heat loss 190.5442 (35)

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	17.3000	0.0240	0.4152
E3 Sill	13.8000	0.0210	0.2898
E4 Jamb	38.4000	0.0160	0.6144
E5 Ground floor (normal)	37.0000	0.0920	3.4040
E10 Eaves (insulation at ceiling level)	15.8500	0.0580	0.9193
E16 Corner (normal)	27.6600	0.0470	1.3000
E6 Intermediate floor within a dwelling	27.5500	0.0010	0.0276
E12 Gable (insulation at ceiling level)	21.1500	0.0570	1.2055
E17 Corner (inverted - internal area greater than external area)	7.6600	-0.0880	-0.6741
E20 Exposed floor (normal)	9.4500	0.3200	3.0240
E21 Exposed floor (inverted)	9.4500	0.3200	3.0240

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.5497 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 93.6571 (37)

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

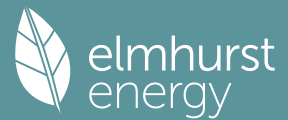
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	68.6138	68.1855	67.7656	65.7937	65.4247	63.7072	63.7072	63.3891	64.3687	65.4247	66.1711	66.9514	(38)
Average = Sum(39)m / 12 =	162.2709	161.8426	161.4227	159.4507	159.0818	157.3643	157.3643	157.0462	158.0258	159.0818	159.8282	160.6085	(39)
												159.4490	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1518	1.1488	1.1458	1.1318	1.1292	1.1170	1.1170	1.1148	1.1217	1.1292	1.1345	1.1400	(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													2.9187	(42)
Hot water usage for mixer showers														
	73.1575	72.0581	70.4560	67.3908	65.1287	62.6060	61.1722	62.7621	64.5050	67.2135	70.3446	72.8772	(42a)	
Hot water usage for baths														
	31.5834	31.1143	30.4538	29.2359	28.3239	27.3127	26.7665	27.4224	28.1366	29.2186	30.4616	31.4766	(42b)	
Hot water usage for other uses														
	44.5208	42.9019	41.2829	39.6640	38.0451	36.4261	36.4261	38.0451	39.6640	41.2829	42.9019	44.5208	(42c)	
Average daily hot water use (litres/day)													137.2050	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Energy conte	149.2617	146.0743	142.1928	136.2907	131.4977	126.3449	124.3648	128.2296	132.3056	137.7151	143.7081	148.8746	(44)	
Energy content (annual)	236.3940	208.0078	218.5450	186.5751	177.0212	155.3558	150.4084	158.7750	163.1460	186.8781	204.7386	233.1017	(45)	
Distribution loss (46)m = 0.15 x (45)m													2278.9466	
	35.4591	31.2012	32.7817	27.9863	26.5532	23.3034	22.5613	23.8163	24.4719	28.0317	30.7108	34.9653	(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	19.5755	17.6255	19.3953	18.5179	18.9759	18.2026	18.7071	18.7916	18.2813	19.0754	18.7014	19.5423	(61)	
Total heat required for water heating calculated for each month														
	255.9696	225.6333	237.9402	205.0930	195.9970	173.5584	169.1155	177.5666	181.4273	205.9535	223.4399	252.6440	(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	255.9696	225.6333	237.9402	205.0930	195.9970	173.5584	169.1155	177.5666	181.4273	205.9535	223.4399	252.6440	(64)	
													2504.3383	(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														
	83.4949	73.5690	77.5150	66.6657	63.6035	56.2064	54.6876	57.4906	58.8164	66.9058	72.7509	82.3919	(65)	

