

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 10:34:33

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

Dwelling Details			
Assessment Type	As designed	Total Floor Area	93 m ²
Site Reference	SAP VG 21-0282	Plot Reference	Plot 39
Address			

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

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

1a Target emission rate and dwelling emission rate			
Fuel for main heating system	Mains gas		
Target carbon dioxide emission rate	12.2 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	12.08 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	63.92 kWh _{PE} /m ²		
Dwelling primary energy	63.36 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	38.8 kWh/m ²		
Dwelling fabric energy efficiency	38.4 kWh/m ²		OK

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.18	Walls (3) (0.23)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	0.13	Heatloss Floor 1 (0.13)	OK
Roofs	0.16	0.13	Roof (2) (0.18)	OK
Windows, doors, and roof windows	1.6	1.28	Front Windows (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)	81.51	0.19
Exposed wall: Walls (2)	24.61	0.11 (!)
Exposed wall: Walls (3)	13.63	0.23
Party wall: Party Wall (1)	55.15	0 (!)
Ground floor: Heatloss Floor 1, Heatloss Floor 1	35.97	0.13
Exposed roof: Roof (1)	11.9	0.09 (!)
Exposed roof: Roof (2)	11.84	0.18
Exposed roof: Roof (3)	14.71	0.11

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 door, Front door	2.14	South	N/A	1.1 (!)
Front Windows, Windows	5.79	South	0.7	1.3
Side Windows, Windows	1.42	West	0.7	1.3
Rear Windows, Windows	7.42	North	0.7	1.3
Roof light , Rooflight	0.95	North	0.7	1.3
Side Window, Windows	0.71	West	0.7	1.3

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))	
Building part 1 - Main Dwelling: Thermal bridging calculated from linear thermal transmittances for each junction	

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.024 (!)	MFF-150-E2-02
External wall	E3: Sill	Calculated by person with suitable expertise	0.022 (!)	RCD E3.01
External wall	E4: Jamb	Calculated by person with suitable expertise	0.017 (!)	
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.092	Manufacturer Declaration
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.001 (!)	RCD E6.01
External wall	E11: Eaves (insulation at rafter level)	Calculated by person with suitable expertise	0.068	SMRF-E11-0.16
External wall	E13: Gable (insulation at rafter level)	Calculated by person with suitable expertise	0.094	SMRF-E13-0.16
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.046	RCD E16.01
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.04	SMRF-P05-0.16
Party wall	P1: Ground floor	Calculated by person with suitable expertise	0.069	Manufacturer Declaration
Party wall	P2: Intermediate floor within a dwelling	SAP table default	0 (!)	
Party wall	P5: Roof (insulation at rafter level)	SAP table default	0.48	
Roof	R1: Head of roof window	Calculated by person with suitable expertise	0.115	SMRF-R01-0.16
Roof	R2: Sill of roof window	Calculated by person with suitable expertise	0.113	SMRF-R02-0.16
Roof	R3: Jamb of roof window	Calculated by person with suitable expertise	0.041	SMRF-R03-0.16
Roof	R4: Ridge (vaulted ceiling)	Calculated by person with suitable expertise	0.044	SMRF-R04-0.16

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	88.7%
Emitter type	Radiators
Flow temperature	
System type	Combi boiler
Manufacturer	Vaillant
Model	ecoFIT sustain 835
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: N/A		
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	1.85 kWp	
Orientation	South	
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 39	Prop Type Ref	SAP VG 21-0282	
Property				

SAP Rating	92 A	DER	12.08	TER	12.20
Environmental	89 B	% DER < TER			0.98
CO ₂ Emissions (t/year)	1.08	DFEE	38.41	TFEE	38.82
Compliance Check	See BREL	% DFEE < TFEE			1.05
% DPER < TPER	0.88	DPER	63.36	TPER	63.92

Assessor Details	Miss Victoria Gartside	Assessor ID	AL30-0001
Client			

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

Orientation	South	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	House, Semi-Detached	
Which Floor	0	
2.0 Number of Storeys	3	
3.0 Date Built	2023	
3.0 Property Age Band	L	
4.0 Sheltered Sides	1	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	214.31	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements	Ground floor:	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	1st Storey:	16.97 m	35.97 m ²	2.40 m
	2nd Storey:	16.97 m	35.97 m ²	2.63 m
		16.84 m	21.25 m ²	2.61 m

8.0 Living Area	12.52	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
	Brick wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.19	110.00	98.99	81.51	0.00	None	17.48	Enter Gross Area
	Stud wall (0.72)	Timber Frame	Timber framed wall (one layer of plasterboard)	0.11	9.00	24.61	24.61	0.00	None	0.00	Enter Gross Area
	Spandrel wall	Timber Frame	Other	0.23	0.00	13.63	13.63	0.00	None	0.00	Enter Gross Area

9.1 Party Walls	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)	Shelter Res	Shelter
	Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs on both sides, dense blocks, cavity or cavity fill	0.00	70.00	55.15	0.00	None

9.2 Internal Walls	Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
	Internal Wall 2	Plasterboard on timber frame	9.00	119.67

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	11.90	11.90	None	0.00	Enter Gross Area	0.00

Summary for Input Data



Sloping roof	External Slope	Plasterboard, insulated slope	0.18	9.00	12.79	11.84	None	0.00	Enter Gross Area	0.95
Roof behind studs (0.72)	External Plane Roof	Plasterboard, insulated at ceiling level	0.11	9.00	14.71	14.71	None	0.00	Enter Gross Area	0.00

10.2 Internal Ceilings

Description	Storey	Construction	Area (m²)
Internal Ceiling 1	+1	Plasterboard ceiling, carpeted chipboard floor	57.16

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Heatloss Floor 1	Ground Floor - Solid	Lowest occupied	Slab on ground, screed over insulation	0.13	None	0.00	110.00	35.97

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor		Plasterboard ceiling, carpeted chipboard floor	9.00	57.16

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front door	Manufacturer	Solid Door				0.00			1.10
Windows	Manufacturer	Window	Double Low-E Soft 0.05			0.73		0.70	1.30
Rooflight	Manufacturer	Roof Window	Double Low-E Soft 0.05			0.73		0.70	1.30

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Front door	Front door	Brick wall	South	2.14	0
Front Windows	Windows	Brick wall	South	5.79	0
Side Windows	Windows	Brick wall	West	1.42	0
Rear Windows	Windows	Brick wall	North	7.42	0
Roof light	Rooflight	Sloping roof	North	0.95	0
Side Window	Windows	Brick wall	West	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	11.43	0.02	0.02 MFF-150-E2-02	No
E3 Sill	Independently assessed	8.60	0.02	0.02 RCD E3.01	No
E4 Jamb	Independently assessed	27.60	0.02	0.02	No
E5 Ground floor (normal)	Independently assessed	16.97	0.09	0.09 Manufacturer Declaration	No
E6 Intermediate floor within a dwelling	Independently assessed	33.94	0.00	0.00 RCD E6.01	No
E11 Eaves (insulation at rafter level)	Independently assessed	8.74	0.07	0.07 SMRF-E11-0.16	No
E13 Gable (insulation at rafter level)	Independently assessed	11.25	0.09	0.09 SMRF-E13-0.16	No
E16 Corner (normal)	Independently assessed	10.90	0.05	0.05 RCD E16.01	No
E18 Party wall between dwellings	Independently assessed	10.90	0.04	0.04 SMRF-P05-0.16	No
P1 Party wall - Ground floor	Independently assessed	8.23	0.07	0.07 Manufacturer Declaration	No
P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	16.46	0.00	0.00	No
P5 Party wall - Roof (insulation at rafter level)	Table K1 - Default	11.25	0.48	0.48	No
R1 Head of roof window	Independently assessed	0.95	0.12	0.12 SMRF-R01-0.16	No
R2 Sill of roof window	Independently assessed	0.95	0.11	0.11 SMRF-R02-0.16	No
R3 Jamb of roof window	Independently assessed	2.06	0.04	0.04 SMRF-R03-0.16	No
R4 Ridge (vaulted ceiling)	Independently assessed	4.37	0.04	0.04 SMRF-R04-0.16	No

Y-value W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present

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	m ² /(h.m ²) @ 50 Pa								
Property Tested?	Yes									
Test Method	Blower Door									
22.0 Lighting	No									
No Fixed Lighting	No									
	Name Lighting	Efficacy 85.00	Power 10.00	Capacity 850.00	Count 18					
24.0 Main Heating 1	Database									
Description	Gas Boiler									
Percentage of Heat	100.00 %									
Database Ref. No.	17960									
Fuel Type	Mains gas									
SAP Code	0									
In Winter	88.70									
In Summer	76.40									
Model Name	ecoFIT sustain 835									
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									
Underfloor Heating	Yes - Pipes in thin screed									
Flow Temperature	Unknown									
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									
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
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
Shower	Combi boiler or unvented hot water system	8.00		No	
Shower	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	No
Cylinder In Heated Space	No
Independent Time Control	No
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
1.85	South	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

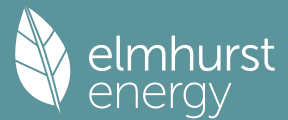
kWh/Year

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



Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 39			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	92 A	DER	12.08	TER	12.20		
Environmental	89 B	% DER < TER				0.98	
CO ₂ Emissions (t/year)	1.08	DFEE	38.41	TFEE	38.82		
Compliance Check	See BREL	% DFEE < TFEE				1.05	
% DPER < TPER	0.88	DPER	63.36	TPER	63.92		
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	35.9700 (1b)	x 2.4000 (2b)	= 86.3280 (1b) - (3b)
First floor	35.9700 (1c)	x 2.6300 (2c)	= 94.6011 (1c) - (3c)
Second floor	21.2500 (1d)	x 2.6100 (2d)	= 55.4625 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.1900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	236.3916 (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) =	0.1692 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	(17)
Infiltration rate	0.3692	(18)
Number of sides sheltered	1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3415 (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	0.4354	0.4269	0.4184	0.3757	0.3671	0.3244	0.3244	0.3159	0.3415	0.3671	0.3842	0.4013 (22b)
Effective ac	0.5948	0.5911	0.5875	0.5706	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805 (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
Front door			2.1400	1.1000	2.3540		(26)
Windows (Uw = 1.30)			15.3400	1.2357	18.9563		(27)
Roof light			0.9500	1.2357	1.1740		(27a)
Heatloss Floor 1			35.9700	0.1300	4.6761	110.0000	3956.7000 (28a)
Brick wall	98.9900	17.4800	81.5100	0.1900	15.4869	110.0000	8966.1000 (29a)
Stud wall (0.72)	24.6100		24.6100	0.1100	2.7071	9.0000	221.4900 (29a)
Spandrel wall	13.6300		13.6300	0.2300	3.1349	0.0000	0.0000 (29a)
Plane roof	11.9000		11.9000	0.0900	1.0710	9.0000	107.1000 (30)
Sloping roof	12.7900	0.9500	11.8400	0.1800	2.1312	9.0000	106.5600 (30)
Roof behind studs (0.72)	14.7100		14.7100	0.1100	1.6181	9.0000	132.3900 (30)
Total net area of external elements A _{um} (A, m ²)			212.6000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	53.3095		(33)
Party Wall 1			55.1500	0.0000	0.0000	70.0000	3860.5000 (32)
Internal Wall 2			119.6700			9.0000	1077.0300 (32c)
Internal Floor			57.1600			18.0000	1028.8800 (32d)
Internal Ceiling 1			57.1600			9.0000	514.4400 (32e)
Heat capacity Cm = Sum (A x k)						(28)...(30) + (32) + (32a)...(32e) =	19971.1900 (34)

Full SAP Calculation Printout



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

214.3061 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	11.4300	0.0240	0.2743
E2 Other lintels (including other steel lintels)	8.6000	0.0220	0.1892
E3 Sill	27.6000	0.0170	0.4692
E4 Jamb	16.9700	0.0920	1.5612
E5 Ground floor (normal)	33.9400	0.0010	0.0339
E6 Intermediate floor within a dwelling	8.7400	0.0680	0.5943
E11 Eaves (insulation at rafter level)	11.2500	0.0940	1.0575
E13 Gable (insulation at rafter level)	10.9000	0.0460	0.5014
E16 Corner (normal)	10.9000	0.0400	0.4360
E18 Party wall between dwellings	8.2300	0.0690	0.5679
P1 Party wall - Ground floor	16.4600	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	11.2500	0.4800	5.4000
P5 Party wall - Roof (insulation at rafter level)	0.9500	0.1150	0.1092
R1 Head of roof window	0.9500	0.1130	0.1074
R2 Sill of roof window	2.0600	0.0410	0.0845
R3 Jamb of roof window	4.3700	0.0440	0.1923
R4 Ridge (vaulted ceiling)			

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

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 64.8879 (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	46.4001	46.1130	45.8315	44.5093	44.2619	43.1104	43.1104	42.8971	43.5540	44.2619	44.7624	45.2855 (38)
Heat transfer coeff	111.2880	111.0008	110.7193	109.3972	109.1498	107.9982	107.9982	107.7850	108.4418	109.1498	109.6502	110.1734 (39)
Average = Sum(39)m / 12 =												109.3960

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1942	1.1911	1.1881	1.1739	1.1713	1.1589	1.1589	1.1566	1.1637	1.1713	1.1766	1.1822 (40)
HLP (average)												1.1739
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy

2.6669 (42)

Hot water usage for mixer showers

68.9352 67.8992 66.3896 63.5013 61.3697 58.9927 57.6416 59.1397 60.7820 63.3342 66.2846 68.6710 (42a)

Hot water usage for baths

29.7676 29.3255 28.7030 27.5551 26.6956 25.7425 25.2277 25.8459 26.5190 27.5388 28.7103 29.6670 (42b)

Hot water usage for other uses

41.9419 40.4167 38.8916 37.3664 35.8412 34.3161 34.3161 35.8412 37.3664 38.8916 40.4167 41.9419 (42c)

Average daily hot water use (litres/day)

129.2842 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	140.6446	137.6414	133.9841	128.4227	123.9065	119.0512	117.1853	120.8269	124.6674	129.7646	135.4117	140.2799 (44)
Energy conte	222.7467	195.9996	205.9286	175.8043	166.8020	146.3874	141.7255	149.6089	153.7274	176.0894	192.9188	219.6444 (45)
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m	33.4120	29.3999	30.8893	26.3706	25.0203	21.9581	21.2588	22.4413	23.0591	26.4134	28.9378	32.9467 (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 0.0000 (59)

Combi loss

0.6420 0.5885 0.6484 0.5927 0.5924 0.5484 0.5415 0.5498 0.5413 0.5842 0.5964 0.6363 (61)

Total heat required for water heating calculated for each month

223.3887 196.5880 206.5770 176.3970 167.3944 146.9357 142.2670 150.1587 154.2687 176.6735 193.5152 220.2807 (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 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 -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 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 0.0000 (63d)

Output from w/h

223.3887 196.5880 206.5770 176.3970 167.3944 146.9357 142.2670 150.1587 154.2687 176.6735 193.5152 220.2807 (64)

12Total per year (kWh/year)

Total per year (kWh/year) = Sum(64)m = 2154.4446 (64)

Electric shower(s)

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)

Heat gains from water heating, kWh/month

74.2238 65.3170 68.6334 58.6031 55.6098 48.8109 47.2591 49.8824 51.2497 58.6958 64.2946 73.1908 (65)

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

Metabolic gains (Table 5), Watts

(66)m 133.3458 133.3458 133.3458 133.3458 133.3458 133.3458 133.3458 133.3458 133.3458 133.3458 133.3458 133.3458 (66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

126.4826 140.0343 126.4826 130.6987 126.4826 130.6987 126.4826 126.4826 130.6987 126.4826 130.6987 126.4826 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

244.8256 247.3662 240.9641 227.3349 210.1306 193.9608 183.1585 180.6180 187.0200 200.6492 217.8536 234.0233 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

36.3346 36.3346 36.3346 36.3346 36.3346 36.3346 36.3346 36.3346 36.3346 36.3346 36.3346 36.3346 (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)

-106.6766 -106.6766 -106.6766 -106.6766 -106.6766 -106.6766 -106.6766 -106.6766 -106.6766 -106.6766 -106.6766 -106.6766 (71)

Water heating gains (Table 5)

99.7632 97.1979 92.2491 81.3932 74.7443 67.7929 63.5203 67.0462 71.1801 78.8921 89.2980 98.3748 (72)

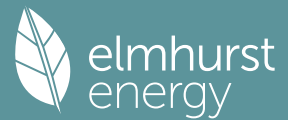
Total internal gains

537.0751 550.6021 525.6996 505.4306 477.3612 455.4562 436.1651 437.1505 451.9025 472.0277 503.8540 524.8844 (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
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North			7.4200		10.6334		0.7300		0.7000		0.7700		27.9402 (74)
South			5.7900		46.7521		0.7300		0.7000		0.7700		95.8591 (78)
West			2.1300		19.6403		0.7300		0.7000		0.7700		14.8143 (80)
North			0.9500		26.0000		0.7300		0.7000		1.0000		11.3595 (82)

