

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 10:34:18

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	106 m ²
Site Reference	SAP VG 21-0282	Plot Reference	Plot 64
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	12.86 kgCO ₂ /m ²
Dwelling carbon dioxide emission rate	12.81 kgCO ₂ /m ² OK

1b Target primary energy rate and dwelling primary energy

Target primary energy	67.52 kWh _{PE} /m ²
Dwelling primary energy	67.36 kWh _{PE} /m ² OK

1c Target fabric energy efficiency and dwelling fabric energy efficiency

Target fabric energy efficiency	44.1 kWh/m ²
Dwelling fabric energy efficiency	41.5 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 (1) (0.19)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	0.16	Exposed floor (0.2)	OK
Roofs	0.16	0.09	Roof (1) (0.09)	OK
Windows, doors, and roof windows	1.6	1.28	Front windows brick (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)	108.11	0.19
Exposed wall: Walls (2)	12.92	0.18
Sheltered wall: Walls (3)	21.32	0.14 (!)
Party wall: Party Wall (1)	69.14	0 (!)
Ground floor: Ground floor , Ground floor	25.41	0.13
Upper floor: Exposed floor , Exposed floor	14.76	0.2
Exposed roof: Roof (1)	40.18	0.09 (!)

2c Openings (better than typically expected values are flagged with a subsequent (!))

Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
Front door, Solid front door	2.14	West	N/A	1.1 (!)
Front windows brick, Windows	7	West	0.7	1.3
Side windows brick, Windows	1.42	North	0.7	1.3
Rear windows brick, Windows	7.21	East	0.7	1.3

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))

Building part 1 - Main Dwelling: Thermal bridging calculated from linear thermal transmittances for each junction

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.024 (!)	MFF-150-E2-02
External wall	E3: Sill	Calculated by person with suitable expertise	0.022 (!)	MFF-150-E3-01
External wall	E4: Jamb	Calculated by person with suitable expertise	0.017 (!)	MFF-150-E4-01
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 (!)	MFF-150-E6-01
External wall	E10: Eaves (insulation at ceiling level)	Calculated by person with suitable expertise	0.06	MFF-150-E10-01
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.056	MFF-150-E12-01
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.046	MFF-150-E16-01
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.088	MFF-150-E17-01
External wall	E20: Exposed floor (normal)	Calculated by person with suitable expertise	0.069	MFF-150-E20-01
External wall	E21: Exposed floor (inverted)	SAP table default	0.32	
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.038 (!)	MFF-150-E18-04
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	P4: Roof (insulation at ceiling level)	SAP table default	0.48	

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	88.6%
Emitter type	Both radiators and underfloor
Flow temperature	
System type	Combi boiler
Manufacturer	Vaillant
Model	ecoTEC sustain 34
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	2.43 kWp	
Orientation	East	
Pitch	30°	
Overshading	None or very little	
Manufacturer	PV	
MCS certificate		
Technology type: Photovoltaic system (2)		
Peak power	0.6 kWp	
Orientation	West	
Pitch	30°	
Overshading	None or very little	
Manufacturer	Front panels	
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 64	Prop Type Ref	SAP VG 21-0282	
Property				

SAP Rating	93 A	DER	12.81	TER	12.86
Environmental	88 B	% DER < TER			0.39
CO ₂ Emissions (t/year)	1.3	DFEE	41.49	TFEE	44.09
Compliance Check	See BREL	% DFEE < TFEE			5.89
% DPER < TPER	0.23	DPER	67.36	TPER	67.52

Assessor Details	Miss Victoria Gartside	Assessor ID	AL30-0001
Client			

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

Orientation	West
Property Tenture	ND
Transaction Type	6
Terrain Type	Suburban
1.0 Property Type	House, Semi-Detached
Which Floor	0
2.0 Number of Storeys	3
3.0 Date Built	2024
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	287.87 kJ/m ² K
7.0 Electricity Tariff	Standard
Smart electricity meter fitted	Yes
Smart gas meter fitted	Yes