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	175.1244	175.1244	175.1244	175.1244	175.1244	175.1244	175.1244	175.1244	175.1244	175.1244	175.1244	175.1244	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	37.8555	33.6229	27.3440	20.7012	15.4744	13.0641	14.1162	18.3488	24.6277	31.2706	36.4974	38.9076	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	463.2991	468.1066	455.9917	430.2003	397.6433	367.0444	346.6024	341.7948	353.9098	379.7012	412.2581	442.8571	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.4312	55.4312	55.4312	55.4312	55.4312	55.4312	55.4312	55.4312	55.4312	55.4312	55.4312	55.4312	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	(71)
Water heating gains (Table 5)	112.2243	109.4776	104.1868	92.5912	85.4886	78.0645	73.5048	77.2723	81.6894	89.9272	101.0429	110.7418	(72)
Total internal gains	730.1849	728.0132	704.3285	660.2987	615.4123	571.9790	548.0294	551.2219	574.0329	617.7049	666.6044	709.3125	(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					0.7100	10.6334	0.7300	0.7000			0.7700	2.6735 (74)	
East					12.4600	19.6403	0.7300	0.7000			0.7700	86.6602 (76)	
South					1.4200	46.7521	0.7300	0.7000			0.7700	23.5095 (78)	
West					8.3400	19.6403	0.7300	0.7000			0.7700	58.0053 (80)	
Solar gains	170.8485	326.6080	523.7818	749.0900	909.5626	928.4376	884.9310	765.0022	603.7128	383.4094	211.5457	141.5090	(83)
Total gains	901.0334	1054.6212	1228.1103	1409.3887	1524.9749	1500.4166	1432.9604	1316.2242	1177.7457	1001.1143	878.1501	850.8215	(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	45.9517	46.0734	46.1932	46.7645	46.8729	47.3845	47.3845	47.4805	47.1862	46.8729	46.6540	46.4274	
alpha	4.0634	4.0716	4.0795	4.1176	4.1249	4.1590	4.1590	4.1654	4.1457	4.1249	4.1103	4.0952	
util living area	0.9924	0.9849	0.9644	0.9075	0.7925	0.6230	0.4708	0.5275	0.7734	0.9462	0.9866	0.9939	(86)
MIT	19.6484	19.8225	20.1109	20.4660	20.7338	20.8745	20.9131	20.9060	20.7985	20.4257	19.9690	19.6196	(87)
Th 2	19.9587	19.9612	19.9636	19.9749	19.9771	19.9870	19.9870	19.9888	19.9831	19.9771	19.9728	19.9683	(88)
util rest of house	0.9904	0.9810	0.9552	0.8835	0.7418	0.5408	0.3681	0.4210	0.7008	0.9271	0.9825	0.9923	(89)
MIT 2	18.3751	18.5983	18.9635	19.4071	19.7128	19.8587	19.8866	19.8850	19.7928	19.3703	18.7951	18.3456	(90)
Living area fraction	18.5113	18.7293	19.0863	19.5205	19.8221	19.9675	19.9965	19.9943	19.9005	19.4833	18.9208	18.4820	(91)
MIT	18.3613	18.5793	18.9363	19.3705	19.6721	19.8175	19.8465	19.8443	19.7505	19.3333	18.7708	18.3320	(93)
Temperature adjustment												-0.1500	
adjusted MIT													

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9860	0.9738	0.9430	0.8662	0.7246	0.5261	0.3534	0.4049	0.6815	0.9111	0.9756	0.9887	(94)
Useful gains	888.4204	1027.0116	1158.1209	1220.7996	1104.9303	789.3431	506.3557	532.9817	802.6831	912.1236	856.6851	841.1904	(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	2281.7474	2213.8945	2007.5032	1669.5254	1268.2185	821.0431	510.8861	540.9066	892.9203	1389.3043	1865.3226	2269.7114	(97)
Space heating kWh	1036.6353	797.5853	631.9404	323.0825	121.4864	0.0000	0.0000	0.0000	0.0000	355.0225	726.2190	1062.8196	(98a)
Space heating requirement - total per year (kWh/year)												5054.7910	
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	1036.6353	797.5853	631.9404	323.0825	121.4864	0.0000	0.0000	0.0000	0.0000	355.0225	726.2190	1062.8196	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5054.7910	
Space heating per m ²												35.8801	(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	
	1036.6353	797.5853	631.9404	323.0825	121.4864	0.0000	0.0000	0.0000	0.0000	355.0225	726.2190	1062.8196	(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)	1171.3393	901.2263	714.0569	365.0650	137.2728	0.0000	0.0000	0.0000	0.0000	401.1553	820.5864	1200.9261	(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

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Efficiency of water heater (217)m	255.9696	225.6333	237.9402	205.0930	195.9970	173.5584	169.1155	177.5666	181.4273	205.9535	223.4399	252.6440 (64)
Fuel for water heating, kWh/month	88.1989	88.1648	88.0846	87.9114	87.5679	87.0000	87.0000	87.0000	87.0000	87.9433	88.1424	87.0000 (216)
Space cooling fuel requirement (221)m	290.2187	255.9222	270.1270	233.2950	223.8228	199.4924	194.3857	204.0995	208.5371	234.1889	253.4987	286.4187 (219)
Pumps and Fa	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)
Lighting	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685 (231)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	33.1347	26.5819	23.9340	17.5351	13.5446	11.0661	12.3559	16.0606	20.8611	27.3710	30.9154	34.0556 (232)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	-52.5111	-78.6467	-119.7985	-137.9065	-147.6891	-136.8960	-134.6397	-127.4065	-112.8662	-91.6474	-58.7698	-44.4379 (233a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	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 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 (233b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	-30.4728	-72.8869	-170.0866	-292.0138	-415.9300	-429.6967	-419.2602	-335.5278	-220.1547	-110.9914	-42.3058	-23.1829 (233b)
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 (234b)
Annual totals kWh/year	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Space heating fuel - main system 1	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)
Space heating fuel - main 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 (211)
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)
Efficiency of water heater	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 fuel used	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (219)
Space cooling fuel	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)
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)												267.4161 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												-3805.7250 (233)
PV generation												0.0000 (234)
Wind generation												0.0000 (235a)
Hydro-electric generation (Appendix N)												0.0000 (235)
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												5113.3260 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	5711.6283	5.6000	319.8512 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2854.0066	5.6000	159.8244 (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	267.4161	26.0600	69.6886 (250)
Additional standing charges			99.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1243.2155	26.0600	-323.9820
PV Unit electricity exported	-2562.5095	5.8100	-148.8818
Total			-472.8638 (252)
Total energy cost			197.9120 (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	5711.6283	0.2100	1199.4419 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2854.0066	0.2100	599.3414 (264)
Space and water heating			1798.7833 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	267.4161	0.1443	38.5964 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1243.2155	0.1341	-166.6809
PV Unit electricity exported	-2562.5095	0.1227	-314.4938
Total			-481.1748 (269)
Total CO2, kg/year			1368.1342 (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	5711.6283	1.1300	6454.1399 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2854.0066	1.1300	3225.0274 (278)
Space and water heating			9679.1674 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	267.4161	1.5338	410.1717 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1243.2155	1.4955	-1859.2188
PV Unit electricity exported	-2562.5095	0.4504	-1154.0307
Total			-3013.2495 (283)
Total Primary energy kWh/year			7206.1904 (286)