Solar gains	149.9732	262.9605	380.3808	506.9006	601.0405	611.5377	583.3949	510.7545	423.7432	296.1140	180.9832	127.4810	(83)
Total gains	687.0483	813.5626	906.0804	1012.3311	1078.4017	1066.9939	1019.5601	947.9050	875.6457	768.1417	684.8372	652.3654	(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	49.8486	49.9776	50.1046	50.7102	50.8251	51.3671	51.3671	51.4687	51.1570	50.8251	50.5932	50.3529	
alpha	4.3232	4.3318	4.3403	4.3807	4.3883	4.4245	4.4245	4.4312	4.4105	4.3883	4.3729	4.3569	
util living area	0.9914	0.9817	0.9618	0.9049	0.7890	0.6109	0.4574	0.5085	0.7460	0.9337	0.9831	0.9931	(86)
MIT	19.4871	19.7291	20.0557	20.4740	20.7879	20.9490	20.9886	20.9821	20.8772	20.4604	19.9027	19.4503	(87)
Th 2	19.9246	19.9271	19.9295	19.9409	19.9431	19.9530	19.9530	19.9549	19.9492	19.9431	19.9387	19.9342	(88)
util rest of house	0.9990	0.9766	0.9510	0.8782	0.7341	0.5247	0.3528	0.3998	0.6660	0.9091	0.9775	0.9911	(89)
MIT 2	18.1779	18.4860	18.8973	19.4131	19.7641	19.9227	19.9490	19.9480	19.8644	19.4105	18.7170	18.1377	(90)
Living area fraction									FLA = Living area / (4) =			0.1343	(91)
MIT	18.3538	18.6530	19.0530	19.5556	19.9017	20.0606	20.0887	20.0869	20.0005	19.5515	18.8763	18.3140	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.2038	18.5030	18.9030	19.4056	19.7517	19.9106	19.9387	19.9369	19.8505	19.4015	18.7263	18.1640	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9832	0.9671	0.9372	0.8618	0.7230	0.5210	0.3513	0.3979	0.6576	0.8928	0.9683	0.9861	(94)
Useful gains	675.4739	786.8175	849.1937	872.4772	779.6557	555.9124	358.2196	377.1707	575.8139	685.7709	663.1306	643.3301	(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	1547.3247	1509.9416	1373.2481	1149.2861	878.8361	573.5336	360.5731	381.2251	623.5911	960.6873	1274.8247	1538.4619	(97)
Space heating kWh	648.6570	485.9395	389.8965	199.3024	73.7902	0.0000	0.0000	0.0000	0.0000	204.5378	440.4198	665.9781	(98a)
Space heating requirement - total per year (kWh/year)												3108.5211	
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	648.6570	485.9395	389.8965	199.3024	73.7902	0.0000	0.0000	0.0000	0.0000	204.5378	440.4198	665.9781	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3108.5211	
Space heating per m2										(98c) / (4) =		33.3568	(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 %) 88.7000 (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	648.6570	485.9395	389.8965	199.3024	73.7902	0.0000	0.0000	0.0000	0.0000	204.5378	440.4198	665.9781	(98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000	(210)
Space heating fuel (main heating system)	731.2931	547.8461	439.5676	224.6927	83.1907	0.0000	0.0000	0.0000	0.0000	230.5951	496.5273	750.8208	(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	223.3887	196.5880	206.5770	176.3970	167.3944	146.9357	142.2670	150.1587	154.2687	176.6735	193.5152	220.2807	(64)
Efficiency of water heater (217)m	85.1868	84.7691	84.0155	82.4664	79.7849	76.4000	76.4000	76.4000	76.4000	82.5413	84.5450	85.2872	(216)
Fuel for water heating, kWh/month	262.2341	231.9099	245.8796	213.9016	209.8071	192.3243	186.2133	196.5428	201.9224	214.0426	228.8901	258.2811	(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	25.7434	20.6523	18.5951	13.6236	10.5233	8.5977	12.4780	16.2077	21.2654	24.0192	26.4589	26.4589	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-31.6574	-45.9094	-67.9529	-78.6836	-86.6909	-81.5557	-80.4722	-74.9956	-65.6627	-53.4178	-35.2225	-27.2103	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-14.6726	-31.4021	-63.7174	-97.7806	-131.3157	-132.7795	-131.0305	-109.7953	-79.0656	-45.4146	-19.7316	-11.5600	(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												3504.5334	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												76.4000	

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Water heating fuel used	2641.9487 (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)	207.7642 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1597.6964 (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	4842.5498 (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	3504.5334	0.2100	735.9520 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2641.9487	0.2100	554.8092 (264)
Space and water heating			1290.7612 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	207.7642	0.1443	29.9868 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-729.4309	0.1340	-97.7455
PV Unit electricity exported	-868.2655	0.1253	-108.8097
Total			-206.5553 (269)
Total CO2, kg/year			1126.1220 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.0800 (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	3504.5334	1.1300	3960.1228 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2641.9487	1.1300	2985.4020 (278)
Space and water heating			6945.5248 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	207.7642	1.5338	318.6756 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-729.4309	1.4952	-1090.6581
PV Unit electricity exported	-868.2655	0.4600	-399.3810
Total			-1490.0391 (283)
Total Primary energy kWh/year			5904.2621 (286)
Dwelling Primary energy Rate (DPER)			63.3600 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	35.9700 (1b)	x 2.4000 (2b)	= 86.3280 (1b) - (3b)
First floor	35.9700 (1c)	x 2.6300 (2c)	= 94.6011 (1c) - (3c)
Second floor	21.2500 (1d)	x 2.6100 (2d)	= 55.4625 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.1900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	236.3916 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1269 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3769 (18)
Number of sides sheltered	1 (19)

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Shelter factor
Infiltration rate adjusted to include shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.9250 \quad (20)$$
$$(21) = (18) \times (20) = 0.3486 \quad (21)$$

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
Effective ac	0.4445	0.4358	0.4271	0.3835	0.3748	0.3312	0.3312	0.3225	0.3486	0.3748	0.3922	0.4097	(22b)
	0.5988	0.5950	0.5912	0.5735	0.5702	0.5548	0.5548	0.5520	0.5608	0.5702	0.5769	0.5839	(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 Opaque door			2.1400	1.0000	2.1400			(26)
TER Opening Type (Uw = 1.20)			15.3400	1.1450	17.5649			(27)
Roof light			0.9500	1.5918	1.5122			(27a)
Heatloss Floor 1			35.9700	0.1300	4.6761			(28a)
Brick wall	98.9900	17.4800	81.5100	0.1800	14.6718			(29a)
Stud wall (0.72)	24.6100		24.6100	0.1800	4.4298			(29a)
Spandrel wall	13.6300		13.6300	0.1800	2.4534			(29a)
Plane roof	11.9000		11.9000	0.1100	1.3090			(30)
Sloping roof	12.7900	0.9500	11.8400	0.1100	1.3024			(30)
Roof behind studs (0.72)	14.7100		14.7100	0.1100	1.6181			(30)
Total net area of external elements Aum(A, m2)			212.6000					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	51.6777		(33)
Party Wall 1			55.1500	0.0000	0.0000			(32)

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

214.3061 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	11.4300	0.0500	0.5715	
E3 Sill	8.6000	0.0500	0.4300	
E4 Jamb	27.6000	0.0500	1.3800	
E5 Ground floor (normal)	16.9700	0.1600	2.7152	
E6 Intermediate floor within a dwelling	33.9400	0.0000	0.0000	
E11 Eaves (insulation at rafter level)	8.7400	0.0400	0.3496	
E13 Gable (insulation at rafter level)	11.2500	0.0800	0.9000	
E16 Corner (normal)	10.9000	0.0900	0.9810	
E18 Party wall between dwellings	10.9000	0.0600	0.6540	
P1 Party wall - Ground floor	8.2300	0.0800	0.6584	
P2 Party wall - Intermediate floor within a dwelling	16.4600	0.0000	0.0000	
P5 Party wall - Roof (insulation at rafter level)	11.2500	0.0800	0.9000	
R1 Head of roof window	0.9500	0.0800	0.0760	
R2 Sill of roof window	0.9500	0.0600	0.0570	
R3 Jamb of roof window	2.0600	0.0800	0.1648	
R4 Ridge (vaulted ceiling)	4.3700	0.0800	0.3496	

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

10.1871 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 61.8648 (37)

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

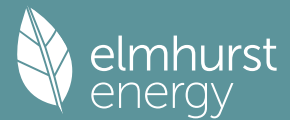
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.7117	46.4124	46.1191	44.7412	44.4834	43.2834	43.2834	43.0611	43.7456	44.4834	45.0049	45.5502	(38)
Heat transfer coeff	108.5765	108.2772	107.9838	106.6060	106.3482	105.1481	105.1481	104.9259	105.6104	106.3482	106.8697	107.4149	(39)
Average = Sum(39)m / 12 =												106.6048	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1651	1.1619	1.1587	1.1440	1.1412	1.1283	1.1283	1.1259	1.1333	1.1412	1.1468	1.1526	(40)
HLP (average)												1.1440	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6669 (42)
Hot water usage for mixer showers	68.9352	67.8992	66.3896	63.5013	61.3697	58.9927	57.6416	59.1397	60.7820	63.3342	66.2846	68.6710	(42a)
Hot water usage for baths	29.7676	29.3255	28.7030	27.5551	26.6956	25.7425	25.2277	25.8459	26.5190	27.5388	28.7103	29.6670	(42b)
Hot water usage for other uses	41.9419	40.4167	38.8916	37.3664	35.8412	34.3161	34.3161	35.8412	37.3664	38.8916	40.4167	41.9419	(42c)
Average daily hot water use (litres/day)												129.2842	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	140.6446	137.6414	133.9841	128.4227	123.9065	119.0512	117.1853	120.8269	124.6674	129.7646	135.4117	140.2799	(44)
Energy content (annual)	222.7467	195.9996	205.9286	175.8043	166.8020	146.3874	141.7255	149.6089	153.7274	176.0894	192.9188	219.6444	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2147.3829	
	33.4120	29.3999	30.8893	26.3706	25.0203	21.9581	21.2588	22.4413	23.0591	26.4134	28.9378	32.9467	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	273.7056	242.0270	256.8875	225.1194	217.7609	195.7025	192.6844	200.5678	203.0424	227.0483	242.2338	270.6033	(62)
WWHRS	-31.5143	-27.8715	-29.1854	-24.1667	-22.5225	-19.2726	-18.0650	-19.2103	-19.9402	-23.5073	-26.6309	-30.9307	(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	242.1914	214.1555	227.7021	200.9527	195.2384	176.4298	174.6194	181.3574	183.1022	203.5409	215.6029	239.6726	(64)
12Total per year (kWh/year)												2454.5654	(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	86.8030	76.6767	81.2110	70.7837	68.2014	61.0026	59.8634	62.4847	63.4431	71.2894	76.4743	85.7715	(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	133.3458	133.3458	133.3458	133.3458	133.3458	133.3458	133.3458	133.3458	133.3458	133.3458	133.3458	133.3458	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	126.4826	140.0343	126.4826	130.6987	126.4826	130.6987	126.4826	126.4826	130.6987	126.4826	130.6987	126.4826	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	244.8256	247.3662	240.9641	227.3349	210.1306	193.9608	183.1585	180.6180	187.0200	200.6492	217.8536	234.0233	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3346	36.3346	36.3346	36.3346	36.3346	36.3346	36.3346	36.3346	36.3346	36.3346	36.3346	36.3346	(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)	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	(71)
Water heating gains (Table 5)	116.6707	114.1022	109.1546	98.3107	91.6685	84.7258	80.4616	83.9848	88.1154	95.8191	106.2142	115.2843	(72)
Total internal gains	553.9827	567.5064	542.6050	522.3481	494.2854	472.3891	453.1064	454.0891	468.8379	488.9547	520.7702	541.7939	(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				7.4200	10.6334	0.6300	0.7000	0.7700	24.1128 (74)			
South				5.7900	46.7521	0.6300	0.7000	0.7700	82.7277 (78)			
West				2.1300	19.6403	0.6300	0.7000	0.7700	12.7849 (80)			
North				0.9500	26.0000	0.6300	0.7000	1.0000	9.8034 (82)			
Solar gains	129.4289	226.9385	328.2739	437.4621	518.7062	527.7654	503.4778	440.7881	365.6962	255.5505	156.1910	110.0179 (83)
Total gains	683.4116	794.4450	870.8789	959.8102	1012.9916	1000.1545	956.5843	894.8772	834.5341	744.5051	676.9612	651.8118 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)

Utilisation factor for gains for living area, nil,m (see Table 9a)													21.0000	(85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	51.0935	51.2347	51.3739	52.0379	52.1641	52.7594	52.7594	52.8712	52.5285	52.1641	51.9095	51.6460		
alpha	4.4062	4.4156	4.4249	4.4692	4.4776	4.5173	4.5173	4.5247	4.5019	4.4776	4.4606	4.4431		
util living area	0.9915	0.9828	0.9655	0.9148	0.8075	0.6314	0.4741	0.5236	0.7588	0.9373	0.9834	0.9930	(86)	
MIT	19.5320	19.7551	20.0617	20.4652	20.7778	20.9461	20.9881	20.9817	20.8758	20.4697	19.9364	19.5002	(87)	
Th 2	19.9480	19.9506	19.9531	19.9651	19.9673	19.9778	19.9778	19.9737	19.9737	19.9673	19.9628	19.9581	(88)	
util rest of house	0.9891	0.9781	0.9556	0.8904	0.7553	0.5458	0.3686	0.4149	0.6809	0.9140	0.9780	0.9911	(89)	
MIT 2	18.2511	18.5354	18.9226	19.4236	19.7771	19.9451	19.9735	19.9725	19.8868	19.4410	18.7764	18.2175	(90)	
Living area fraction	18.4232	18.6993	19.0756	19.5636	19.9116	20.0796	20.1098	20.1081	20.0197	19.5792	18.9322	18.3899	(92)	
MIT	18.4232	18.6993	19.0756	19.5636	19.9116	20.0796	20.1098	20.1081	20.0197	19.5792	18.9322	18.3899	(93)	
Temperature adjustment													0.0000	
adjusted MIT	18.4232	18.6993	19.0756	19.5636	19.9116	20.0796	20.1098	20.1081	20.0197	19.5792	18.9322	18.3899	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9840	0.9702	0.9448	0.8790	0.7521	0.5548	0.3826	0.4290	0.6848	0.9029	0.9704	0.9867	(94)
Useful gains	672.5108	770.8038	822.8122	843.6260	761.9120	554.9324	365.9662	383.9444	571.4929	672.1870	656.9248	643.1634	(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	1533.4458	1494.1493	1357.9628	1136.7997	873.2857	576.1693	369.0505	389.0715	625.1803	954.9246	1264.5077	1524.2038	(97)
Space heating kWh	640.5356	486.0882	398.1521	211.0850	82.8620	0.0000	0.0000	0.0000	0.0000	210.3568	437.4597	655.4941	(98a)
Space heating requirement - total per year (kWh/year)												3122.0335	
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	640.5356	486.0882	398.1521	211.0850	82.8620	0.0000	0.0000	0.0000	0.0000	210.3568	437.4597	655.4941	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3122.0335	
Space heating per m2										(98c) / (4) =		33.5018	(99)

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

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

Fraction of space heat from main system(s)													0.0000	(201)
Efficiency of main space heating system 1 (in %)													1.0000	(202)
Efficiency of main space heating system 2 (in %)													92.4000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(207)
													0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	640.5356	486.0882	398.1521	211.0850	82.8620	0.0000	0.0000	0.0000	0.0000	210.3568	437.4597	655.4941	(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)	693.2203	526.0694	430.9005	228.4470	89.6775	0.0000	0.0000	0.0000	0.0000	227.6588	473.4413	709.4092	(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)	

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Water heating													
Water heating requirement	242.1914	214.1555	227.7021	200.9527	195.2384	176.4298	174.6194	181.3574	183.1022	203.5409	215.6029	239.6726	(64)
Efficiency of water heater												80.3000	(216)
(217)m	86.3623	86.0805	85.5659	84.4870	82.6832	80.3000	80.3000	80.3000	80.3000	84.4521	85.8641	86.4219	(217)
Fuel for water heating, kWh/month	280.4364	248.7850	266.1131	237.8503	236.1282	219.7133	217.4587	225.8499	228.0227	241.0134	251.0980	277.3286	(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	7.0685	(231)
Lighting	26.2806	21.0833	18.9831	13.9079	10.7428	8.7770	9.8000	12.7384	16.5459	21.7091	24.5204	27.0110	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-35.0837	-50.2191	-73.2719	-83.6520	-91.2622	-85.5378	-84.4568	-79.1986	-70.1116	-57.9709	-38.8286	-30.2417	(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	-17.5835	-37.2255	-74.4350	-112.4575	-149.3535	-150.3295	-148.5888	-125.5348	-91.6306	-53.4885	-23.5562	-13.8892	(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												3378.8241	(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												2929.7977	(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)												212.0994	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1777.9074	(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												4828.8138	(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	3378.8241	0.2100	709.5531	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2929.7977	0.2100	615.2575	(264)
Space and water heating			1324.8106	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	212.0994	0.1443	30.6125	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-779.8349	0.1343	-104.7128	
PV Unit electricity exported	-998.0725	0.1257	-125.4757	
Total			-230.1885	(269)
Total CO2, kg/year			1137.1638	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.2000	(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	3378.8241	1.1300	3818.0712	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2929.7977	1.1300	3310.6714	(278)
Space and water heating			7128.7426	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	212.0994	1.5338	325.3251	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-779.8349	1.4962	-1166.8221	
PV Unit electricity exported	-998.0725	0.4615	-460.5734	
Total			-1627.3955	(283)
Total Primary energy kWh/year			5956.7730	(286)
Target Primary Energy Rate (TPER)			63.9200	(287)