7.0 Measurements	Heat Loss Perimeter	Internal Floor Area	Unheated Space Floor Area	Average Storey Height
Ground floor:	17.45 m	25.41 m ²	14.76 m ²	2.84 m
1st Storey:	17.93 m	40.18 m ²		2.39 m
2nd Storey:	17.93 m	40.18 m ²		2.60 m

8.0 Living Area	17.74 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	125.88	108.11	0.00	None	17.77	Enter Gross Area
	Retaining wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.18	110.00	12.92	12.92	0.00	None	0.00	Enter Gross Area
	Garage wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.15	110.00	21.32	21.32	0.55	Garage Single 2 Inside	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	Dense plaster both sides. lightweight aggregate blocks, cavity or cavity fill	0.00	140.00	69.14	0.00	None

9.2 Internal Walls	Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
	Internal Wall	Dense block, plasterboard on dabs	75.00	18.20
	Internal Wall	Plasterboard on timber frame	9.00	146.34

10.0 External Roofs	
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Summary for Input Data



Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Plane roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	40.18	40.18	None	0.00	Enter Gross Area	0.00

10.2 Internal Ceilings

Description	Storey	Construction	Area (m²)
Internal Ceiling 1	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	65.59

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Ground floor	Ground Floor - Solid	Lowest occupied	Other	0.13	None	0.00	0.00	25.41
Exposed floor	Exposed Floor - Timber	Lowest occupied	Timber exposed floor, insulation between joists	0.20	None	0.00	20.00	14.76

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1		Plasterboard ceiling, carpeted chipboard floor	9.00	65.59

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Solid front door	Manufacturer	Solid Door				0.00			1.10
Windows	Manufacturer	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	Solid front door	Brick wall	West	2.14	0
Front windows brick	Windows	Brick wall	West	7.00	0
Side windows brick	Windows	Brick wall	North	1.42	0
Rear windows brick	Windows	Brick wall	East	7.21	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	12.33	0.02	0.02 MFF-150-E2-02	No
E3 Sill	Independently assessed	9.50	0.02	0.02 MFF-150-E3-01	No
E4 Jamb	Independently assessed	30.30	0.02	0.02 MFF-150-E4-01	No
E5 Ground floor (normal)	Independently assessed	20.19	0.09	0.09 Manufacturer Declaration	No
E6 Intermediate floor within a dwelling	Independently assessed	27.87	0.00	0.00 MFF-150-E6-01	No
E10 Eaves (insulation at ceiling level)	Independently assessed	9.10	0.06	0.06 MFF-150-E10-01	No
E12 Gable (insulation at ceiling level)	Independently assessed	8.85	0.06	0.06 MFF-150-E12-01	No
E16 Corner (normal)	Independently assessed	18.50	0.05	0.05 MFF-150-E16-01	No
E17 Corner (inverted – internal area greater than external area)	Independently assessed	5.68	-0.09	-0.09 MFF-150-E17-01	No
E20 Exposed floor (normal)	Independently assessed	7.99	0.07	0.07 MFF-150-E20-01	No
E21 Exposed floor (inverted)	Table K1 - Default	7.51	0.32	0.32	No
E18 Party wall between dwellings	Independently assessed	15.66	0.04	0.04 MFF-150-E18-04	No
P1 Party wall - Ground floor	Independently assessed	8.83	0.07	0.07 Manufacturer Declaration	No
P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	8.83	0.00	0.00	No
P4 Party wall - Roof (insulation at ceiling level)	Table K1 - Default	8.83	0.48	0.48	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 1	Efficacy 85.00	Power 10.00	Capacity 850.00	Count 25					
24.0 Main Heating 1	Database									
Percentage of Heat	100.00				%					
Database Ref. No.	18120									
Fuel Type	Mains gas									
SAP Code	0									
In Winter	88.60									
In Summer	79.60									
Model Name	ecoTEC sustain 34									
Manufacturer	Vaillant									
System Type	Combi boiler									
Controls SAP Code	2110									
Delayed Start Stat	Yes									
Burner Control	Modulating									
HETAS approved System	No									
Flue Type	Balanced									
Fan Assisted Flue	Yes									
Is MHS Pumped	Pump in heated space									
Heating Pump Age	2013 or later									
Heat Emitter	Radiators and Underfloor									
Underfloor Heating	Yes - Pipes in Concrete									
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									
Waste Water Heat Recovery Storage System	No									