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SAP 10 EPC IMPROVEMENTS

Plot 30

Current energy efficiency rating: A 96
Current environmental impact rating: B 90

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

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

Measures omitted - SAP change or cost saving too small:
N Solar water heating + 0.4 -£ 21 -137 kg (10.0%)

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

Potential energy efficiency rating: A 96
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	£92	£92	£0
Mains gas	£579	£579	£0
Space heating	£441	£441	£0
Water heating	£160	£160	£0
Lighting	£70	£70	£0
Generated (PV)	-£473	-£473	£0
Total cost of fuels	£198	£198	£0
Total cost of uses	£198	£198	£0
Delivered energy	36 kWh/m ²	36 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	1.4 tonnes	1.4 tonnes	0.0 tonnes
CO2 emissions per m ²	10 kg/m ²	10 kg/m ²	0 kg/m ²
Primary energy	51 kWh/m ²	51 kWh/m ²	0 kWh/m ²

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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	60.4100 (1b)	x 2.6600 (2b)	= 160.6906 (1b) - (3b)
First floor	80.4700 (1c)	x 2.3400 (2c)	= 188.2998 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	140.8800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	348.9904 (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) = 0.1433 (8)

Pressure Test Yes

Pressure Test Method Blower Door

Measured/design AP50 4.0000 (17)

Infiltration rate 0.3433 (18)

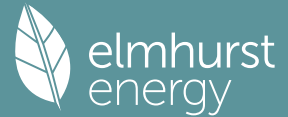
Number of sides sheltered 0 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 1.0000 (20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3433 (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												

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Effective ac	0.4377	0.4291	0.4205	0.3776	0.3690	0.3261	0.3261	0.3175	0.3433	0.3690	0.3862	0.4033 (22b)
	0.5958	0.5921	0.5884	0.5713	0.5681	0.5532	0.5532	0.5504	0.5589	0.5681	0.5746	0.5813 (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)			22.9300	1.2357	28.3356		(27)
Door			2.1400	1.3000	2.7820		(26a)
Ground Floor			60.4100	0.1300	7.8533	75.0000	4530.7500 (28a)
Exposed Floor			20.0600	0.2000	4.0120	20.0000	401.2000 (28b)
External Wall	159.8600	25.0700	134.7900	0.1900	25.6101	110.0000	14826.9000 (29a)
Garage Wall	25.1300		25.1300	0.1700	4.2721	110.0000	2764.3000 (29a)
Plane Roof	80.4700		80.4700	0.0900	7.2423	9.0000	724.2300 (30)
Total net area of external elements Aum(A, m2)			345.9300				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	80.1074	(33)
Studs			218.3800			9.0000	1965.4200 (32c)
Internal Floor 1			60.4100			18.0000	1087.3800 (32d)
Internal Ceiling 1			60.4100			9.0000	543.6900 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
(28)...(30) + (32) + (32a)...(32e) = 26843.8700 (34)
List of Thermal Bridges
190.5442 (35)

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	17.3000	0.0240	0.4152
E3 Sill	13.8000	0.0210	0.2898
E4 Jamb	38.4000	0.0160	0.6144
E5 Ground floor (normal)	37.0000	0.0920	3.4040
E10 Eaves (insulation at ceiling level)	15.8500	0.0580	0.9193
E16 Corner (normal)	27.6600	0.0470	1.3000
E6 Intermediate floor within a dwelling	27.5500	0.0010	0.0276
E12 Gable (insulation at ceiling level)	21.1500	0.0570	1.2055
E17 Corner (inverted - internal area greater than external area)	7.6600	-0.0880	-0.6741
E20 Exposed floor (normal)	9.4500	0.3200	3.0240
E21 Exposed floor (inverted)	9.4500	0.3200	3.0240
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			13.5497 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 93.6571 (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 68.6138 68.1855 67.7656 65.7937 65.4247 63.7072 63.7072 63.3891 64.3687 65.4247 66.1711 66.9514 (38)
Heat transfer coeff 162.2709 161.8426 161.4227 159.4507 159.0818 157.3643 157.3643 157.0462 158.0258 159.0818 159.8282 160.6085 (39)
Average = Sum(39)m / 12 = 159.4490

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1518	1.1488	1.1458	1.1318	1.1292	1.1170	1.1170	1.1148	1.1217	1.1292	1.1345	1.1400 (40)
HLP (average)												1.1318
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