Full SAP Calculation Printout



Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 39			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	92 A	DER	12.08	TER	12.20		
Environmental	89 B	% DER < TER				0.98	
CO ₂ Emissions (t/year)	1.08	DFEE	38.41	TFEE	38.82		
Compliance Check	See BREL	% DFEE < TFEE				1.05	
% DPER < TPER	0.88	DPER	63.36	TPER	63.92		
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	35.9700 (1b)	x 2.4000 (2b)	= 86.3280 (1b) - (3b)
First floor	35.9700 (1c)	x 2.6300 (2c)	= 94.6011 (1c) - (3c)
Second floor	21.2500 (1d)	x 2.6100 (2d)	= 55.4625 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.1900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	236.3916 (5)

2. Ventilation rate

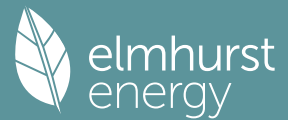
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1269 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3269 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3024 (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	0.3855	0.3780	0.3704	0.3326	0.3251	0.2873	0.2873	0.2797	0.3024	0.3251	0.3402	0.3553 (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	0.5743	0.5714	0.5686	0.5553	0.5528	0.5413	0.5413	0.5391	0.5457	0.5528	0.5579	0.5631 (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
Front door			2.1400	1.1000	2.3540		(26)
Windows (Uw = 1.30)			15.3400	1.2357	18.9563		(27)
Roof light			0.9500	1.2357	1.1740		(27a)
Heatloss Floor 1			35.9700	0.1300	4.6761	110.0000	3956.7000 (28a)
Brick wall	98.9900	17.4800	81.5100	0.1900	15.4869	110.0000	8966.1000 (29a)
Stud wall (0.72)	24.6100		24.6100	0.1100	2.7071	9.0000	221.4900 (29a)
Spandrel wall	13.6300		13.6300	0.2300	3.1349	0.0000	0.0000 (29a)
Plane roof	11.9000		11.9000	0.0900	1.0710	9.0000	107.1000 (30)
Sloping roof	12.7900	0.9500	11.8400	0.1800	2.1312	9.0000	106.5600 (30)
Roof behind studs (0.72)	14.7100		14.7100	0.1100	1.6181	9.0000	132.3900 (30)
Total net area of external elements Aum(A, m ²)			212.6000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	53.3095		(33)
Party Wall 1			55.1500	0.0000	0.0000	70.0000	3860.5000 (32)
Internal Wall 2			119.6700			9.0000	1077.0300 (32c)
Internal Floor			57.1600			18.0000	1028.8800 (32d)
Internal Ceiling 1			57.1600			9.0000	514.4400 (32e)

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Heat capacity Cm = Sum(A x k)

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

List of Thermal Bridges

K1 Element
E2 Other lintels (including other steel lintels)
E3 Sill
E4 Jamb
E5 Ground floor (normal)
E6 Intermediate floor within a dwelling
E11 Eaves (insulation at rafter level)
E13 Gable (insulation at rafter level)
E16 Corner (normal)
E18 Party wall between dwellings
P1 Party wall - Ground floor
P2 Party wall - Intermediate floor within a dwelling
P5 Party wall - Roof (insulation at rafter level)
R1 Head of roof window
R2 Sill of roof window
R3 Jamb of roof window
R4 Ridge (vaulted ceiling)

(28)...(30) + (32) + (32a)...(32e) = 19971.1900 (34)
214.3061 (35)

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

Point Thermal bridges

Total fabric heat loss

(36a) = 0.0000
(33) + (36) + (36a) = 64.8879 (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	44.8025	44.5774	44.3567	43.3202	43.1262	42.2234	42.2234	42.0563	42.5712	43.1262	43.5186	43.9287
Heat transfer coeff	109.6904	109.4652	109.2446	108.2080	108.0141	107.1113	107.1113	106.9441	107.4590	108.0141	108.4064	108.8166
Average = Sum(39)m / 12 =												108.2071

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1771	1.1746	1.1723	1.1612	1.1591	1.1494	1.1494	1.1476	1.1531	1.1591	1.1633	1.1677
HLP (average)												1.1611
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6669 (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	0.0000 (42a)
Hot water usage for baths												
29.7676	29.3255	28.7030	27.5551	26.6956	25.7425	25.2277	25.8459	26.5190	27.5388	28.7103	29.6670	29.6670 (42b)
Hot water usage for other uses												
41.9419	40.4167	38.8916	37.3664	35.8412	34.3161	34.3161	35.8412	37.3664	38.8916	40.4167	41.9419	41.9419 (42c)
Average daily hot water use (litres/day)												65.7282 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	71.7095	69.7422	67.5945	64.9215	62.5368	60.0586	59.5438	61.6871	63.8854	66.4304	69.1270	71.6088
Energy conte	113.5703	99.3120	103.8903	88.8743	84.1865	73.8490	72.0130	76.3815	78.7771	90.1454	98.4842	112.1221
Energy content (annual)												1091.6057
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	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	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	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												
96.5347	84.4152	88.3067	75.5431	71.5586	62.7717	61.2111	64.9243	66.9605	76.6236	83.7115	95.3038	95.3038 (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												
96.5347	84.4152	88.3067	75.5431	71.5586	62.7717	61.2111	64.9243	66.9605	76.6236	83.7115	95.3038	95.3038 (64)
12Total per year (kWh/year)												927.8648
Electric shower(s)												928 (64)
55.2056	49.1886	53.7121	51.2568	52.2186	49.8115	51.4719	52.2186	51.2568	53.7121	52.7021	55.2056	55.2056 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												627.9603 (64a)
Heat gains from water heating, kWh/month												
37.9351	33.4010	35.5047	31.7000	30.9443	28.1458	28.1707	29.2857	29.5543	32.5839	34.1034	37.6274	37.6274 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	133.3458	133.3458	133.3458	133.3458	133.3458	133.3458	133.3458	133.3458	133.3458	133.3458	133.3458	133.3458 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
126.4826	140.0343	126.4826	130.6987	126.4826	130.6987	126.4826	126.4826	130.6987	126.4826	130.6987	126.4826	126.4826 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
244.8256	247.3662	240.9641	227.3349	210.1306	193.9608	183.1585	180.6180	187.0200	200.6492	217.8536	234.0233	234.0233 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
36.3346	36.3346	36.3346	36.3346	36.3346	36.3346	36.3346	36.3346	36.3346	36.3346	36.3346	36.3346	36.3346 (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)												
-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766 (71)
Water heating gains (Table 5)												
50.9880	49.7038	47.7214	44.0277	41.5918	39.0914	37.8639	39.3625	41.0477	43.7956	47.3658	50.5744	50.5744 (72)
Total internal gains												
485.3000	500.1080	478.1718	465.0651	441.2087	426.7546	410.5087	409.4668	421.7701	433.9311	458.9218	474.0840	474.0840 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W
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		W/m2	or Table 6b	or Table 6c	Table 6d	
North	7.4200	10.6334	0.7300	0.7000	0.7700	27.9402 (74)
South	5.7900	46.7521	0.7300	0.7000	0.7700	95.8591 (78)
West	2.1300	19.6403	0.7300	0.7000	0.7700	14.8143 (80)
North	0.9500	26.0000	0.7300	0.7000	1.0000	11.3595 (82)

Solar gains	149.9732	262.9605	380.3808	506.9006	601.0405	611.5377	583.3949	510.7545	423.7432	296.1140	180.9832	127.4810 (83)
Total gains	635.2732	763.0685	858.5527	971.9657	1042.2492	1038.2924	993.9037	920.2213	845.5133	730.0452	639.9050	601.5650 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	50.5747	50.6787	50.7810	51.2675	51.3595	51.7924	51.7924	51.8734	51.6248	51.3595	51.1737	50.9808
alpha	4.3716	4.3786	4.3854	4.4178	4.4240	4.4528	4.4528	4.4582	4.4417	4.4240	4.4116	4.3987
util living area	0.9936	0.9853	0.9676	0.9137	0.8003	0.6208	0.4650	0.5188	0.7590	0.9424	0.9867	0.9949 (86)
MIT	19.4518	19.6963	20.0276	20.4551	20.7794	20.9469	20.9882	20.9812	20.8708	20.4366	19.8679	19.4114 (87)
Th 2	19.9384	19.9403	19.9422	19.9512	19.9529	19.9607	19.9607	19.9622	19.9577	19.9529	19.9495	19.9459 (88)
util rest of house	0.9918	0.9812	0.9582	0.8889	0.7469	0.5346	0.3597	0.4092	0.6803	0.9204	0.9823	0.9935 (89)
MIT 2	18.5389	18.7822	19.1087	19.5220	19.8066	19.9359	19.9575	19.9564	19.8874	19.5151	18.9610	18.5044 (90)
Living area fraction	FLA = Living area / (4) =											
MIT	18.6615	18.9050	19.2321	19.6473	19.9373	20.0717	20.0959	20.0941	20.0195	19.6389	19.0828	18.6262 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.6615	18.9050	19.2321	19.6473	19.9373	20.0717	20.0959	20.0941	20.0195	19.6389	19.0828	18.6262 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9887	0.9758	0.9502	0.8804	0.7460	0.5443	0.3737	0.4236	0.6855	0.9121	0.9772	0.9909 (94)
Useful gains	628.0646	744.5713	815.7608	855.7264	777.4967	565.1578	371.4176	389.8121	579.5803	665.8913	625.3028	596.0757 (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	1575.3199	1533.0632	1390.9152	1162.9463	889.7459	586.0859	374.4545	395.0627	636.1027	976.3239	1299.0168	1569.8147 (97)
Space heating kWh	704.7579	529.8666	427.9149	221.1983	83.5134	0.0000	0.0000	0.0000	0.0000	230.9619	485.0741	724.4619 (98a)
Space heating requirement - total per year (kWh/year)	3407.7488											
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	704.7579	529.8666	427.9149	221.1983	83.5134	0.0000	0.0000	0.0000	0.0000	230.9619	485.0741	724.4619 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	3407.7488											
Space heating per m2	(98c) / (4) = 36.5678 (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	1006.8462	792.6236	812.7753	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8655	0.9216	0.8952	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	871.3804	730.4848	727.6250	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1146.6904	1098.1484	1016.8967	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	198.2232	273.5417	215.2181	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	49.5558	68.3854	53.8045	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	171.7457 (107)											
Energy for space heating	36.5678 (99)											
Energy for space cooling	1.8430 (108)											
Total	38.4107 (109)											
Fabric Energy Efficiency (DFEE)	38.4 (109)											

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	35.9700 (1b)	x 2.4000 (2b)	= 86.3280 (1b) - (3b)
First floor	35.9700 (1c)	x 2.6300 (2c)	= 94.6011 (1c) - (3c)
Second floor	21.2500 (1d)	x 2.6100 (2d)	= 55.4625 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.1900		(4)
Dwelling volume	(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		236.3916 (5)

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2. Ventilation rate

											m3 per hour	
Number of open chimneys											0 * 80 =	0.0000 (6a)
Number of open flues											0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire											0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler											0 * 20 =	0.0000 (6d)
Number of flues attached to other heater											0 * 35 =	0.0000 (6e)
Number of blocked chimneys											0 * 20 =	0.0000 (6f)
Number of intermittent extract fans											3 * 10 =	30.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
											Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											30.0000 / (5) =	0.1269 (8)
Pressure test											Yes	
Pressure Test Method											Blower Door	
Measured/design AP50											5.0000 (17)	
Infiltration rate											0.3769 (18)	
Number of sides sheltered											1 (19)	
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.3486 (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	0.4445	0.4358	0.4271	0.3835	0.3748	0.3312	0.3312	0.3225	0.3486	0.3748	0.3922	0.4097 (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	0.5988	0.5950	0.5912	0.5735	0.5702	0.5548	0.5548	0.5520	0.5608	0.5702	0.5769	0.5839 (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 Opaque door			2.1400	1.0000	2.1400			(26)
TER Opening Type (Uw = 1.20)			15.3400	1.1450	17.5649			(27)
Roof light			0.9500	1.5918	1.5122			(27a)
Heatloss Floor 1			35.9700	0.1300	4.6761			(28a)
Brick wall	98.9900	17.4800	81.5100	0.1800	14.6718			(29a)
Stud wall (0.72)	24.6100		24.6100	0.1800	4.4298			(29a)
Spandrel wall	13.6300		13.6300	0.1800	2.4534			(29a)
Plane roof	11.9000		11.9000	0.1100	1.3090			(30)
Sloping roof	12.7900	0.9500	11.8400	0.1100	1.3024			(30)
Roof behind studs (0.72)	14.7100		14.7100	0.1100	1.6181			(30)
Total net area of external elements Aum(A, m2)			212.6000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	51.6777			(33)
Party Wall 1			55.1500	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								214.3061 (35)
List of Thermal Bridges								
K1 Element				Length	Psi-value		Total	
E2 Other lintels (including other steel lintels)				11.4300	0.0500		0.5715	
E3 Sill				8.6000	0.0500		0.4300	
E4 Jamb				27.6000	0.0500		1.3800	
E5 Ground floor (normal)				16.9700	0.1600		2.7152	
E6 Intermediate floor within a dwelling				33.9400	0.0000		0.0000	
E11 Eaves (insulation at rafter level)				8.7400	0.0400		0.3496	
E13 Gable (insulation at rafter level)				11.2500	0.0800		0.9000	
E16 Corner (normal)				10.9000	0.0900		0.9810	
E18 Party wall between dwellings				10.9000	0.0600		0.6540	
P1 Party wall - Ground floor				8.2300	0.0800		0.6584	
P2 Party wall - Intermediate floor within a dwelling				16.4600	0.0000		0.0000	
P5 Party wall - Roof (insulation at rafter level)				11.2500	0.0800		0.9000	
R1 Head of roof window				0.9500	0.0800		0.0760	
R2 Sill of roof window				0.9500	0.0600		0.0570	
R3 Jamb of roof window				2.0600	0.0800		0.1648	
R4 Ridge (vaulted ceiling)				4.3700	0.0800		0.3496	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								10.1871 (36)
Point Thermal bridges								(36a) = 0.0000
Total fabric heat loss								(33) + (36) + (36a) = 61.8648 (37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6669 (42)
Hot water usage for mixer showers												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.7676	29.3255	28.7030	27.5551	26.6956	25.7425	25.2277	25.8459	26.5190	27.5388	28.7103	29.6670 (42b)
Hot water usage for other uses	41.9419	40.4167	38.8916	37.3664	35.8412	34.3161	34.3161	35.8412	37.3664	38.8916	40.4167	41.9419 (42c)
Average daily hot water use (litres/day)												65.7282 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
71.7095	69.7422	67.5945	64.9215	62.5368	60.0586	59.5438	61.6871	63.8854	66.4304	69.1270	71.6088	(44)
Energy conte	113.5703	99.3120	103.8903	88.8743	84.1865	73.8490	72.0130	76.3815	78.7771	90.1454	98.4842	112.1221 (45)
Energy content (annual)												Total = Sum(45)m = 1091.6057

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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	96.5347	84.4152	88.3067	75.5431	71.5586	62.7717	61.2111	64.9243	66.9605	76.6236	83.7115	95.3038 (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	96.5347	84.4152	88.3067	75.5431	71.5586	62.7717	61.2111	64.9243	66.9605	76.6236	83.7115	95.3038 (64)
								Total per year (kWh/year) = Sum(64)m =				927.8648 (64)
											928	(64)
12Total per year (kWh/year)												
Electric shower(s)	55.2056	49.1886	53.7121	51.2568	52.2186	49.8115	51.4719	52.2186	51.2568	53.7121	52.7021	55.2056 (64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				627.9603 (64a)
Heat gains from water heating, kWh/month	37.9351	33.4010	35.5047	31.7000	30.9443	28.1458	28.1707	29.2857	29.5543	32.5839	34.1034	37.6274 (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	133.3458	133.3458	133.3458	133.3458	133.3458	133.3458	133.3458	133.3458	133.3458	133.3458	133.3458	133.3458	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	126.4826	140.0343	126.4826	130.6987	126.4826	130.6987	126.4826	126.4826	130.6987	126.4826	130.6987	126.4826	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	244.8256	247.3662	240.9641	227.3349	210.1306	193.9608	183.1585	180.6180	187.0200	200.6492	217.8536	234.0233	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3346	36.3346	36.3346	36.3346	36.3346	36.3346	36.3346	36.3346	36.3346	36.3346	36.3346	36.3346	(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)	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	(71)
Water heating gains (Table 5)	50.9880	49.7038	47.7214	44.0277	41.5918	39.0914	37.8639	39.3625	41.0477	43.7956	47.3658	50.5744	(72)
Total internal gains	485.3000	500.1080	478.1718	465.0651	441.2087	426.7546	410.5087	409.4668	421.7701	433.9311	458.9218	474.0840	(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					7.4200	10.6334	0.6300	0.7000			0.7700	24.1128 (74)	
South					5.7900	46.7521	0.6300	0.7000			0.7700	82.7277 (78)	
West					2.1300	19.6403	0.6300	0.7000			0.7700	12.7849 (80)	
North					0.9500	26.0000	0.6300	0.7000			1.0000	9.8034 (82)	