Summary for Input Data

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
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32.0 Photovoltaic Unit

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

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

34.0 Small-scale Hydro

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

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

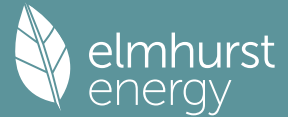
Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout



Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 64			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	93 A	DER	12.81	TER	12.86		
Environmental	88 B	% DER < TER				0.39	
CO ₂ Emissions (t/year)	1.3	DFEE	41.49	TFEE	44.09		
Compliance Check	See BREL	% DFEE < TFEE				5.89	
% DPER < TPER	0.23	DPER	67.36	TPER	67.52		
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	25.4100 (1b)	x 2.8400 (2b)	= 72.1644 (1b) - (3b)
First floor	40.1800 (1c)	x 2.3900 (2c)	= 96.0302 (1c) - (3c)
Second floor	40.1800 (1d)	x 2.6000 (2d)	= 104.4680 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	272.6626 (5)

2. Ventilation rate

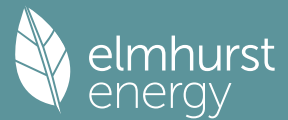
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	6 * 10 = 60.0000 (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) =	60.0000 / (5) = 0.2201 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.4201 (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) = 0.3885 (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	0.4954	0.4857	0.4760	0.4274	0.4177	0.3691	0.3691	0.3594	0.3885	0.4177	0.4371	0.4565 (22b)
Effective ac	0.6227	0.6179	0.6133	0.5913	0.5872	0.5681	0.5681	0.5646	0.5755	0.5872	0.5955	0.6042 (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
Solid front door			2.1400	1.1000	2.3540		(26)
Windows (Uw = 1.30)			15.6300	1.2357	19.3146		(27)
Ground floor			25.4100	0.1300	3.3033	0.0000	0.0000 (28a)
Exposed floor			14.7600	0.2000	2.9520	20.0000	295.2000 (28b)
Brick wall	125.8800	17.7700	108.1100	0.1900	20.5409	110.0000	11892.1000 (29a)
Retaining wall	12.9200		12.9200	0.1800	2.3256	110.0000	1421.2000 (29a)
Garage wall	21.3200		21.3200	0.1400	2.9848	110.0000	2345.2000 (29a)
Plane roof	40.1800		40.1800	0.0900	3.6162	9.0000	361.6200 (30)
Total net area of external elements Aum(A, m ²)			240.4700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	57.3914		(33)
Party Wall 1			69.1400	0.0000	0.0000	140.0000	9679.6000 (32)
Internal Wall			18.2000			75.0000	1365.0000 (32c)
Internal Wall			146.3400			9.0000	1317.0600 (32c)
Internal Floor 1			65.5900			18.0000	1180.6200 (32d)
Internal Ceiling 1			65.5900			9.0000	590.3100 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	30447.9100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							287.8691 (35)