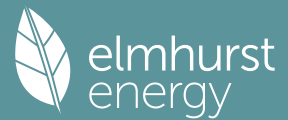
Assumed occupancy												2.9187 (42)
Hot water usage for mixer showers	73.1575	72.0581	70.4560	67.3908	65.1287	62.6060	61.1722	62.7621	64.5050	67.2135	70.3446	72.8772 (42a)
Hot water usage for baths	31.5834	31.1143	30.4538	29.2359	28.3239	27.3127	26.7665	27.4224	28.1366	29.2186	30.4616	31.4766 (42b)
Hot water usage for other uses	44.5208	42.9019	41.2829	39.6640	38.0451	36.4261	36.4261	38.0451	39.6640	41.2829	42.9019	44.5208 (42c)
Average daily hot water use (litres/day)												137.2050 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	149.2617	146.0743	142.1928	136.2907	131.4977	126.3449	124.3648	128.2296	132.3056	137.7151	143.7081	148.8746 (44)
Energy conte	236.3940	208.0078	218.5450	186.5751	177.0212	155.3558	150.4084	158.7750	163.1460	186.8781	204.7386	233.1017 (45)
Energy content (annual)												Total = Sum(45)m = 2278.9466
Distribution loss (46)m = 0.15 x (45)m	35.4591	31.2012	32.7817	27.9863	26.5532	23.3034	22.5613	23.8163	24.4719	28.0317	30.7108	34.9653 (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	19.5755	17.6255	19.3953	18.5179	18.9759	18.2026	18.7071	18.7916	18.2813	19.0754	18.7014	19.5423 (61)
Total heat required for water heating calculated for each month	255.9696	225.6333	237.9402	205.0930	195.9970	173.5584	169.1155	177.5666	181.4273	205.9535	223.4399	252.6440 (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	255.9696	225.6333	237.9402	205.0930	195.9970	173.5584	169.1155	177.5666	181.4273	205.9535	223.4399	252.6440 (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	83.4949	73.5690	77.5150	66.6657	63.6035	56.2064	54.6876	57.4906	58.8164	66.9058	72.7509	82.3919 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	175.1244	175.1244	175.1244	175.1244	175.1244	175.1244	175.1244	175.1244	175.1244	175.1244	175.1244	175.1244 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	37.8555	33.6229	27.3440	20.7012	15.4744	13.0641	14.1162	18.3488	24.6277	31.2706	36.4974	38.9076 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	463.2991	468.1066	455.9917	430.2003	397.6433	367.0444	346.6024	341.7948	353.9098	379.7012	412.2581	442.8571 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												