Solar gains	129.4289	226.9385	328.2739	437.4621	518.7062	527.7654	503.4778	440.7881	365.6962	255.5505	156.1910	110.0179	(83)
Total gains	614.7289	727.0466	806.4457	902.5272	959.9149	954.5201	913.9865	850.2549	787.4663	689.4816	615.1128	584.1019	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	51.0935	51.2347	51.3739	52.0379	52.1641	52.7594	52.7594	52.8712	52.5285	52.1641	51.9095	51.6460	
alpha	4.4062	4.4156	4.4249	4.4692	4.4776	4.5173	4.5173	4.5247	4.5019	4.4776	4.4606	4.4431	
util living area	0.9944	0.9876	0.9735	0.9291	0.8294	0.6548	0.4944	0.5479	0.7852	0.9509	0.9884	0.9955	(86)
MIT	19.4463	19.6739	19.9896	20.4139	20.7495	20.9376	20.9859	20.9781	20.8563	20.4150	19.8614	19.4149	(87)
Th 2	19.9480	19.9506	19.9531	19.9651	19.9673	19.9778	19.9778	19.9797	19.9737	19.9673	19.9628	19.9581	(88)
util rest of house	0.9927	0.9841	0.9657	0.9077	0.7798	0.5684	0.3852	0.4356	0.7096	0.9316	0.9845	0.9942	(89)
MIT 2	18.5406	18.7682	19.0808	19.4972	19.7976	19.9479	19.9738	19.9729	19.8937	19.5077	18.9649	18.5170	(90)
Living area fraction									FLA = Living area / (4) =			0.1343	(91)
MIT	18.6623	18.8898	19.2029	19.6203	19.9255	20.0809	20.1098	20.1079	20.0230	19.6296	19.0854	18.6377	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6623	18.8898	19.2029	19.6203	19.9255	20.0809	20.1098	20.1079	20.0230	19.6296	19.0854	18.6377	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	608.5272	711.9746	772.8844	811.3948	746.3956	551.3913	365.3630	382.8344	562.0000	636.7855	602.7588	579.3246	(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	(96)
Heat loss rate W	1559.4099	1514.7809	1371.7101	1142.8518	874.7678	576.3040	369.0463	389.0552	625.5307	960.2777	1280.8743	1550.8208	(97)
Space heating kWh	707.4568	539.4858	445.5263	238.6490	95.5089	0.0000	0.0000	0.0000	0.0000	240.6782	488.2432	722.7932	(98a)
Space heating requirement - total per year (kWh/year)												3478.3414	
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	707.4568	539.4858	445.5263	238.6490	95.5089	0.0000	0.0000	0.0000	0.0000	240.6782	488.2432	722.7932	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3478.3414	
Space heating per m ²										(98c) / (4) =		37.3253	(99)

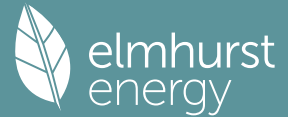
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----- 8c. Space cooling requirement -----

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	988.3924	778.0961	797.4368	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8429	0.9065	0.8782	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	833.0988	705.3263	700.2781	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1050.7956	1006.6486	936.7042	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	156.7417	224.1838	175.9010	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	39.1854	56.0460	43.9753	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												139.2066 (107)
Energy for space heating												37.3253 (99)
Energy for space cooling												1.4938 (108)
Total												38.8191 (109)
Fabric Energy Efficiency (TFEE)												38.8 (109)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 39			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	92 A	DER	12.08	TER	12.20		
Environmental	89 B	% DER < TER				0.98	
CO ₂ Emissions (t/year)	1.08	DFEE	38.41	TFEE	38.82		
Compliance Check	See BREL	% DFEE < TFEE				1.05	
% DPER < TPER	0.88	DPER	63.36	TPER	63.92		
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	35.9700 (1b)	x 2.4000 (2b)	= 86.3280 (1b) - (3b)
First floor	35.9700 (1c)	x 2.6300 (2c)	= 94.6011 (1c) - (3c)
Second floor	21.2500 (1d)	x 2.6100 (2d)	= 55.4625 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.1900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 236.3916 (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) =	0.1692 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	(17)
Infiltration rate	0.3692	(18)
Number of sides sheltered	1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3415 (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	0.4354	0.4269	0.4184	0.3757	0.3671	0.3244	0.3244	0.3159	0.3415	0.3671	0.3842	0.4013 (22b)
Effective ac	0.5948	0.5911	0.5875	0.5706	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805 (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
Front door			2.1400	1.1000	2.3540		(26)
Windows (Uw = 1.30)			15.3400	1.2357	18.9563		(27)
Roof light			0.9500	1.2357	1.1740		(27a)
Heatloss Floor 1			35.9700	0.1300	4.6761	110.0000	3956.7000 (28a)
Brick wall	98.9900	17.4800	81.5100	0.1900	15.4869	110.0000	8966.1000 (29a)
Stud wall (0.72)	24.6100		24.6100	0.1100	2.7071	9.0000	221.4900 (29a)
Spandrel wall	13.6300		13.6300	0.2300	3.1349	0.0000	0.0000 (29a)
Plane roof	11.9000		11.9000	0.0900	1.0710	9.0000	107.1000 (30)
Sloping roof	12.7900	0.9500	11.8400	0.1800	2.1312	9.0000	106.5600 (30)
Roof behind studs (0.72)	14.7100		14.7100	0.1100	1.6181	9.0000	132.3900 (30)
Total net area of external elements A _{um} (A, m ²)			212.6000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	53.3095		(33)
Party Wall 1			55.1500	0.0000	0.0000	70.0000	3860.5000 (32)
Internal Wall 2			119.6700			9.0000	1077.0300 (32c)
Internal Floor			57.1600			18.0000	1028.8800 (32d)
Internal Ceiling 1			57.1600			9.0000	514.4400 (32e)
Heat capacity Cm = Sum (A x k)						(28)...(30) + (32) + (32a)...(32e) =	19971.1900 (34)

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

214.3061 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	11.4300	0.0240	0.2743
E2 Other lintels (including other steel lintels)	8.6000	0.0220	0.1892
E3 Sill	27.6000	0.0170	0.4692
E4 Jamb	16.9700	0.0920	1.5612
E5 Ground floor (normal)	33.9400	0.0010	0.0339
E6 Intermediate floor within a dwelling	8.7400	0.0680	0.5943
E11 Eaves (insulation at rafter level)	11.2500	0.0940	1.0575
E13 Gable (insulation at rafter level)	10.9000	0.0460	0.5014
E16 Corner (normal)	10.9000	0.0400	0.4360
E18 Party wall between dwellings	8.2300	0.0690	0.5679
P1 Party wall - Ground floor	16.4600	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	11.2500	0.4800	5.4000
P5 Party wall - Roof (insulation at rafter level)	0.9500	0.1150	0.1092
R1 Head of roof window	0.9500	0.1130	0.1074
R2 Sill of roof window	2.0600	0.0410	0.0845
R3 Jamb of roof window	4.3700	0.0440	0.1923
R4 Ridge (vaulted ceiling)			

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

Point Thermal bridges

11.5783 (36)

Total fabric heat loss

(33) + (36) + (36a) = 64.8879 (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	46.4001	46.1130	45.8315	44.5093	44.2619	43.1104	43.1104	42.8971	43.5540	44.2619	44.7624	45.2855 (38)
Heat transfer coeff	111.2880	111.0008	110.7193	109.3972	109.1498	107.9982	107.9982	107.7850	108.4418	109.1498	109.6502	110.1734 (39)
Average = Sum(39)m / 12 =												109.3960

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1942	1.1911	1.1881	1.1739	1.1713	1.1589	1.1589	1.1566	1.1637	1.1713	1.1766	1.1822 (40)
HLP (average)												1.1739
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy

2.6669 (42)

Hot water usage for mixer showers

68.9352 67.8992 66.3896 63.5013 61.3697 58.9927 57.6416 59.1397 60.7820 63.3342 66.2846 68.6710 (42a)

Hot water usage for baths

29.7676 29.3255 28.7030 27.5551 26.6956 25.7425 25.2277 25.8459 26.5190 27.5388 28.7103 29.6670 (42b)

Hot water usage for other uses

41.9419 40.4167 38.8916 37.3664 35.8412 34.3161 34.3161 35.8412 37.3664 38.8916 40.4167 41.9419 (42c)

Average daily hot water use (litres/day)

129.2842 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	140.6446	137.6414	133.9841	128.4227	123.9065	119.0512	117.1853	120.8269	124.6674	129.7646	135.4117	140.2799 (44)
Energy conte	222.7467	195.9996	205.9286	175.8043	166.8020	146.3874	141.7255	149.6089	153.7274	176.0894	192.9188	219.6444 (45)
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m	33.4120	29.3999	30.8893	26.3706	25.0203	21.9581	21.2588	22.4413	23.0591	26.4134	28.9378	32.9467 (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

0.6420 0.5885 0.6484 0.5927 0.5924 0.5484 0.5415 0.5498 0.5413 0.5842 0.5964 0.6363 (61)

Total heat required for water heating calculated for each month

223.3887 196.5880 206.5770 176.3970 167.3944 146.9357 142.2670 150.1587 154.2687 176.6735 193.5152 220.2807 (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

223.3887 196.5880 206.5770 176.3970 167.3944 146.9357 142.2670 150.1587 154.2687 176.6735 193.5152 220.2807 (64)

12Total per year (kWh/year)

Total per year (kWh/year) = Sum(64)m = 2154.4446 (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

74.2238 65.3170 68.6334 58.6031 55.6098 48.8109 47.2591 49.8824 51.2497 58.6958 64.2946 73.1908 (65)

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

Metabolic gains (Table 5), Watts

(66)m 133.3458 133.3458 133.3458 133.3458 133.3458 133.3458 133.3458 133.3458 133.3458 133.3458 133.3458 133.3458 (66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

126.4826 140.0343 126.4826 130.6987 126.4826 130.6987 126.4826 126.4826 130.6987 126.4826 130.6987 126.4826 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

244.8256 247.3662 240.9641 227.3349 210.1306 193.9608 183.1585 180.6180 187.0200 200.6492 217.8536 234.0233 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

36.3346 36.3346 36.3346 36.3346 36.3346 36.3346 36.3346 36.3346 36.3346 36.3346 36.3346 36.3346 (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)

-106.6766 -106.6766 -106.6766 -106.6766 -106.6766 -106.6766 -106.6766 -106.6766 -106.6766 -106.6766 -106.6766 -106.6766 (71)

Water heating gains (Table 5)

99.7632 97.1979 92.2491 81.3932 74.7443 67.7929 63.5203 67.0462 71.1801 78.8921 89.2980 98.3748 (72)

Total internal gains

537.0751 550.6021 525.6996 505.4306 477.3612 455.4562 436.1651 437.1505 451.9025 472.0277 503.8540 524.8844 (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
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North			7.4200		10.6334		0.7300		0.7000		0.7700		27.9402 (74)
South			5.7900		46.7521		0.7300		0.7000		0.7700		95.8591 (78)
West			2.1300		19.6403		0.7300		0.7000		0.7700		14.8143 (80)
North			0.9500		26.0000		0.7300		0.7000		1.0000		11.3595 (82)

Solar gains	149.9732	262.9605	380.3808	506.9006	601.0405	611.5377	583.3949	510.7545	423.7432	296.1140	180.9832	127.4810	(83)
Total gains	687.0483	813.5626	906.0804	1012.3311	1078.4017	1066.9939	1019.5601	947.9050	875.6457	768.1417	684.8372	652.3654	(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	49.8486	49.9776	50.1046	50.7102	50.8251	51.3671	51.3671	51.4687	51.1570	50.8251	50.5932	50.3529	
alpha	4.3232	4.3318	4.3403	4.3807	4.3883	4.4245	4.4245	4.4312	4.4105	4.3883	4.3729	4.3569	
util living area	0.9914	0.9817	0.9618	0.9049	0.7890	0.6109	0.4574	0.5085	0.7460	0.9337	0.9831	0.9931	(86)
MIT	19.4871	19.7291	20.0557	20.4740	20.7879	20.9490	20.9886	20.9821	20.8772	20.4604	19.9027	19.4503	(87)
Th 2	19.9246	19.9271	19.9295	19.9409	19.9431	19.9530	19.9530	19.9549	19.9492	19.9431	19.9387	19.9342	(88)
util rest of house	0.9990	0.9766	0.9510	0.8782	0.7341	0.5247	0.3528	0.3998	0.6660	0.9091	0.9775	0.9911	(89)
MIT 2	18.1779	18.4860	18.8973	19.4131	19.7641	19.9227	19.9490	19.9480	19.8644	19.4105	18.7170	18.1377	(90)
Living area fraction									FLA = Living area / (4) =				0.1343 (91)
MIT	18.3538	18.6530	19.0530	19.5556	19.9017	20.0606	20.0887	20.0869	20.0005	19.5515	18.8763	18.3140	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.2038	18.5030	18.9030	19.4056	19.7517	19.9106	19.9387	19.9369	19.8505	19.4015	18.7263	18.1640	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9832	0.9671	0.9372	0.8618	0.7230	0.5210	0.3513	0.3979	0.6576	0.8928	0.9683	0.9861	(94)
Useful gains	675.4739	786.8175	849.1937	872.4772	779.6557	555.9124	358.2196	377.1707	575.8139	685.7709	663.1306	643.3301	(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	1547.3247	1509.9416	1373.2481	1149.2861	878.8361	573.5336	360.5731	381.2251	623.5911	960.6873	1274.8247	1538.4619	(97)
Space heating kWh	648.6570	485.9395	389.8965	199.3024	73.7902	0.0000	0.0000	0.0000	0.0000	204.5378	440.4198	665.9781	(98a)
Space heating requirement - total per year (kWh/year)												3108.5211	
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	648.6570	485.9395	389.8965	199.3024	73.7902	0.0000	0.0000	0.0000	0.0000	204.5378	440.4198	665.9781	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3108.5211	
Space heating per m2										(98c) / (4) =		33.3568	(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 %)													88.7000 (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	648.6570	485.9395	389.8965	199.3024	73.7902	0.0000	0.0000	0.0000	0.0000	204.5378	440.4198	665.9781	(98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000	(210)
Space heating fuel (main heating system)	731.2931	547.8461	439.5676	224.6927	83.1907	0.0000	0.0000	0.0000	0.0000	230.5951	496.5273	750.8208	(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	223.3887	196.5880	206.5770	176.3970	167.3944	146.9357	142.2670	150.1587	154.2687	176.6735	193.5152	220.2807	(64)
Efficiency of water heater (217)m	85.1868	84.7691	84.0155	82.4664	79.7849	76.4000	76.4000	76.4000	76.4000	82.5413	84.5450	85.2872	(216)
Fuel for water heating, kWh/month	262.2341	231.9099	245.8796	213.9016	209.8071	192.3243	186.2133	196.5428	201.9224	214.0426	228.8901	258.2811	(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	25.7434	20.6523	18.5951	13.6236	10.5233	8.5977	12.4780	16.2077	21.2654	24.0192	26.4589	26.4589	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-31.6574	-45.9094	-67.9529	-78.6836	-86.6909	-81.5557	-80.4722	-74.9956	-65.6627	-53.4178	-35.2225	-27.2103	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-14.6726	-31.4021	-63.7174	-97.7806	-131.3157	-132.7795	-131.0305	-109.7953	-79.0656	-45.4146	-19.7316	-11.5600	(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												3504.5334	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												76.4000	

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Water heating fuel used	2641.9487 (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)	207.7642 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1597.6964 (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	4842.5498 (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	3504.5334	0.2100	735.9520 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2641.9487	0.2100	554.8092 (264)
Space and water heating			1290.7612 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	207.7642	0.1443	29.9868 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-729.4309	0.1340	-97.7455
PV Unit electricity exported	-868.2655	0.1253	-108.8097
Total			-206.5553 (269)
Total CO2, kg/year			1126.1220 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.0800 (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	3504.5334	1.1300	3960.1228 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2641.9487	1.1300	2985.4020 (278)
Space and water heating			6945.5248 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	207.7642	1.5338	318.6756 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-729.4309	1.4952	-1090.6581
PV Unit electricity exported	-868.2655	0.4600	-399.3810
Total			-1490.0391 (283)
Total Primary energy kWh/year			5904.2621 (286)
Dwelling Primary energy Rate (DPER)			63.3600 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	35.9700 (1b)	x 2.4000 (2b)	= 86.3280 (1b) - (3b)
First floor	35.9700 (1c)	x 2.6300 (2c)	= 94.6011 (1c) - (3c)
Second floor	21.2500 (1d)	x 2.6100 (2d)	= 55.4625 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.1900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	236.3916 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1269 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3769 (18)
Number of sides sheltered	1 (19)