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Pumps, fans	55.4312 3.0000	55.4312 3.0000	55.4312 3.0000	55.4312 3.0000	55.4312 3.0000	55.4312 0.0000	55.4312 0.0000	55.4312 0.0000	55.4312 0.0000	55.4312 3.0000	55.4312 3.0000	55.4312 (69) 3.0000 (70)
Losses e.g. evaporation	(negative values) (Table 5)											
Water heating gains	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496 (71)
Water heating gains	(Table 5)											
Total internal gains	112.2243	109.4776	104.1868	92.5912	85.4886	78.0645	73.5048	77.2723	81.6894	89.9272	101.0429	110.7418 (72)
	730.1849	728.0132	704.3285	660.2987	615.4123	571.9790	548.0294	551.2219	574.0329	617.7049	666.6044	709.3125 (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					0.7100	10.6334	0.7300	0.7000			0.7700	2.6735 (74)	
East					12.4600	19.6403	0.7300	0.7000			0.7700	86.6602 (76)	
South					1.4200	46.7521	0.7300	0.7000			0.7700	23.5095 (78)	
West					8.3400	19.6403	0.7300	0.7000			0.7700	58.0053 (80)	
Solar gains	170.8485	326.6080	523.7818	749.0900	909.5626	928.4376	884.9310	765.0022	603.7128	383.4094	211.5457	141.5090 (83)	
Total gains	901.0334	1054.6212	1228.1103	1409.3887	1524.9749	1500.4166	1432.9604	1316.2242	1177.7457	1001.1143	878.1501	850.8215 (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	45.9517	46.0734	46.1932	46.7645	46.8729	47.3845	47.3845	47.4805	47.1862	46.8729	46.6540	46.4274
alpha	4.0634	4.0716	4.0795	4.1176	4.1249	4.1590	4.1590	4.1654	4.1457	4.1249	4.1103	4.0952
util living area	0.9924	0.9849	0.9644	0.9075	0.7925	0.6230	0.4708	0.5275	0.7734	0.9462	0.9866	0.9939 (86)
MIT	19.6484	19.8225	20.1109	20.4660	20.7338	20.8745	20.9131	20.9060	20.7985	20.4257	19.9690	19.6196 (87)
Th 2	19.9587	19.9612	19.9636	19.9749	19.9771	19.9870	19.9870	19.9888	19.9831	19.9771	19.9728	19.9683 (88)
util rest of house	0.9904	0.9810	0.9552	0.8835	0.7418	0.5408	0.3681	0.4210	0.7008	0.9271	0.9825	0.9923 (89)
MIT 2	18.3751	18.5983	18.9635	19.4071	19.7128	19.8587	19.8866	19.8850	19.7928	19.3703	18.7951	18.3456 (90)
Living area fraction	FLA = Living area / (4) =											
MIT	18.5113	18.7293	19.0863	19.5205	19.8221	19.9675	19.9965	19.9943	19.9005	19.4833	18.9208	18.4820 (92)
Temperature adjustment	-0.1500											
adjusted MIT	18.3613	18.5793	18.9363	19.3705	19.6721	19.8175	19.8465	19.8443	19.7505	19.3333	18.7708	18.3320 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9860	0.9738	0.9430	0.8662	0.7246	0.5261	0.3534	0.4049	0.6815	0.9111	0.9756	0.9887 (94)
Useful gains	888.4204	1027.0116	1158.1209	1220.7996	1104.9303	789.3431	506.3557	532.9817	802.6831	912.1236	856.6851	841.1904 (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	2281.7474	2213.8945	2007.5032	1669.5254	1268.2185	821.0431	510.8861	540.9066	892.9203	1389.3043	1865.3226	2269.7114 (97)
Space heating kWh	1036.6353	797.5853	631.9404	323.0825	121.4864	0.0000	0.0000	0.0000	0.0000	355.0225	726.2190	1062.8196 (98a)
Space heating requirement - total per year (kWh/year)												5054.7910
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	1036.6353	797.5853	631.9404	323.0825	121.4864	0.0000	0.0000	0.0000	0.0000	355.0225	726.2190	1062.8196 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5054.7910
Space heating per m ²												(98c) / (4) = 35.8801 (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	1036.6353	797.5853	631.9404	323.0825	121.4864	0.0000	0.0000	0.0000	0.0000	355.0225	726.2190	1062.8196 (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)	1171.3393	901.2263	714.0569	365.0650	137.2728	0.0000	0.0000	0.0000	0.0000	401.1553	820.5864	1200.9261 (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	255.9696	225.6333	237.9402	205.0930	195.9970	173.5584	169.1155	177.5666	181.4273	205.9535	223.4399	252.6440 (64)
Efficiency of water heater (217)m	88.1989	88.1648	88.0846	87.9114	87.5679	87.0000	87.0000	87.0000	87.0000	87.9433	88.1424	87.0000 (216)
Fuel for water heating, kWh/month	290.2187	255.9222	270.1270	233.2950	223.8228	199.4924	194.3857	204.0995	208.5371	234.1889	253.4987	286.4187 (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	33.1347	26.5819	23.9340	17.5351	13.5446	11.0661	12.3559	16.0606	20.8611	27.3710	30.9154	34.0556 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-52.5111	-78.6467	-119.7985	-137.9065	-147.6891	-136.8960	-134.6397	-127.4065	-112.8662	-91.6474	-58.7698	-44.4379 (233a)

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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	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	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	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)														
(233b)m	-30.4728	-72.8869	-170.0866	-292.0138	-415.9300	-429.6967	-419.2602	-335.5278	-220.1547	-110.9914	-42.3058	-23.1829		(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	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	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	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													5711.6283	(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													2854.0066	(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)													267.4161	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-3805.7250	(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													5113.3260	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	5711.6283	3.6400	207.9033	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2854.0066	3.6400	103.8858	(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	267.4161	16.4900	44.0969	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1243.2155	16.4900	-205.0062	
PV Unit electricity exported	-2562.5095	5.5900	-143.2443	
Total			-348.2505	(252)
Total energy cost			113.8169	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.2204	(257)
SAP value		96.4268	
SAP rating (Section 12)		96	(258)
SAP band		A	

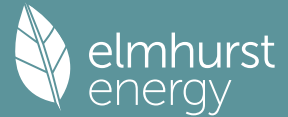
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	5711.6283	0.2100	1199.4419	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2854.0066	0.2100	599.3414	(264)
Space and water heating			1798.7833	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	267.4161	0.1443	38.5964	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1243.2155	0.1341	-166.6809	
PV Unit electricity exported	-2562.5095	0.1227	-314.4938	
Total			-481.1748	(269)
Total CO2, kg/year			1368.1342	(272)
CO2 emissions per m2			9.7100	(273)
EI value			90.1372	
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

Full SAP Calculation Printout



	Area (m ²)	Storey height (m)	Volume (m ³)	
Ground floor	60.4100 (1b)	x 2.6600 (2b)	= 160.6906 (1b) - (3b)	
First floor	80.4700 (1c)	x 2.3400 (2c)	= 188.2998 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	140.8800		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 348.9904 (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) =	0.1433 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	(17)
Infiltration rate	0.3433	(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) =	0.3433 (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	0.4377	0.4291	0.4205	0.3776	0.3690	0.3261	0.3261	0.3175	0.3433	0.3690	0.3862	0.4033	(22b)
Effective ac	0.5958	0.5921	0.5884	0.5713	0.5681	0.5532	0.5532	0.5504	0.5589	0.5681	0.5746	0.5813	(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)			22.9300	1.2357	28.3356			(27)
Door			2.1400	1.3000	2.7820			(26a)
Ground Floor			60.4100	0.1300	7.8533	75.0000	4530.7500	(28a)
Exposed Floor			20.0600	0.2000	4.0120	20.0000	401.2000	(28b)
External Wall	159.8600	25.0700	134.7900	0.1900	25.6101	110.0000	14826.9000	(29a)
Garage Wall	25.1300		25.1300	0.1700	4.2721	110.0000	2764.3000	(29a)
Plane Roof	80.4700		80.4700	0.0900	7.2423	9.0000	724.2300	(30)
Total net area of external elements Aum(A, m ²)			345.9300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	80.1074				(33)
Studs			218.3800			9.0000	1965.4200	(32c)
Internal Floor 1			60.4100			18.0000	1087.3800	(32d)
Internal Ceiling 1			60.4100			9.0000	543.6900	(32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	26843.8700	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							190.5442	(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		
E2 Other lintels (including other steel lintels)				17.3000	0.0240	0.4152		
E3 Sill				13.8000	0.0210	0.2898		
E4 Jamb				38.4000	0.0160	0.6144		
E5 Ground floor (normal)				37.0000	0.0920	3.4040		
E10 Eaves (insulation at ceiling level)				15.8500	0.0580	0.9193		
E16 Corner (normal)				27.6600	0.0470	1.3000		
E6 Intermediate floor within a dwelling				27.5500	0.0010	0.0276		
E12 Gable (insulation at ceiling level)				21.1500	0.0570	1.2055		
E17 Corner (inverted - internal area greater than external area)				7.6600	-0.0880	-0.6741		
E20 Exposed floor (normal)				9.4500	0.3200	3.0240		
E21 Exposed floor (inverted)				9.4500	0.3200	3.0240		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.5497	(36)
Point Thermal bridges							0.0000	
Total fabric heat loss						(33) + (36) + (36a) =	93.6571	(37)

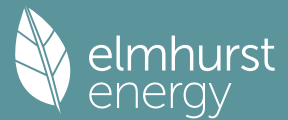
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	68.6138	68.1855	67.7656	65.7937	65.4247	63.7072	63.7072	63.3891	64.3687	65.4247	66.1711	66.9514	(38)
Heat transfer coeff	162.2709	161.8426	161.4227	159.4507	159.0818	157.3643	157.3643	157.0462	158.0258	159.0818	159.8282	160.6085	(39)
Average = Sum(39)m / 12 =												159.4490	
HLP	1.1518	1.1488	1.1458	1.1318	1.1292	1.1170	1.1170	1.1148	1.1217	1.1292	1.1345	1.1400	(40)
HLP (average)												1.1318	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9187 (42)
Hot water usage for mixer showers													
73.1575	72.0581	70.4560	67.3908	65.1287	62.6060	61.1722	62.7621	64.5050	67.2135	70.3446	72.8772	(42a)	
Hot water usage for baths													
31.5834	31.1143	30.4538	29.2359	28.3239	27.3127	26.7665	27.4224	28.1366	29.2186	30.4616	31.4766	(42b)	
Hot water usage for other uses													
44.5208	42.9019	41.2829	39.6640	38.0451	36.4261	36.4261	38.0451	39.6640	41.2829	42.9019	44.5208	(42c)	
Average daily hot water use (litres/day)												137.2050	(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