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Shelter factor
Infiltration rate adjusted to include shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.9250 \quad (20)$$
$$(21) = (18) \times (20) = 0.3486 \quad (21)$$

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
Effective ac	0.4445	0.4358	0.4271	0.3835	0.3748	0.3312	0.3312	0.3225	0.3486	0.3748	0.3922	0.4097	(22b)
	0.5988	0.5950	0.5912	0.5735	0.5702	0.5548	0.5548	0.5520	0.5608	0.5702	0.5769	0.5839	(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 Opaque door			2.1400	1.0000	2.1400			(26)
TER Opening Type (Uw = 1.20)			15.3400	1.1450	17.5649			(27)
Roof light			0.9500	1.5918	1.5122			(27a)
Heatloss Floor 1			35.9700	0.1300	4.6761			(28a)
Brick wall	98.9900	17.4800	81.5100	0.1800	14.6718			(29a)
Stud wall (0.72)	24.6100		24.6100	0.1800	4.4298			(29a)
Spandrel wall	13.6300		13.6300	0.1800	2.4534			(29a)
Plane roof	11.9000		11.9000	0.1100	1.3090			(30)
Sloping roof	12.7900	0.9500	11.8400	0.1100	1.3024			(30)
Roof behind studs (0.72)	14.7100		14.7100	0.1100	1.6181			(30)
Total net area of external elements Aum(A, m2)			212.6000					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	51.6777		(33)
Party Wall 1			55.1500	0.0000	0.0000			(32)

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

214.3061 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element	11.4300	0.0500	0.5715	
E2 Other lintels (including other steel lintels)	8.6000	0.0500	0.4300	
E3 Sill	27.6000	0.0500	1.3800	
E4 Jamb	16.9700	0.1600	2.7152	
E5 Ground floor (normal)	33.9400	0.0000	0.0000	
E6 Intermediate floor within a dwelling	8.7400	0.0400	0.3496	
E11 Eaves (insulation at rafter level)	11.2500	0.0800	0.9000	
E13 Gable (insulation at rafter level)	10.9000	0.0900	0.9810	
E16 Corner (normal)	10.9000	0.0600	0.6540	
E18 Party wall between dwellings	8.2300	0.0800	0.6584	
P1 Party wall - Ground floor	16.4600	0.0000	0.0000	
P2 Party wall - Intermediate floor within a dwelling	11.2500	0.0800	0.9000	
P5 Party wall - Roof (insulation at rafter level)	0.9500	0.0800	0.0760	
R1 Head of roof window	0.9500	0.0600	0.0570	
R2 Sill of roof window	2.0600	0.0800	0.1648	
R3 Jamb of roof window	4.3700	0.0800	0.3496	
R4 Ridge (vaulted ceiling)				

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

10.1871 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 61.8648 (37)

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

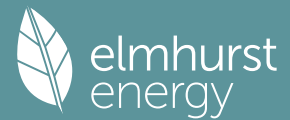
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.7117	46.4124	46.1191	44.7412	44.4834	43.2834	43.2834	43.0611	43.7456	44.4834	45.0049	45.5502	(38)
Heat transfer coeff	108.5765	108.2772	107.9838	106.6060	106.3482	105.1481	105.1481	104.9259	105.6104	106.3482	106.8697	107.4149	(39)
Average = Sum(39)m / 12 =												106.6048	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1651	1.1619	1.1587	1.1440	1.1412	1.1283	1.1283	1.1259	1.1333	1.1412	1.1468	1.1526	(40)
HLP (average)												1.1440	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6669 (42)
Hot water usage for mixer showers	68.9352	67.8992	66.3896	63.5013	61.3697	58.9927	57.6416	59.1397	60.7820	63.3342	66.2846	68.6710	(42a)
Hot water usage for baths	29.7676	29.3255	28.7030	27.5551	26.6956	25.7425	25.2277	25.8459	26.5190	27.5388	28.7103	29.6670	(42b)
Hot water usage for other uses	41.9419	40.4167	38.8916	37.3664	35.8412	34.3161	34.3161	35.8412	37.3664	38.8916	40.4167	41.9419	(42c)
Average daily hot water use (litres/day)												129.2842	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	140.6446	137.6414	133.9841	128.4227	123.9065	119.0512	117.1853	120.8269	124.6674	129.7646	135.4117	140.2799	(44)
Energy conte	222.7467	195.9996	205.9286	175.8043	166.8020	146.3874	141.7255	149.6089	153.7274	176.0894	192.9188	219.6444	(45)
Energy content (annual)										Total = Sum(45)m =		2147.3829	
Distribution loss (46)m = 0.15 x (45)m	33.4120	29.3999	30.8893	26.3706	25.0203	21.9581	21.2588	22.4413	23.0591	26.4134	28.9378	32.9467	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	273.7056	242.0270	256.8875	225.1194	217.7609	195.7025	192.6844	200.5678	203.0424	227.0483	242.2338	270.6033	(62)
WWHRS	-31.5143	-27.8715	-29.1854	-24.1667	-22.5225	-19.2726	-18.0650	-19.2103	-19.9402	-23.5073	-26.6309	-30.9307	(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	242.1914	214.1555	227.7021	200.9527	195.2384	176.4298	174.6194	181.3574	183.1022	203.5409	215.6029	239.6726	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2454.5654	(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	86.8030	76.6767	81.2110	70.7837	68.2014	61.0026	59.8634	62.4847	63.4431	71.2894	76.4743	85.7715	(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	133.3458	133.3458	133.3458	133.3458	133.3458	133.3458	133.3458	133.3458	133.3458	133.3458	133.3458	133.3458	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	126.4826	140.0343	126.4826	130.6987	126.4826	130.6987	126.4826	126.4826	130.6987	126.4826	130.6987	126.4826	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	244.8256	247.3662	240.9641	227.3349	210.1306	193.9608	183.1585	180.6180	187.0200	200.6492	217.8536	234.0233	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3346	36.3346	36.3346	36.3346	36.3346	36.3346	36.3346	36.3346	36.3346	36.3346	36.3346	36.3346	(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)	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	(71)
Water heating gains (Table 5)	116.6707	114.1022	109.1546	98.3107	91.6685	84.7258	80.4616	83.9848	88.1154	95.8191	106.2142	115.2843	(72)
Total internal gains	553.9827	567.5064	542.6050	522.3481	494.2854	472.3891	453.1064	454.0891	468.8379	488.9547	520.7702	541.7939	(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				7.4200	10.6334	0.6300	0.7000	0.7700	24.1128 (74)			
South				5.7900	46.7521	0.6300	0.7000	0.7700	82.7277 (78)			
West				2.1300	19.6403	0.6300	0.7000	0.7700	12.7849 (80)			
North				0.9500	26.0000	0.6300	0.7000	1.0000	9.8034 (82)			
Solar gains	129.4289	226.9385	328.2739	437.4621	518.7062	527.7654	503.4778	440.7881	365.6962	255.5505	156.1910	110.0179 (83)
Total gains	683.4116	794.4450	870.8789	959.8102	1012.9916	1000.1545	956.5843	894.8772	834.5341	744.5051	676.9612	651.8118 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)

Utilisation factor for gains for living area, nil,m (see Table 9a)													21.0000	(85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	51.0935	51.2347	51.3739	52.0379	52.1641	52.7594	52.7594	52.8712	52.5285	52.1641	51.9095	51.6460		
alpha	4.4062	4.4156	4.4249	4.4692	4.4776	4.5173	4.5173	4.5247	4.5019	4.4776	4.4606	4.4431		
util living area	0.9915	0.9828	0.9655	0.9148	0.8075	0.6314	0.4741	0.5236	0.7588	0.9373	0.9834	0.9930	(86)	
MIT	19.5320	19.7551	20.0617	20.4652	20.7778	20.9461	20.9881	20.9817	20.8758	20.4697	19.9364	19.5002	(87)	
Th 2	19.9480	19.9506	19.9531	19.9651	19.9673	19.9778	19.9778	19.9737	19.9737	19.9673	19.9628	19.9581	(88)	
util rest of house	0.9891	0.9781	0.9556	0.8904	0.7553	0.5458	0.3686	0.4149	0.6809	0.9140	0.9780	0.9911	(89)	
MIT 2	18.2511	18.5354	18.9226	19.4236	19.7771	19.9451	19.9735	19.9725	19.8868	19.4410	18.7764	18.2175	(90)	
Living area fraction	18.4232	18.6993	19.0756	19.5636	19.9116	20.0796	20.1098	20.1081	20.0197	19.5792	18.9322	18.3899	(92)	
MIT	18.4232	18.6993	19.0756	19.5636	19.9116	20.0796	20.1098	20.1081	20.0197	19.5792	18.9322	18.3899	(93)	
Temperature adjustment													0.0000	
adjusted MIT	18.4232	18.6993	19.0756	19.5636	19.9116	20.0796	20.1098	20.1081	20.0197	19.5792	18.9322	18.3899	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9840	0.9702	0.9448	0.8790	0.7521	0.5548	0.3826	0.4290	0.6848	0.9029	0.9704	0.9867	(94)
Useful gains	672.5108	770.8038	822.8122	843.6260	761.9120	554.9324	365.9662	383.9444	571.4929	672.1870	656.9248	643.1634	(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	1533.4458	1494.1493	1357.9628	1136.7997	873.2857	576.1693	369.0505	389.0715	625.1803	954.9246	1264.5077	1524.2038	(97)
Space heating kWh	640.5356	486.0882	398.1521	211.0850	82.8620	0.0000	0.0000	0.0000	0.0000	210.3568	437.4597	655.4941	(98a)
Space heating requirement - total per year (kWh/year)												3122.0335	
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	640.5356	486.0882	398.1521	211.0850	82.8620	0.0000	0.0000	0.0000	0.0000	210.3568	437.4597	655.4941	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3122.0335	
Space heating per m2										(98c) / (4) =		33.5018	(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	640.5356	486.0882	398.1521	211.0850	82.8620	0.0000	0.0000	0.0000	0.0000	210.3568	437.4597	655.4941	(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)	693.2203	526.0694	430.9005	228.4470	89.6775	0.0000	0.0000	0.0000	0.0000	227.6588	473.4413	709.4092	(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)

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Water heating													
Water heating requirement	242.1914	214.1555	227.7021	200.9527	195.2384	176.4298	174.6194	181.3574	183.1022	203.5409	215.6029	239.6726	(64)
Efficiency of water heater												80.3000	(216)
(217)m	86.3623	86.0805	85.5659	84.4870	82.6832	80.3000	80.3000	80.3000	80.3000	84.4521	85.8641	86.4219	(217)
Fuel for water heating, kWh/month	280.4364	248.7850	266.1131	237.8503	236.1282	219.7133	217.4587	225.8499	228.0227	241.0134	251.0980	277.3286	(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	7.0685	(231)
Lighting	26.2806	21.0833	18.9831	13.9079	10.7428	8.7770	9.8000	12.7384	16.5459	21.7091	24.5204	27.0110	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-35.0837	-50.2191	-73.2719	-83.6520	-91.2622	-85.5378	-84.4568	-79.1986	-70.1116	-57.9709	-38.8286	-30.2417	(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	-17.5835	-37.2255	-74.4350	-112.4575	-149.3535	-150.3295	-148.5888	-125.5348	-91.6306	-53.4885	-23.5562	-13.8892	(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												3378.8241	(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												2929.7977	(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)												212.0994	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1777.9074	(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												4828.8138	(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	3378.8241	0.2100	709.5531	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2929.7977	0.2100	615.2575	(264)
Space and water heating			1324.8106	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	212.0994	0.1443	30.6125	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-779.8349	0.1343	-104.7128	
PV Unit electricity exported	-998.0725	0.1257	-125.4757	
Total			-230.1885	(269)
Total CO2, kg/year			1137.1638	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.2000	(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	3378.8241	1.1300	3818.0712	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2929.7977	1.1300	3310.6714	(278)
Space and water heating			7128.7426	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	212.0994	1.5338	325.3251	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-779.8349	1.4962	-1166.8221	
PV Unit electricity exported	-998.0725	0.4615	-460.5734	
Total			-1627.3955	(283)
Total Primary energy kWh/year			5956.7730	(286)
Target Primary Energy Rate (TPER)			63.9200	(287)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 39			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	92 A	DER	12.08	TER	12.20		
Environmental	89 B	% DER < TER				0.98	
CO ₂ Emissions (t/year)	1.08	DFEE	38.41	TFEE	38.82		
Compliance Check	See BREL	% DFEE < TFEE				1.05	
% DPER < TPER	0.88	DPER	63.36	TPER	63.92		
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	35.9700 (1b)	x 2.4000 (2b)	= 86.3280 (1b) - (3b)
First floor	35.9700 (1c)	x 2.6300 (2c)	= 94.6011 (1c) - (3c)
Second floor	21.2500 (1d)	x 2.6100 (2d)	= 55.4625 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.1900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	236.3916 (5)

2. Ventilation rate

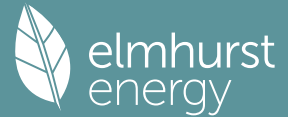
	m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
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) =	0.1692 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	(17)
Infiltration rate	0.3692	(18)
Number of sides sheltered	1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3415 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4354	0.4269	0.4184	0.3757	0.3671	0.3244	0.3244	0.3159	0.3415	0.3671	0.3842	0.4013 (22b)
Effective ac	0.5948	0.5911	0.5875	0.5706	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805 (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
Front door			2.1400	1.1000	2.3540		(26)
Windows (Uw = 1.30)			15.3400	1.2357	18.9563		(27)
Roof light			0.9500	1.2357	1.1740		(27a)
Heatloss Floor 1			35.9700	0.1300	4.6761	110.0000	3956.7000 (28a)
Brick wall	98.9900	17.4800	81.5100	0.1900	15.4869	110.0000	8966.1000 (29a)
Stud wall (0.72)	24.6100		24.6100	0.1100	2.7071	9.0000	221.4900 (29a)
Spandrel wall	13.6300		13.6300	0.2300	3.1349	0.0000	0.0000 (29a)
Plane roof	11.9000		11.9000	0.0900	1.0710	9.0000	107.1000 (30)
Sloping roof	12.7900	0.9500	11.8400	0.1800	2.1312	9.0000	106.5600 (30)
Roof behind studs (0.72)	14.7100		14.7100	0.1100	1.6181	9.0000	132.3900 (30)
Total net area of external elements Aum(A, m ²)			212.6000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	53.3095		(33)
Party Wall 1			55.1500	0.0000	0.0000	70.0000	3860.5000 (32)
Internal Wall 2			119.6700			9.0000	1077.0300 (32c)
Internal Floor			57.1600			18.0000	1028.8800 (32d)
Internal Ceiling 1			57.1600			9.0000	514.4400 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	19971.1900 (34)

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

214.3061 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	11.4300	0.0240	0.2743
E2 Other lintels (including other steel lintels)	8.6000	0.0220	0.1892
E3 Sill	27.6000	0.0170	0.4692
E4 Jamb	16.9700	0.0920	1.5612
E5 Ground floor (normal)	33.9400	0.0010	0.0339
E6 Intermediate floor within a dwelling	8.7400	0.0680	0.5943
E11 Eaves (insulation at rafter level)	11.2500	0.0940	1.0575
E13 Gable (insulation at rafter level)	10.9000	0.0460	0.5014
E16 Corner (normal)	10.9000	0.0400	0.4360
E18 Party wall between dwellings	8.2300	0.0690	0.5679
P1 Party wall - Ground floor	16.4600	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	11.2500	0.4800	5.4000
P5 Party wall - Roof (insulation at rafter level)	0.9500	0.1150	0.1092
R1 Head of roof window	0.9500	0.1130	0.1074
R2 Sill of roof window	2.0600	0.0410	0.0845
R3 Jamb of roof window	4.3700	0.0440	0.1923
R4 Ridge (vaulted ceiling)			

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

Point Thermal bridges	(36a) =	11.5783 (36)
Total fabric heat loss	(33) + (36) + (36a) =	64.8879 (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	46.4001	46.1130	45.8315	44.5093	44.2619	43.1104	43.1104	42.8971	43.5540	44.2619	44.7624	45.2855 (38)
Heat transfer coeff	111.2880	111.0008	110.7193	109.3972	109.1498	107.9982	107.9982	107.7850	108.4418	109.1498	109.6502	110.1734 (39)
Average = Sum(39)m / 12 =												109.3960