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Daily hot water use	149.2617	146.0743	142.1928	136.2907	131.4977	126.3449	124.3648	128.2296	132.3056	137.7151	143.7081	148.8746 (44)
Energy content (annual)	236.3940	208.0078	218.5450	186.5751	177.0212	155.3558	150.4084	158.7750	163.1460	186.8781	204.7386	233.1017 (45)
Energy content (annual)										Total = Sum(45)m =		2278.9466
Distribution loss (46)m = 0.15 x (45)m	35.4591	31.2012	32.7817	27.9863	26.5532	23.3034	22.5613	23.8163	24.4719	28.0317	30.7108	34.9653 (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	19.5755	17.6255	19.3953	18.5179	18.9759	18.2026	18.7071	18.7916	18.2813	19.0754	18.7014	19.5423 (61)
Total heat required for water heating calculated for each month	255.9696	225.6333	237.9402	205.0930	195.9970	173.5584	169.1155	177.5666	181.4273	205.9535	223.4399	252.6440 (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	255.9696	225.6333	237.9402	205.0930	195.9970	173.5584	169.1155	177.5666	181.4273	205.9535	223.4399	252.6440 (64)
								Total per year (kWh/year) = Sum(64)m =				2504.3383 (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	83.4949	73.5690	77.5150	66.6657	63.6035	56.2064	54.6876	57.4906	58.8164	66.9058	72.7509	82.3919 (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	175.1244	175.1244	175.1244	175.1244	175.1244	175.1244	175.1244	175.1244	175.1244	175.1244	175.1244	175.1244 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	37.8555	33.6229	27.3440	20.7012	15.4744	13.0641	14.1162	18.3488	24.6277	31.2706	36.4974	38.9076 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	463.2991	468.1066	455.9917	430.2003	397.6433	367.0444	346.6024	341.7948	353.9098	379.7012	412.2581	442.8571 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.4312	55.4312	55.4312	55.4312	55.4312	55.4312	55.4312	55.4312	55.4312	55.4312	55.4312	55.4312 (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)	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496	-116.7496 (71)
Water heating gains (Table 5)	112.2243	109.4776	104.1868	92.5912	85.4886	78.0645	73.5048	77.2723	81.6894	89.9272	101.0429	110.7418 (72)
Total internal gains	730.1849	728.0132	704.3285	660.2987	615.4123	571.9790	548.0294	551.2219	574.0329	617.7049	666.6044	709.3125 (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				0.7100	10.6334	0.7300	0.7000	0.7700	2.6735 (74)			
East				12.4600	19.6403	0.7300	0.7000	0.7700	86.6602 (76)			
South				1.4200	46.7521	0.7300	0.7000	0.7700	23.5095 (78)			
West				8.3400	19.6403	0.7300	0.7000	0.7700	58.0053 (80)			
Solar gains	170.8485	326.6080	523.7818	749.0900	909.5626	928.4376	884.9310	765.0022	603.7128	383.4094	211.5457	141.5090 (83)
Total gains	901.0334	1054.6212	1228.1103	1409.3887	1524.9749	1500.4166	1432.9604	1316.2242	1177.7457	1001.1143	878.1501	850.8215 (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	45.9517	46.0734	46.1932	46.7645	46.8729	47.3845	47.3845	47.4805	47.1862	46.8729	46.6540	46.4274
alpha	4.0634	4.0716	4.0795	4.1176	4.1249	4.1590	4.1590	4.1654	4.1457	4.1249	4.1103	4.0952
util living area	0.9924	0.9849	0.9644	0.9075	0.7925	0.6230	0.4708	0.5275	0.7734	0.9462	0.9866	0.9939 (86)
MIT	19.6484	19.8225	20.1109	20.4660	20.7338	20.8745	20.9131	20.9060	20.7985	20.4257	19.9690	19.6196 (87)
Th 2	19.9587	19.9612	19.9636	19.9749	19.9771	19.9870	19.9870	19.9888	19.9831	19.9771	19.9728	19.9683 (88)
util rest of house	0.9904	0.9810	0.9552	0.8835	0.7418	0.5408	0.3681	0.4210	0.7008	0.9271	0.9825	0.9923 (89)
MIT 2	18.3751	18.5983	18.9635	19.4071	19.7128	19.8587	19.8866	19.8850	19.7928	19.3703	18.7951	18.3456 (90)
Living area fraction	18.5113	18.7293	19.0863	19.5205	19.8221	19.9675	19.9965	19.9943	19.9005	19.4833	18.9208	18.4820 (91)
MIT	18.3613	18.5793	18.9363	19.3705	19.6721	19.8175	19.8465	19.8443	19.7505	19.3333	18.7708	-0.1500 (92)
Temperature adjustment												
adjusted MIT												18.3320 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	888.4204	1027.0116	1158.1209	1220.7996	1104.9303	789.3431	506.3557	532.9817	802.6831	912.1236	856.6851	841.1904 (94)
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 (95)
Heat loss rate W	2281.7474	2213.8945	2007.5032	1669.5254	1268.2185	821.0431	510.8861	540.9066	892.9203	1389.3043	1865.3226	2269.7114 (97)
Space heating kWh	1036.6353	797.5853	631.9404	323.0825	121.4864	0.0000	0.0000	0.0000	0.0000	355.0225	726.2190	1062.8196 (98a)
Space heating requirement - total per year (kWh/year)												5054.7910
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	1036.6353	797.5853	631.9404	323.0825	121.4864	0.0000	0.0000	0.0000	0.0000	355.0225	726.2190	1062.8196 (98c)

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Space heating requirement after solar contribution - total per year (kWh/year)
Space heating per m2

5054.7910
(98c) / (4) = 35.8801 (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	1036.6353	797.5853	631.9404	323.0825	121.4864	0.0000	0.0000	0.0000	0.0000	355.0225	726.2190	1062.8196 (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)	1171.3393	901.2263	714.0569	365.0650	137.2728	0.0000	0.0000	0.0000	0.0000	401.1553	820.5864	1200.9261 (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	255.9696	225.6333	237.9402	205.0930	195.9970	173.5584	169.1155	177.5666	181.4273	205.9535	223.4399	252.6440 (64)
Efficiency of water heater (217)m	88.1989	88.1648	88.0846	87.9114	87.5679	87.0000	87.0000	87.0000	87.0000	87.9433	88.1424	88.2079 (216)
Fuel for water heating, kWh/month	290.2187	255.9222	270.1270	233.2950	223.8228	199.4924	194.3857	204.0995	208.5371	234.1889	253.4987	286.4187 (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	7.0685	7.3041	7.0685	7.3041	7.3041 (231)
Lighting	33.1347	26.5819	23.9340	17.5351	13.5446	11.0661	12.3559	16.0606	20.8611	27.3710	30.9154	34.0556 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-52.5111	-78.6467	-119.7985	-137.9065	-147.6891	-136.8960	-134.6397	-127.4065	-112.8662	-91.6474	-58.7698	-44.4379 (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)	-30.4728	-72.8869	-170.0866	-292.0138	-415.9300	-429.6967	-419.2602	-335.5278	-220.1547	-110.9914	-42.3058	-23.1829 (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												5711.6283 (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												2854.0066 (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)												267.4161 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-3805.7250 (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												5113.3260 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	5711.6283	5.6000	319.8512 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2854.0066	5.6000	159.8244 (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	267.4161	26.0600	69.6886 (250)
Additional standing charges			99.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1243.2155	26.0600	-323.9820
PV Unit electricity exported	-2562.5095	5.8100	-148.8818
Total			-472.8638 (252)
Total energy cost			197.9120 (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	5711.6283	0.2100	1199.4419 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2854.0066	0.2100	599.3414 (264)
Space and water heating			1798.7833 (265)