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1942	1.1911	1.1881	1.1739	1.1713	1.1589	1.1589	1.1566	1.1637	1.1713	1.1766	1.1822 (40)
HLP (average)												1.1739
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6669 (42)
Hot water usage for mixer showers													
68.9352	67.8992	66.3896	63.5013	61.3697	58.9927	57.6416	59.1397	60.7820	63.3342	66.2846	68.6710	(42a)	
Hot water usage for baths													
29.7676	29.3255	28.7030	27.5551	26.6956	25.7425	25.2277	25.8459	26.5190	27.5388	28.7103	29.6670	(42b)	
Hot water usage for other uses													
41.9419	40.4167	38.8916	37.3664	35.8412	34.3161	34.3161	35.8412	37.3664	38.8916	40.4167	41.9419	(42c)	
Average daily hot water use (litres/day)												129.2842 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
140.6446	137.6414	133.9841	128.4227	123.9065	119.0512	117.1853	120.8269	124.6674	129.7646	135.4117	140.2799	(44)	
Energy content (annual)	222.7467	195.9996	205.9286	175.8043	166.8020	146.3874	141.7255	149.6089	153.7274	176.0894	192.9188	219.6444 (45)	
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2147.3829	
33.4120	29.3999	30.8893	26.3706	25.0203	21.9581	21.2588	22.4413	23.0591	26.4134	28.9378	32.9467	(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	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	0.6420	0.5885	0.6484	0.5927	0.5924	0.5484	0.5415	0.5498	0.5413	0.5842	0.5964	0.6363 (61)	
Total heat required for water heating calculated for each month													
223.3887	196.5880	206.5770	176.3970	167.3944	146.9357	142.2670	150.1587	154.2687	176.6735	193.5152	220.2807	(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													
223.3887	196.5880	206.5770	176.3970	167.3944	146.9357	142.2670	150.1587	154.2687	176.6735	193.5152	220.2807	(64)	
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)	
Heat gains from water heating, kWh/month													
74.2238	65.3170	68.6334	58.6031	55.6098	48.8109	47.2591	49.8824	51.2497	58.6958	64.2946	73.1908	(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	160.0149	160.0149	160.0149	160.0149	160.0149	160.0149	160.0149	160.0149	160.0149	160.0149	160.0149	160.0149 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.4112	26.1227	21.2444	16.0834	12.0225	10.1499	10.9674	14.2558	19.1341	24.2951	28.3560	30.2286 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	365.4114	369.2032	359.6480	339.3059	313.6277	289.4938	273.3709	269.5791	279.1343	299.4764	325.1546	349.2885 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.6684	53.6684	53.6684	53.6684	53.6684	53.6684	53.6684	53.6684	53.6684	53.6684	53.6684	53.6684 (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)	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766 (71)
Water heating gains (Table 5)	99.7632	97.1979	92.2491	81.3932	74.7443	67.7929	63.5203	67.0462	71.1801	78.8921	89.2980	98.3748 (72)
Total internal gains	604.5925	602.5306	583.1482	546.7892	510.4013	474.4434	454.8652	457.8878	476.4552	512.6704	552.8154	587.8986 (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	7.4200	10.6334	0.7300	0.7000	0.7700	27.9402 (74)

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South	5.7900	46.7521	0.7300	0.7000	0.7700	95.8591 (78)
West	2.1300	19.6403	0.7300	0.7000	0.7700	14.8143 (80)
North	0.9500	26.0000	0.7300	0.7000	1.0000	11.3595 (82)

Solar gains	149.9732	262.9605	380.3808	506.9006	601.0405	611.5377	583.3949	510.7545	423.7432	296.1140	180.9832	127.4810 (83)
Total gains	754.5656	865.4911	963.5291	1053.6898	1111.4418	1085.9811	1038.2602	968.6422	900.1985	808.7844	733.7985	715.3796 (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	49.8486	49.9776	50.1046	50.7102	50.8251	51.3671	51.3671	51.4687	51.1570	50.8251	50.5932	50.3529
alpha	4.3232	4.3318	4.3403	4.3807	4.3883	4.4245	4.4245	4.4312	4.4105	4.3883	4.3729	4.3569
util living area	0.9878	0.9772	0.9533	0.8938	0.7757	0.6022	0.4498	0.4987	0.7330	0.9226	0.9784	0.9902 (86)
MIT	19.5696	19.7896	20.1163	20.5072	20.8026	20.9518	20.9893	20.9834	20.8857	20.4978	19.9603	19.5282 (87)
Th 2	19.9246	19.9271	19.9295	19.9409	19.9431	19.9530	19.9530	19.9549	19.9492	19.9431	19.9387	19.9342 (88)
util rest of house	0.9845	0.9711	0.9406	0.8651	0.7198	0.5165	0.3466	0.3916	0.6523	0.8951	0.9714	0.9875 (89)
MIT 2	18.2824	18.5617	18.9710	19.4504	19.7778	19.9245	19.9493	19.9485	19.8711	19.4530	18.7887	18.2366 (90)
Living area fraction	18.4553	18.7267	19.1248	19.5924	19.9155	20.0625	20.0890	20.0876	20.0074	19.5933	18.9461	18.4101 (92)
MIT	18.4553	18.7267	19.1248	19.5924	19.9155	20.0625	20.0890	20.0876	20.0074	19.5933	18.9461	18.4101 (92)
Temperature adjustment	18.3053	18.5767	18.9748	19.4424	19.7655	19.9125	19.9390	19.9376	19.8574	19.4433	18.7961	-0.1500
adjusted MIT	18.3053	18.5767	18.9748	19.4424	19.7655	19.9125	19.9390	19.9376	19.8574	19.4433	18.7961	18.2601 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9771	0.9603	0.9258	0.8490	0.7093	0.5130	0.3452	0.3898	0.6445	0.8786	0.9608	0.9811 (94)
Useful gains	737.2889	831.1564	892.0350	894.5330	788.3280	557.1390	358.4158	377.5579	580.1409	710.5854	705.0432	701.8715 (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	1558.6254	1518.1203	1381.2060	1153.3064	880.3475	573.7415	360.6092	381.2949	624.3399	965.2484	1282.4840	1549.0486 (97)
Space heating kWh	611.0744	461.6397	363.9433	186.3169	68.4625	0.0000	0.0000	0.0000	0.0000	189.4693	415.7574	630.2998 (98a)
Space heating requirement - total per year (kWh/year)												2926.9631
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	611.0744	461.6397	363.9433	186.3169	68.4625	0.0000	0.0000	0.0000	0.0000	189.4693	415.7574	630.2998 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2926.9631
Space heating per m2										(98c) / (4) =		31.4086 (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 %)												88.7000 (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	611.0744	461.6397	363.9433	186.3169	68.4625	0.0000	0.0000	0.0000	0.0000	189.4693	415.7574	630.2998 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	688.9226	520.4506	410.3081	210.0528	77.1843	0.0000	0.0000	0.0000	0.0000	213.6069	468.7231	710.5973 (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	223.3887	196.5880	206.5770	176.3970	167.3944	146.9357	142.2670	150.1587	154.2687	176.6735	193.5152	220.2807 (64)
Efficiency of water heater (217)m	85.0351	84.6307	83.8142	82.2594	79.6042	76.4000	76.4000	76.4000	76.4000	82.3061	84.3850	76.4000 (216)
Fuel for water heating, kWh/month	262.7019	232.2893	246.4703	214.4398	210.2834	192.3243	186.2133	196.5428	201.9224	214.6542	229.3241	258.6979 (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	25.7434	20.6523	18.5951	13.6236	10.5233	8.5976	9.5997	12.4780	16.2077	21.2654	24.0192	26.4589 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-31.6574	-45.9094	-67.9529	-78.6836	-86.6909	-81.5557	-80.4722	-74.9956	-65.6627	-53.4178	-35.2225	-27.2103 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-14.6726	-31.4021	-63.7174	-97.7806	-131.3157	-132.7795	-131.0305	-109.7953	-79.0656	-45.4146	-19.7316	-11.5600 (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												3299.8457 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												76.4000
Water heating fuel used												2645.8636 (219)

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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)	207.7642 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1597.6964 (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	4641.7770 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3299.8457	3.6400	120.1144 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2645.8636	3.6400	96.3094 (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	207.7642	16.4900	34.2603 (250)
Additional standing charges			92.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-729.4309	16.4900	-120.2832
PV Unit electricity exported	-868.2655	5.5900	-48.5360
Total			-168.8192 (252)
Total energy cost			188.0463 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] = 0.4899 (257)
SAP value	92.0590
SAP rating (Section 12)	92 (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	3299.8457	0.2100	692.9676 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2645.8636	0.2100	555.6314 (264)
Space and water heating			1248.5989 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	207.7642	0.1443	29.9868 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-729.4309	0.1340	-97.7455
PV Unit electricity exported	-868.2655	0.1253	-108.8097
Total			-206.5553 (269)
Total CO2, kg/year			1083.9597 (272)
CO2 emissions per m2			11.6300 (273)
EI value			89.4891
EI rating			89 (274)
EI band			B

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

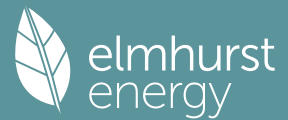
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	35.9700 (1b)	x 2.4000 (2b)	= 86.3280 (1b) - (3b)
First floor	35.9700 (1c)	x 2.6300 (2c)	= 94.6011 (1c) - (3c)
Second floor	21.2500 (1d)	x 2.6100 (2d)	= 55.4625 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.1900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	236.3916 (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)

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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

0 * 35 = 0.0000 (6e)
0 * 20 = 0.0000 (6f)
4 * 10 = 40.0000 (7a)
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) = 40.0000 / (5) = 0.1692 (8)
Pressure test
Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered
Blower Door
Yes
4.0000 (17)
0.3692 (18)
1 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3415 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
Effective ac	0.4354	0.4269	0.4184	0.3757	0.3671	0.3244	0.3244	0.3159	0.3415	0.3671	0.3842	0.4013	(22b)
	0.5948	0.5911	0.5875	0.5706	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805	(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	
Front door			2.1400	1.1000	2.3540			(26)
Windows (Uw = 1.30)			15.3400	1.2357	18.9563			(27)
Roof light			0.9500	1.2357	1.1740			(27a)
Heatloss Floor 1			35.9700	0.1300	4.6761	110.0000	3956.7000	(28a)
Brick wall	98.9900	17.4800	81.5100	0.1900	15.4869	110.0000	8966.1000	(29a)
Stud wall (0.72)	24.6100		24.6100	0.1100	2.7071	9.0000	221.4900	(29a)
Spandrel wall	13.6300		13.6300	0.2300	3.1349	0.0000	0.0000	(29a)
Plane roof	11.9000		11.9000	0.0900	1.0710	9.0000	107.1000	(30)
Sloping roof	12.7900	0.9500	11.8400	0.1800	2.1312	9.0000	106.5600	(30)
Roof behind studs (0.72)	14.7100		14.7100	0.1100	1.6181	9.0000	132.3900	(30)
Total net area of external elements Aum(A, m2)			212.6000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	53.3095			(33)
Party Wall 1			55.1500	0.0000	0.0000	70.0000	3860.5000	(32)
Internal Wall 2			119.6700			9.0000	1077.0300	(32c)
Internal Floor			57.1600			18.0000	1028.8800	(32d)
Internal Ceiling 1			57.1600			9.0000	514.4400	(32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
(28)...(30) + (32) + (32a)...(32e) = 19971.1900 (34)
List of Thermal Bridges
214.3061 (35)

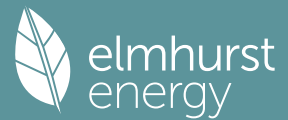
	Length	Psi-value	Total	
K1 Element	11.4300	0.0240	0.2743	
E2 Other lintels (including other steel lintels)	8.6000	0.0220	0.1892	
E3 Sill	27.6000	0.0170	0.4692	
E4 Jamb	16.9700	0.0920	1.5612	
E5 Ground floor (normal)	33.9400	0.0010	0.0339	
E6 Intermediate floor within a dwelling	8.7400	0.0680	0.5943	
E11 Eaves (insulation at rafter level)	11.2500	0.0940	1.0575	
E13 Gable (insulation at rafter level)	10.9000	0.0460	0.5014	
E16 Corner (normal)	10.9000	0.0400	0.4360	
E18 Party wall between dwellings	8.2300	0.0690	0.5679	
P1 Party wall - Ground floor	16.4600	0.0000	0.0000	
P2 Party wall - Intermediate floor within a dwelling	11.2500	0.4800	5.4000	
P5 Party wall - Roof (insulation at rafter level)	0.9500	0.1150	0.1092	
R1 Head of roof window	0.9500	0.1130	0.1074	
R2 Sill of roof window	2.0600	0.0410	0.0845	
R3 Jamb of roof window	4.3700	0.0440	0.1923	
R4 Ridge (vaulted ceiling)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.5783	(36)
Point Thermal bridges			0.0000	(36a) =
Total fabric heat loss			64.8879	(33) + (36) + (36a) =

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	46.4001	46.1130	45.8315	44.5093	44.2619	43.1104	43.1104	42.8971	43.5540	44.2619	44.7624	45.2855	(38)
Heat transfer coeff	111.2880	111.0008	110.7193	109.3972	109.1498	107.9982	107.9982	107.7850	108.4418	109.1498	109.6502	110.1734	(39)
Average = Sum(39)m / 12 =												109.3960	
HLP	1.1942	1.1911	1.1881	1.1739	1.1713	1.1589	1.1589	1.1566	1.1637	1.1713	1.1766	1.1822	(40)
HLP (average)												1.1739	
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	68.9352	67.8992	66.3896	63.5013	61.3697	58.9927	57.6416	59.1397	60.7820	63.3342	66.2846	68.6710	(42a)
Hot water usage for baths	29.7676	29.3255	28.7030	27.5551	26.6956	25.7425	25.2277	25.8459	26.5190	27.5388	28.7103	29.6670	(42b)
Hot water usage for other uses	41.9419	40.4167	38.8916	37.3664	35.8412	34.3161	34.3161	35.8412	37.3664	38.8916	40.4167	41.9419	(42c)
Average daily hot water use (litres/day)												129.2842	(43)
Daily hot water use	140.6446	137.6414	133.9841	128.4227	123.9065	119.0512	117.1853	120.8269	124.6674	129.7646	135.4117	140.2799	(44)
Energy conte	222.7467	195.9996	205.9286	175.8043	166.8020	146.3874	141.7255	149.6089	153.7274	176.0894	192.9188	219.6444	(45)
Energy content (annual)										Total = Sum(45)m =		2147.3829	
Distribution loss (46)m = 0.15 x (45)m	33.4120	29.3999	30.8893	26.3706	25.0203	21.9581	21.2588	22.4413	23.0591	26.4134	28.9378	32.9467	(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													

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Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.6420	0.5885	0.6484	0.5927	0.5924	0.5484	0.5415	0.5498	0.5413	0.5842	0.5964	0.6363	(61)
Total heat required for water heating calculated for each month													
	223.3887	196.5880	206.5770	176.3970	167.3944	146.9357	142.2670	150.1587	154.2687	176.6735	193.5152	220.2807	(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	223.3887	196.5880	206.5770	176.3970	167.3944	146.9357	142.2670	150.1587	154.2687	176.6735	193.5152	220.2807	(64)
Total per year (kWh/year) = Sum(64)m =												2154.4446	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
	74.2238	65.3170	68.6334	58.6031	55.6098	48.8109	47.2591	49.8824	51.2497	58.6958	64.2946	73.1908	(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	160.0149	160.0149	160.0149	160.0149	160.0149	160.0149	160.0149	160.0149	160.0149	160.0149	160.0149	160.0149	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	29.4112	26.1227	21.2444	16.0834	12.0225	10.1499	10.9674	14.2558	19.1341	24.2951	28.3560	30.2286	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	365.4114	369.2032	359.6480	339.3059	313.6277	289.4938	273.3709	269.5791	279.1343	299.4764	325.1546	349.2885	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.6684	53.6684	53.6684	53.6684	53.6684	53.6684	53.6684	53.6684	53.6684	53.6684	53.6684	53.6684	(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)													
	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	(71)
Water heating gains (Table 5)													
	99.7632	97.1979	92.2491	81.3932	74.7443	67.7929	63.5203	67.0462	71.1801	78.8921	89.2980	98.3748	(72)
Total internal gains	604.5925	602.5306	583.1482	546.7892	510.4013	474.4434	454.8652	457.8878	476.4552	512.6704	552.8154	587.8986	(73)

6. Solar gains

[Jan]		Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W				
North		7.4200	10.6334	0.7300	0.7300	0.7000	0.7700	0.7700	27.9402	(74)			
South		5.7900	46.7521	0.7300	0.7300	0.7000	0.7700	0.7700	95.8591	(78)			
West		2.1300	19.6403	0.7300	0.7300	0.7000	0.7700	0.7700	14.8143	(80)			
North		0.9500	26.0000	0.7300	0.7300	0.7000	1.0000	1.0000	11.3595	(82)			
Solar gains	149.9732	262.9605	380.3808	506.9006	601.0405	611.5377	583.3949	510.7545	423.7432	296.1140	180.9832	127.4810	(83)
Total gains	754.5656	865.4911	963.5291	1053.6898	1111.4418	1085.9811	1038.2602	968.6422	900.1985	808.7844	733.7985	715.3796	(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	49.8486	49.9776	50.1046	50.7102	50.8251	51.3671	51.3671	51.4687	51.1570	50.8251	50.5932	50.3529	
alpha	4.3232	4.3318	4.3403	4.3807	4.3883	4.4245	4.4245	4.4312	4.4105	4.3883	4.3729	4.3569	
util living area	0.9878	0.9772	0.9533	0.8938	0.7757	0.6022	0.4498	0.4987	0.7330	0.9226	0.9784	0.9902	(86)
MIT	19.5696	19.7896	20.1163	20.5072	20.8026	20.9518	20.9893	20.9834	20.8857	20.4978	19.9603	19.5282	(87)
Th 2	19.9246	19.9271	19.9295	19.9409	19.9431	19.9530	19.9530	19.9549	19.9492	19.9431	19.9387	19.9342	(88)
util rest of house	0.9845	0.9711	0.9406	0.8651	0.7198	0.5165	0.3466	0.3916	0.6523	0.8951	0.9714	0.9875	(89)
MIT 2	18.2824	18.5617	18.9710	19.4504	19.7778	19.9245	19.9493	19.9485	19.8711	19.4530	18.7887	18.2366	(90)
Living area fraction	18.4553	18.7267	19.1248	19.5924	19.9155	20.0625	20.0890	20.0876	20.0074	19.5933	18.9461	18.4101	(91)
MIT	18.4553	18.7267	19.1248	19.5924	19.9155	20.0625	20.0890	20.0876	20.0074	19.5933	18.9461	18.4101	(92)
Temperature adjustment	18.3053	18.5767	18.9748	19.4424	19.7655	19.9125	19.9390	19.9376	19.8574	19.4433	18.7961	18.2601	(93)
adjusted MIT	18.3053	18.5767	18.9748	19.4424	19.7655	19.9125	19.9390	19.9376	19.8574	19.4433	18.7961	18.2601	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9771	0.9603	0.9258	0.8490	0.7093	0.5130	0.3452	0.3898	0.6445	0.8786	0.9608	0.9811	(94)
Useful gains	737.2889	831.1564	892.0350	894.5330	788.3280	557.1390	358.4158	377.5579	580.1409	710.5854	705.0432	701.8715	(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	1558.6254	1518.1203	1381.2060	1153.3064	880.3475	573.7415	360.6092	381.2949	624.3399	965.2484	1282.4840	1549.0486	(97)
Space heating kWh	611.0744	461.6397	363.9433	186.3169	68.4625	0.0000	0.0000	0.0000	0.0000	189.4693	415.7574	630.2998	(98a)
Space heating requirement - total per year (kWh/year)												2926.9631	
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	611.0744	461.6397	363.9433	186.3169	68.4625	0.0000	0.0000	0.0000	0.0000	189.4693	415.7574	630.2998	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2926.9631	
Space heating per m2										(98c) / (4) =		31.4086	(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)

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Efficiency of main space heating system 1 (in %) 88.7000 (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	611.0744	461.6397	363.9433	186.3169	68.4625	0.0000	0.0000	0.0000	0.0000	189.4693	415.7574	630.2998	(98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000	(210)
Space heating fuel (main heating system)	688.9226	520.4506	410.3081	210.0528	77.1843	0.0000	0.0000	0.0000	0.0000	213.6069	468.7231	710.5973	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	223.3887	196.5880	206.5770	176.3970	167.3944	146.9357	142.2670	150.1587	154.2687	176.6735	193.5152	220.2807	(64)
Efficiency of water heater	85.0351	84.6307	83.8142	82.2594	79.6042	76.4000	76.4000	76.4000	76.4000	82.3061	84.3850	85.1498	(216)
Fuel for water heating, kWh/month	262.7019	232.2893	246.4703	214.4398	210.2834	192.3243	186.2133	196.5428	201.9224	214.6542	229.3241	258.6979	(217)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(219)
(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	25.7434	20.6523	18.5951	13.6236	10.5233	8.5976	9.5997	12.4780	16.2077	21.2654	24.0192	26.4589	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-31.6574	-45.9094	-67.9529	-78.6836	-86.6909	-81.5557	-80.4722	-74.9956	-65.6627	-53.4178	-35.2225	-27.2103	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-14.6726	-31.4021	-63.7174	-97.7806	-131.3157	-132.7795	-131.0305	-109.7953	-79.0656	-45.4146	-19.7316	-11.5600	(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													3299.8457 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													76.4000
Water heating fuel used													2645.8636 (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)													207.7642 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-1597.6964 (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													4641.7770 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3299.8457	5.6000	184.7914	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2645.8636	5.6000	148.1684	(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	207.7642	26.0600	54.1433	(250)
Additional standing charges			99.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-729.4309	26.0600	-190.0897	
PV Unit electricity exported	-868.2655	5.8100	-50.4462	
Total			-240.5359	(252)
Total energy cost			267.9787	(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	3299.8457	0.2100	692.9676	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2645.8636	0.2100	555.6314	(264)
Space and water heating			1248.5989	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	207.7642	0.1443	29.9868	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-729.4309	0.1340	-97.7455	
PV Unit electricity exported	-868.2655	0.1253	-108.8097	
Total			-206.5553	(269)
Total CO2, kg/year			1083.9597	(272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3299.8457	1.1300	3728.8256 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2645.8636	1.1300	2989.8259 (278)
Space and water heating			6718.6515 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	207.7642	1.5338	318.6756 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-729.4309	1.4952	-1090.6581
PV Unit electricity exported	-868.2655	0.4600	-399.3810
Total			-1490.0391 (283)
Total Primary energy kWh/year			5677.3888 (286)

SAP 10 EPC IMPROVEMENTS

Plot 39

Current energy efficiency rating: A 92
Current environmental impact rating: B 89

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

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

Measures omitted - SAP change or cost saving too small:
N Solar water heating + 0.6 -£ 23 -148 kg (13.6%)

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

Potential energy efficiency rating: A 92
Potential environmental impact rating: B 89

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

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

	Current	Potential	Saving
Electricity	£77	£77	£0
Mains gas	£432	£432	£0
Space heating	£306	£306	£0
Water heating	£148	£148	£0
Lighting	£54	£54	£0
Generated (PV)	-£241	-£241	£0
Total cost of fuels	£268	£268	£0
Total cost of uses	£267	£267	£0
Delivered energy	50 kWh/m²	50 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.1 tonnes	1.1 tonnes	0.0 tonnes
CO2 emissions per m²	12 kg/m²	12 kg/m²	0 kg/m²
Primary energy	61 kWh/m²	61 kWh/m²	0 kWh/m²

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

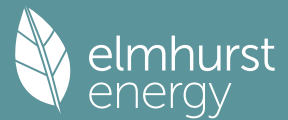
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	35.9700 (1b)	x 2.4000 (2b)	= 86.3280 (1b) - (3b)
First floor	35.9700 (1c)	x 2.6300 (2c)	= 94.6011 (1c) - (3c)
Second floor	21.2500 (1d)	x 2.6100 (2d)	= 55.4625 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.1900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	236.3916 (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)

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Number of blocked chimneys
Number of intermittent extract fans
Number of passive vents
Number of flueless gas fires

0 * 20 = 0.0000 (6f)
4 * 10 = 40.0000 (7a)
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) = 0.1692 (8)
Yes
Blower Door
4.0000 (17)
0.3692 (18)
1 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3415 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
Effective ac	0.4354	0.4269	0.4184	0.3757	0.3671	0.3244	0.3244	0.3159	0.3415	0.3671	0.3842	0.4013	(22b)
	0.5948	0.5911	0.5875	0.5706	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805	(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	
Front door			2.1400	1.1000	2.3540			(26)
Windows (Uw = 1.30)			15.3400	1.2357	18.9563			(27)
Roof light			0.9500	1.2357	1.1740			(27a)
Heatloss Floor 1			35.9700	0.1300	4.6761	110.0000	3956.7000	(28a)
Brick wall	98.9900	17.4800	81.5100	0.1900	15.4869	110.0000	8966.1000	(29a)
Stud wall (0.72)	24.6100		24.6100	0.1100	2.7071	9.0000	221.4900	(29a)
Spandrel wall	13.6300		13.6300	0.2300	3.1349	0.0000	0.0000	(29a)
Plane roof	11.9000		11.9000	0.0900	1.0710	9.0000	107.1000	(30)
Sloping roof	12.7900	0.9500	11.8400	0.1800	2.1312	9.0000	106.5600	(30)
Roof behind studs (0.72)	14.7100		14.7100	0.1100	1.6181	9.0000	132.3900	(30)
Total net area of external elements Aum(A, m2)			212.6000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	53.3095			(33)
Party Wall 1			55.1500	0.0000	0.0000	70.0000	3860.5000	(32)
Internal Wall 2			119.6700			9.0000	1077.0300	(32c)
Internal Floor			57.1600			18.0000	1028.8800	(32d)
Internal Ceiling 1			57.1600			9.0000	514.4400	(32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K (28)...(30) + (32) + (32a)...(32e) = 19971.1900 (34)
List of Thermal Bridges 214.3061 (35)

	Length	Psi-value	Total	
K1 Element	11.4300	0.0240	0.2743	
E2 Other lintels (including other steel lintels)	8.6000	0.0220	0.1892	
E3 Sill	27.6000	0.0170	0.4692	
E4 Jamb	16.9700	0.0920	1.5612	
E6 Intermediate floor within a dwelling	33.9400	0.0010	0.0339	
E11 Eaves (insulation at rafter level)	8.7400	0.0680	0.5943	
E13 Gable (insulation at rafter level)	11.2500	0.0940	1.0575	
E16 Corner (normal)	10.9000	0.0460	0.5014	
E18 Party wall between dwellings	10.9000	0.0400	0.4360	
P1 Party wall - Ground floor	8.2300	0.0690	0.5679	
P2 Party wall - Intermediate floor within a dwelling	16.4600	0.0000	0.0000	
P5 Party wall - Roof (insulation at rafter level)	11.2500	0.4800	5.4000	
R1 Head of roof window	0.9500	0.1150	0.1092	
R2 Sill of roof window	0.9500	0.1130	0.1074	
R3 Jamb of roof window	2.0600	0.0410	0.0845	
R4 Ridge (vaulted ceiling)	4.3700	0.0440	0.1923	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.5783	(36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	64.8879 (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	
	46.4001	46.1130	45.8315	44.5093	44.2619	43.1104	43.1104	42.8971	43.5540	44.2619	44.7624	45.2855	(38)
Heat transfer coeff	111.2880	111.0008	110.7193	109.3972	109.1498	107.9982	107.9982	107.7850	108.4418	109.1498	109.6502	110.1734	(39)
Average = Sum(39)m / 12 =												109.3960	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1942	1.1911	1.1881	1.1739	1.1713	1.1589	1.1589	1.1566	1.1637	1.1713	1.1766	1.1822	(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													2.6669 (42)
Hot water usage for mixer showers													
	68.9352	67.8992	66.3896	63.5013	61.3697	58.9927	57.6416	59.1397	60.7820	63.3342	66.2846	68.6710	(42a)
Hot water usage for baths													
	29.7676	29.3255	28.7030	27.5551	26.6956	25.7425	25.2277	25.8459	26.5190	27.5388	28.7103	29.6670	(42b)
Hot water usage for other uses													
	41.9419	40.4167	38.8916	37.3664	35.8412	34.3161	34.3161	35.8412	37.3664	38.8916	40.4167	41.9419	(42c)
Average daily hot water use (litres/day)													129.2842 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	140.6446	137.6414	133.9841	128.4227	123.9065	119.0512	117.1853	120.8269	124.6674	129.7646	135.4117	140.2799	(44)
Energy conte	222.7467	195.9996	205.9286	175.8043	166.8020	146.3874	141.7255	149.6089	153.7274	176.0894	192.9188	219.6444	(45)
Energy content (annual)										Total =	Sum(45)m =	2147.3829	
Distribution loss (46)m = 0.15 x (45)m													
	33.4120	29.3999	30.8893	26.3706	25.0203	21.9581	21.2588	22.4413	23.0591	26.4134	28.9378	32.9467	(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)

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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	0.6420	0.5885	0.6484	0.5927	0.5924	0.5484	0.5415	0.5498	0.5413	0.5842	0.5964	0.6363 (61)
Total heat required for water heating calculated for each month												
	223.3887	196.5880	206.5770	176.3970	167.3944	146.9357	142.2670	150.1587	154.2687	176.6735	193.5152	220.2807 (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	223.3887	196.5880	206.5770	176.3970	167.3944	146.9357	142.2670	150.1587	154.2687	176.6735	193.5152	220.2807 (64)
Total per year (kWh/year) = Sum(64)m =												2154.4446 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	74.2238	65.3170	68.6334	58.6031	55.6098	48.8109	47.2591	49.8824	51.2497	58.6958	64.2946	73.1908 (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	160.0149	160.0149	160.0149	160.0149	160.0149	160.0149	160.0149	160.0149	160.0149	160.0149	160.0149	160.0149 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.4112	26.1227	21.2444	16.0834	12.0225	10.1499	10.9674	14.2558	19.1341	24.2951	28.3560	30.2286 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	365.4114	369.2032	359.6480	339.3059	313.6277	289.4938	273.3709	269.5791	279.1343	299.4764	325.1546	349.2885 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.6684	53.6684	53.6684	53.6684	53.6684	53.6684	53.6684	53.6684	53.6684	53.6684	53.6684	53.6684 (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)	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766	-106.6766 (71)
Water heating gains (Table 5)	99.7632	97.1979	92.2491	81.3932	74.7443	67.7929	63.5203	67.0462	71.1801	78.8921	89.2980	98.3748 (72)
Total internal gains	604.5925	602.5306	583.1482	546.7892	510.4013	474.4434	454.8652	457.8878	476.4552	512.6704	552.8154	587.8986 (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				7.4200	10.6334	0.7300	0.7000	0.7700	27.9402 (74)			
South				5.7900	46.7521	0.7300	0.7000	0.7700	95.8591 (78)			
West				2.1300	19.6403	0.7300	0.7000	0.7700	14.8143 (80)			
North				0.9500	26.0000	0.7300	0.7000	1.0000	11.3595 (82)			
Solar gains	149.9732	262.9605	380.3808	506.9006	601.0405	611.5377	583.3949	510.7545	423.7432	296.1140	180.9832	127.4810 (83)
Total gains	754.5656	865.4911	963.5291	1053.6898	1111.4418	1085.9811	1038.2602	968.6422	900.1985	808.7844	733.7985	715.3796 (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	49.8486	49.9776	50.1046	50.7102	50.8251	51.3671	51.3671	51.4687	51.1570	50.8251	50.5932	50.3529
alpha	4.3232	4.3318	4.3403	4.3807	4.3883	4.4245	4.4245	4.4312	4.4105	4.3883	4.3729	4.3569
util living area	0.9878	0.9772	0.9533	0.8938	0.7757	0.6022	0.4498	0.4987	0.7330	0.9226	0.9784	0.9902 (86)
MIT	19.5696	19.7896	20.1163	20.5072	20.8026	20.9518	20.9893	20.9834	20.8857	20.4978	19.9603	19.5282 (87)
Th 2	19.9246	19.9271	19.9295	19.9409	19.9431	19.9530	19.9530	19.9549	19.9492	19.9431	19.9387	19.9342 (88)
util rest of house	0.9845	0.9711	0.9406	0.8651	0.7198	0.5165	0.3466	0.3916	0.6523	0.8951	0.9714	0.9875 (89)
MIT 2	18.2824	18.5617	18.9710	19.4504	19.7778	19.9245	19.9493	19.9485	19.8711	19.4530	18.7887	18.2366 (90)
Living area fraction	18.4553	18.7267	19.1248	19.5924	19.9155	20.0625	20.0890	20.0876	20.0074	19.5933	18.9461	0.1343 (91)
MIT	18.4553	18.7267	19.1248	19.5924	19.9155	20.0625	20.0890	20.0876	20.0074	19.5933	18.9461	18.4101 (92)
Temperature adjustment	18.3053	18.5767	18.9748	19.4424	19.7655	19.9125	19.9390	19.9376	19.8574	19.4433	18.7961	-0.1500
adjusted MIT	18.3053	18.5767	18.9748	19.4424	19.7655	19.9125	19.9390	19.9376	19.8574	19.4433	18.7961	18.2601 (93)

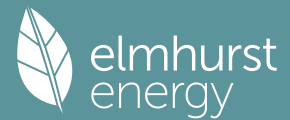
8. Space heating requirement

Utilisation	0.9771	0.9603	0.9258	0.8490	0.7093	0.5130	0.3452	0.3898	0.6445	0.8786	0.9608	0.9811 (94)
Useful gains	737.2889	831.1564	892.0350	894.5330	788.3280	557.1390	358.4158	377.5579	580.1409	710.5854	705.0432	701.8715 (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	1558.6254	1518.1203	1381.2060	1153.3064	880.3475	573.7415	360.6092	381.2949	624.3399	965.2484	1282.4840	1549.0486 (97)
Space heating kWh	611.0744	461.6397	363.9433	186.3169	68.4625	0.0000	0.0000	0.0000	0.0000	189.4693	415.7574	630.2998 (98a)
Space heating requirement - total per year (kWh/year)												2926.9631
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	611.0744	461.6397	363.9433	186.3169	68.4625	0.0000	0.0000	0.0000	0.0000	189.4693	415.7574	630.2998 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2926.9631
Space heating per m ²												(98c) / (4) = 31.4086 (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 %)	88.7000 (206)