Full SAP Calculation Printout



Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	267.4161	0.1443	38.5964 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1243.2155	0.1341	-166.6809
PV Unit electricity exported	-2562.5095	0.1227	-314.4938
Total			-481.1748 (269)
Total CO2, kg/year			1368.1342 (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	5711.6283	1.1300	6454.1399 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2854.0066	1.1300	3225.0274 (278)
Space and water heating			9679.1674 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	267.4161	1.5338	410.1717 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1243.2155	1.4955	-1859.2188
PV Unit electricity exported	-2562.5095	0.4504	-1154.0307
Total			-3013.2495 (283)
Total Primary energy kWh/year			7206.1904 (286)

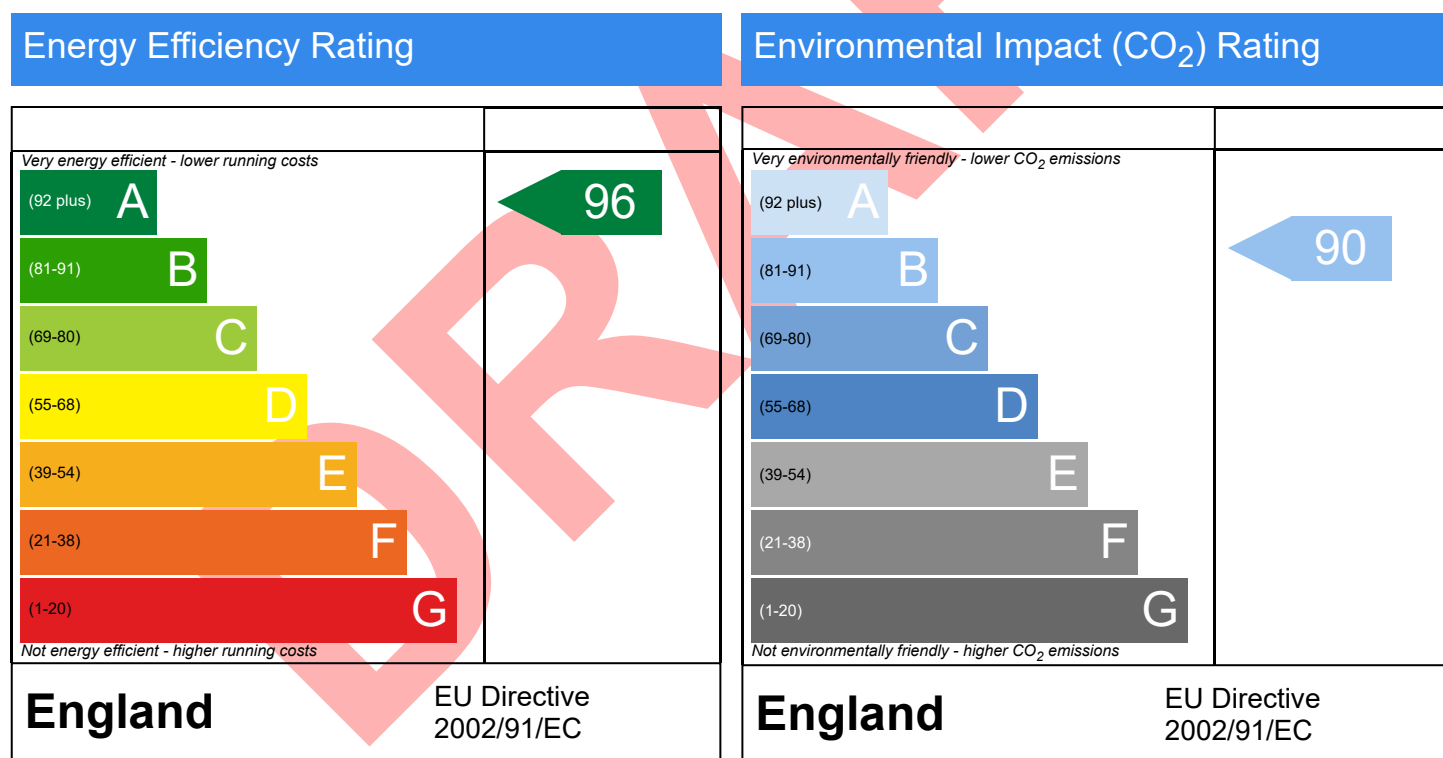
Predicted Energy Assessment



Dwelling type: House, Detached
Date of assessment: 15/11/2024
Produced by: Victoria Gartside
Total floor area: 160.94 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.