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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	611.0744	461.6397	363.9433	186.3169	68.4625	0.0000	0.0000	0.0000	0.0000	189.4693	415.7574	630.2998 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	688.9226	520.4506	410.3081	210.0528	77.1843	0.0000	0.0000	0.0000	0.0000	213.6069	468.7231	710.5973 (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	223.3887	196.5880	206.5770	176.3970	167.3944	146.9357	142.2670	150.1587	154.2687	176.6735	193.5152	220.2807 (64)
Efficiency of water heater												76.4000 (216)
(217)m	85.0351	84.6307	83.8142	82.2594	79.6042	76.4000	76.4000	76.4000	76.4000	82.3061	84.3850	85.1498 (217)
Fuel for water heating, kWh/month	262.7019	232.2893	246.4703	214.4398	210.2834	192.3243	186.2133	196.5428	201.9224	214.6542	229.3241	258.6979 (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	25.7434	20.6523	18.5951	13.6236	10.5233	8.5976	9.5997	12.4780	16.2077	21.2654	24.0192	26.4589 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-31.6574	-45.9094	-67.9529	-78.6836	-86.6909	-81.5557	-80.4722	-74.9956	-65.6627	-53.4178	-35.2225	-27.2103 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-14.6726	-31.4021	-63.7174	-97.7806	-131.3157	-132.7795	-131.0305	-109.7953	-79.0656	-45.4146	-19.7316	-11.5600 (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												3299.8457 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												76.4000
Water heating fuel used												2645.8636 (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)												207.7642 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1597.6964 (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												4641.7770 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3299.8457	3.6400	120.1144 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2645.8636	3.6400	96.3094 (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	207.7642	16.4900	34.2603 (250)
Additional standing charges			92.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-729.4309	16.4900	-120.2832
PV Unit electricity exported	-868.2655	5.5900	-48.5360
Total			-168.8192 (252)
Total energy cost			188.0463 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	0.4899 (257)
SAP value	92.0590
SAP rating (Section 12)	92 (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	3299.8457	0.2100	692.9676 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2645.8636	0.2100	555.6314 (264)
Space and water heating			1248.5989 (265)

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Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	207.7642	0.1443	29.9868 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-729.4309	0.1340	-97.7455
PV Unit electricity exported	-868.2655	0.1253	-108.8097
Total			-206.5553 (269)
Total CO ₂ , kg/year			1083.9597 (272)
CO ₂ emissions per m ²			11.6300 (273)
EI value			89.4891
EI rating			89 (274)
EI band			B

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	35.9700 (1b)	x 2.4000 (2b)	= 86.3280 (1b) - (3b)
First floor	35.9700 (1c)	x 2.6300 (2c)	= 94.6011 (1c) - (3c)
Second floor	21.2500 (1d)	x 2.6100 (2d)	= 55.4625 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.1900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	236.3916 (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) =	0.1692 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	(17)
Infiltration rate	0.3692	(18)
Number of sides sheltered	1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3415 (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	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Effective ac	0.4354	0.4269	0.4184	0.3757	0.3671	0.3244	0.3244	0.3159	0.3415	0.3671	0.3842	0.4013 (22b)
	0.5948	0.5911	0.5875	0.5706	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805 (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
Front door			2.1400	1.1000	2.3540		(26)
Windows (Uw = 1.30)			15.3400	1.2357	18.9563		(27)
Roof light			0.9500	1.2357	1.1740		(27a)
Heatloss Floor 1			35.9700	0.1300	4.6761	110.0000	3956.7000 (28a)
Brick wall	98.9900	17.4800	81.5100	0.1900	15.4869	110.0000	8966.1000 (29a)
Stud wall (0.72)	24.6100		24.6100	0.1100	2.7071	9.0000	221.4900 (29a)
Spandrel wall	13.6300		13.6300	0.2300	3.1349	0.0000	0.0000 (29a)
Plane roof	11.9000		11.9000	0.0900	1.0710	9.0000	107.1000 (30)
Sloping roof	12.7900	0.9500	11.8400	0.1800	2.1312	9.0000	106.5600 (30)
Roof behind studs (0.72)	14.7100		14.7100	0.1100	1.6181	9.0000	132.3900 (30)
Total net area of external elements Aum(A, m ²)			212.6000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	53.3095			(33)
Party Wall 1			55.1500	0.0000	0.0000	70.0000	3860.5000 (32)
Internal Wall 2			119.6700			9.0000	1077.0300 (32c)
Internal Floor			57.1600			18.0000	1028.8800 (32d)
Internal Ceiling 1			57.1600			9.0000	514.4400 (32e)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =	19971.1900			(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K				214.3061			(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.4300	0.0240	0.2743
E3 Sill	8.6000	0.0220	0.1892
E4 Jamb	27.6000	0.0170	0.4692
E5 Ground floor (normal)	16.9700	0.0920	1.5612
E6 Intermediate floor within a dwelling	33.9400	0.0010	0.0339
E11 Eaves (insulation at rafter level)	8.7400	0.0680	0.5943
E13 Gable (insulation at rafter level)	11.2500	0.0940	1.0575
E16 Corner (normal)	10.9000	0.0460	0.5014

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E18 Party wall between dwellings									10.9000	0.0400	0.4360	
P1 Party wall - Ground floor									8.2300	0.0690	0.5679	
P2 Party wall - Intermediate floor within a dwelling									16.4600	0.0000	0.0000	
P5 Party wall - Roof (insulation at rafter level)									11.2500	0.4800	5.4000	
R1 Head of roof window									0.9500	0.1150	0.1092	
R2 Sill of roof window									0.9500	0.1130	0.1074	
R3 Jamb of roof window									2.0600	0.0410	0.0845	
R4 Ridge (vaulted ceiling)									4.3700	0.0440	0.1923	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												11.5783 (36)
Point Thermal bridges												0.0000
Total fabric heat loss											(33) + (36) + (36a) =	64.8879 (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	46.4001	46.1130	45.8315	44.5093	44.2619	43.1104	43.1104	42.8971	43.5540	44.2619	44.7624	45.2855 (38)
Average = Sum(39)m / 12 =	111.2880	111.0008	110.7193	109.3972	109.1498	107.9982	107.9982	107.7850	108.4418	109.1498	109.6502	110.1734 (39)
												109.3960
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1942	1.1911	1.1881	1.1739	1.1713	1.1589	1.1589	1.1566	1.1637	1.1713	1.1766	1.1822 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31
												1.1739
												1.1739

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.6669 (42)
Hot water usage for mixer showers												
Hot water usage for baths												
Hot water usage for other uses												
Average daily hot water use (litres/day)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	140.6446	137.6414	133.9841	128.4227	123.9065	119.0512	117.1853	120.8269	124.6674	129.7646	135.4117	140.2799 (44)
Energy conte	222.7467	195.9996	205.9286	175.8043	166.8020	146.3874	141.7255	149.6089	153.7274	176.0894	192.9188	219.6444 (45)
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:												
Total storage loss												
If cylinder contains dedicated solar storage												
Primary loss												
Combi loss												
Total heat required for water heating calculated for each month												
WWHRS												
PV diverter												
Solar input												
FGHRS												
Output from w/h												
Electric shower(s)												
Heat gains from water heating, kWh/month												
	74.2238	65.3170	68.6334	58.6031	55.6098	48.8109	47.2591	49.8824	51.2497	58.6958	64.2946	73.1908 (65)

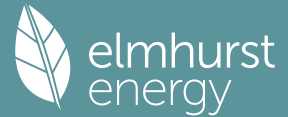
5. Internal gains (see Table 5 and 5a)												

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
Pumps, fans												
Losses e.g. evaporation (negative values) (Table 5)												
Water heating gains (Table 5)												
Total internal gains												
	604.5925	602.5306	583.1482	546.7892	510.4013	474.4434	454.8652	457.8878	476.4552	512.6704	552.8154	587.8986 (73)

6. Solar gains												

[Jan]												
North												
South												
West												
North												
Solar gains	149.9732	262.9605	380.3808	506.9006	601.0405	611.5377	583.3949	510.7545	423.7432	296.1140	180.9832	127.4810 (83)
Total gains	754.5656	865.4911	963.5291	1053.6898	1111.4418	1085.9811	1038.2602	968.6422	900.1985	808.7844	733.7985	715.3796 (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	49.8486	49.9776	50.1046	50.7102	50.8251	51.3671	51.3671	51.4687	51.1570	50.8251	50.5932	50.3529
alpha	4.3232	4.3318	4.3403	4.3807	4.3883	4.4245	4.4245	4.4312	4.4105	4.3883	4.3729	4.3569
util living area	0.9878	0.9772	0.9533	0.8938	0.7757	0.6022	0.4498	0.4987	0.7330	0.9226	0.9784	0.9902 (86)
MIT	19.5696	19.7896	20.1163	20.5072	20.8026	20.9518	20.9893	20.9834	20.8857	20.4978	19.9603	19.5282 (87)
Th 2	19.9246	19.9271	19.9295	19.9409	19.9431	19.9530	19.9530	19.9549	19.9492	19.9431	19.9387	19.9342 (88)
util rest of house	0.9845	0.9711	0.9406	0.8651	0.7198	0.5165	0.3466	0.3916	0.6523	0.8951	0.9714	0.9875 (89)
MIT 2	18.2824	18.5617	18.9710	19.4504	19.7778	19.9245	19.9493	19.9485	19.8711	19.4530	18.7887	18.2366 (90)
Living area fraction									fLA = Living area / (4) =			0.1343 (91)
MIT	18.4553	18.7267	19.1248	19.5924	19.9155	20.0625	20.0890	20.0876	20.0074	19.5933	18.9461	18.4101 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.3053	18.5767	18.9748	19.4424	19.7655	19.9125	19.9390	19.9376	19.8574	19.4433	18.7961	18.2601 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9771	0.9603	0.9258	0.8490	0.7093	0.5130	0.3452	0.3898	0.6445	0.8786	0.9608	0.9811 (94)
Useful gains	737.2889	831.1564	892.0350	894.5330	788.3280	557.1390	358.4158	377.5579	580.1409	710.5854	705.0432	701.8715 (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	1558.6254	1518.1203	1381.2060	1153.3064	880.3475	573.7415	360.6092	381.2949	624.3399	965.2484	1282.4840	1549.0486 (97)
Space heating kWh	611.0744	461.6397	363.9433	186.3169	68.4625	0.0000	0.0000	0.0000	0.0000	189.4693	415.7574	630.2998 (98a)
Space heating requirement - total per year (kWh/year)												2926.9631
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	611.0744	461.6397	363.9433	186.3169	68.4625	0.0000	0.0000	0.0000	0.0000	189.4693	415.7574	630.2998 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2926.9631
Space heating per m2										(98c) / (4) =		31.4086 (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 %)													88.7000 (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	611.0744	461.6397	363.9433	186.3169	68.4625	0.0000	0.0000	0.0000	0.0000	189.4693	415.7574	630.2998 (98)	
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)	
Space heating fuel (main heating system)	688.9226	520.4506	410.3081	210.0528	77.1843	0.0000	0.0000	0.0000	0.0000	213.6069	468.7231	710.5973 (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	223.3887	196.5880	206.5770	176.3970	167.3944	146.9357	142.2670	150.1587	154.2687	176.6735	193.5152	220.2807 (64)	
Efficiency of water heater (217)m	85.0351	84.6307	83.8142	82.2594	79.6042	76.4000	76.4000	76.4000	76.4000	82.3061	84.3850	85.1498 (217)	
Fuel for water heating, kWh/month	262.7019	232.2893	246.4703	214.4398	210.2834	192.3243	186.2133	196.5428	201.9224	214.6542	229.3241	258.6979 (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	25.7434	20.6523	18.5951	13.6236	10.5233	8.5976	9.5997	12.4780	16.2077	21.2654	24.0192	26.4589 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-31.6574	-45.9094	-67.9529	-78.6836	-86.6909	-81.5557	-80.4722	-74.9956	-65.6627	-53.4178	-35.2225	-27.2103 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)	-14.6726	-31.4021	-63.7174	-97.7806	-131.3157	-132.7795	-131.0305	-109.7953	-79.0656	-45.4146	-19.7316	-11.5600 (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													3299.8457 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													76.4000
Water heating fuel used													2645.8636 (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)													207.7642 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-1597.6964 (233)
Wind generation													0.0000 (234)

Full SAP Calculation Printout



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	4641.7770 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3299.8457	5.6000	184.7914 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2645.8636	5.6000	148.1684 (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	207.7642	26.0600	54.1433 (250)
Additional standing charges			99.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-729.4309	26.0600	-190.0897
PV Unit electricity exported	-868.2655	5.8100	-50.4462
Total			-240.5359 (252)
Total energy cost			267.9787 (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	3299.8457	0.2100	692.9676 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2645.8636	0.2100	555.6314 (264)
Space and water heating			1248.5989 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	207.7642	0.1443	29.9868 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-729.4309	0.1340	-97.7455
PV Unit electricity exported	-868.2655	0.1253	-108.8097
Total			-206.5553 (269)
Total CO2, kg/year			1083.9597 (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	3299.8457	1.1300	3728.8256 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2645.8636	1.1300	2989.8259 (278)
Space and water heating			6718.6515 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	207.7642	1.5338	318.6756 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-729.4309	1.4952	-1090.6581
PV Unit electricity exported	-868.2655	0.4600	-399.3810
Total			-1490.0391 (283)
Total Primary energy kWh/year			5677.3888 (286)

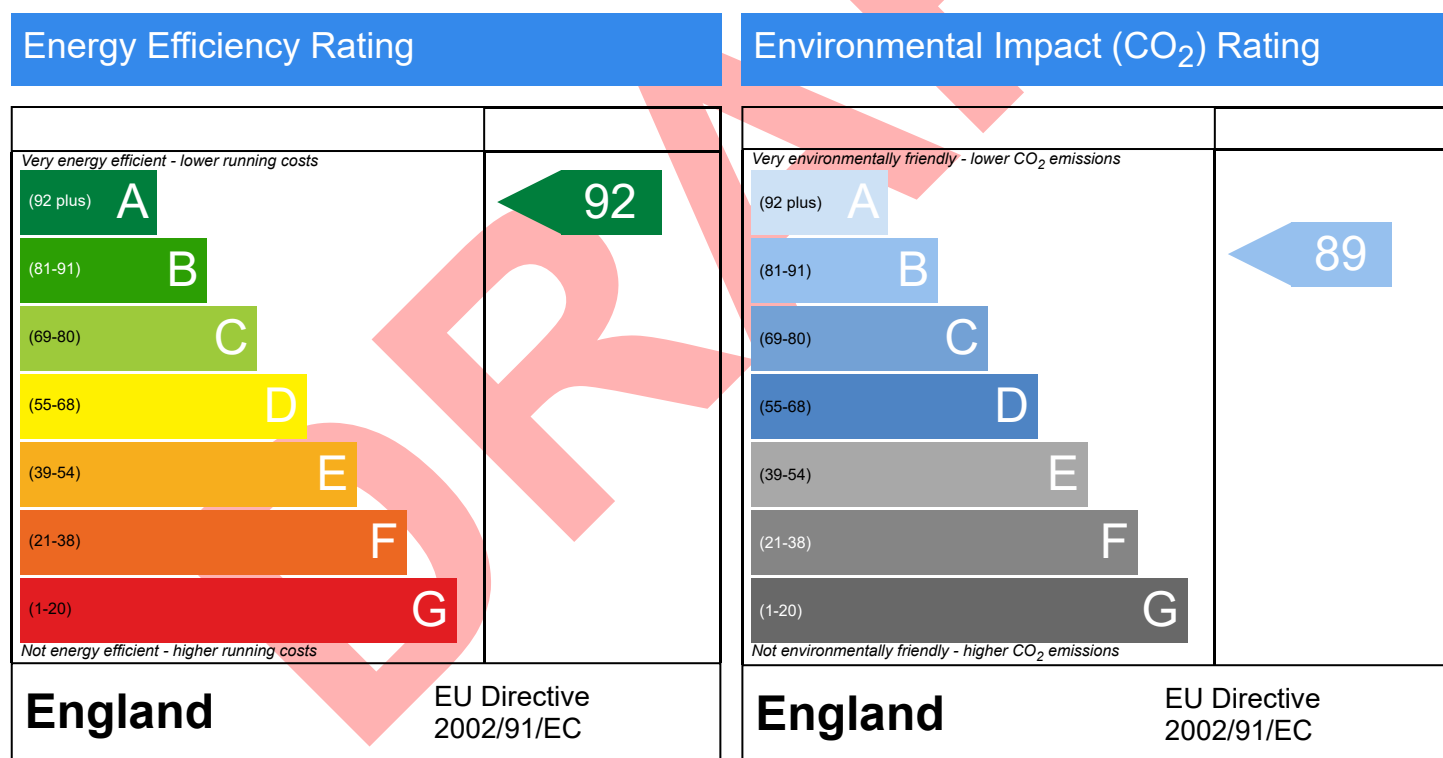
Predicted Energy Assessment



Dwelling type: House, Semi-Detached
Date of assessment: 15/11/2024
Produced by: Victoria Gartside
Total floor area: 93.19 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.