Full SAP Calculation Printout



List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	12.3300	0.0240	0.2959
E2 Other lintels (including other steel lintels)	9.5000	0.0220	0.2090
E3 Sill	30.3000	0.0170	0.5151
E4 Jamb	20.1900	0.0920	1.8575
E5 Ground floor (normal)	27.8700	0.0010	0.0279
E6 Intermediate floor within a dwelling	9.1000	0.0600	0.5460
E10 Eaves (insulation at ceiling level)	8.8500	0.0560	0.4956
E12 Gable (insulation at ceiling level)	18.5000	0.0460	0.8510
E16 Corner (normal)	5.6800	-0.0880	-0.4998
E17 Corner (inverted - internal area greater than external area)	7.9900	0.0690	0.5513
E20 Exposed floor (normal)	7.5100	0.3200	2.4032
E21 Exposed floor (inverted)	15.6600	0.0380	0.5951
E18 Party wall between dwellings	8.8300	0.0690	0.6093
P1 Party wall - Ground floor	8.8300	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	8.8300	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	8.8300	0.4800	4.2384
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			12.6954 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	70.0868 (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	56.0306	55.6019	55.1816	53.2077	52.8384	51.1191	51.1191	50.8008	51.7814	52.8384	53.5855	54.3666 (38)
Heat transfer coeff	126.1174	125.6887	125.2684	123.2945	122.9252	121.2060	121.2060	120.8876	121.8682	122.9252	123.6723	124.4534 (39)
Average = Sum(39)m / 12 =												123.2927
HLP	1.1924	1.1883	1.1843	1.1657	1.1622	1.1459	1.1459	1.1429	1.1522	1.1622	1.1693	1.1766 (40)
HLP (average)												1.1657
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7869 (42)
Hot water usage for mixer showers													
70.9471	69.8809	68.3272	65.3546	63.1608	60.7144	59.3238	60.8657	62.5559	65.1827	68.2192	70.6752 (42a)		
Hot water usage for baths													
30.6328	30.1778	29.5372	28.3559	27.4714	26.4907	25.9609	26.5971	27.2897	28.3392	29.5448	30.5292 (42b)		
Hot water usage for other uses													
43.1707	41.6009	40.0310	38.4612	36.8913	35.3215	35.3215	36.8913	38.4612	40.0310	41.6009	43.1707 (42c)		
Average daily hot water use (litres/day)													133.0583 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	144.7505	141.6596	137.8954	132.1717	127.5236	122.5266	120.6062	124.3541	128.3069	133.5529	139.3648	144.3752 (44)	
Energy conte	229.2495	201.7213	211.9401	180.9364	171.6713	150.6607	145.8628	153.9764	158.2152	181.2300	198.5507	226.0566 (45)	
Energy content (annual)										Total = Sum(45)m =		2210.0711	
Distribution loss (46)m = 0.15 x (45)m													
34.3874	30.2582	31.7910	27.1405	25.7507	22.5991	21.8794	23.0965	23.7323	27.1845	29.7826	33.9085 (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	2.5528	2.3647	2.6361	2.4472	2.4735	2.3138	2.2934	2.3113	2.2561	2.4036	2.4141	2.5334 (61)	
Total heat required for water heating calculated for each month													
231.8023	204.0860	214.5762	183.3837	174.1448	152.9745	148.1562	156.2877	160.4713	183.6337	200.9648	228.5900 (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	231.8023	204.0860	214.5762	183.3837	174.1448	152.9745	148.1562	156.2877	160.4713	183.6337	200.9648	228.5900 (64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2239.0711 (64)	
Electric shower(s)												2239 (64)	
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													
76.8636	67.6635	71.1291	60.7732	57.6991	50.6731	49.0727	51.7750	53.1706	60.8599	66.6216	75.7972 (65)		

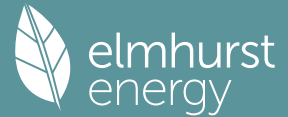
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	141.9174	157.1228	141.9174	146.6480	141.9174	146.6480	141.9174	141.9174	146.6480	141.9174	146.6480	141.9174 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	265.3326	268.0859	261.1477	246.3769	227.7314	210.2073	198.5001	195.7468	202.6851	217.4559	236.1013	253.6254 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345 (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)	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763 (71)
Water heating gains (Table 5)	103.3114	100.6898	95.6036	84.4072	77.5525	70.3794	65.9580	69.5900	73.8480	81.8009	92.5301	101.8779 (72)
Total internal gains	578.3650	593.7021	566.4723	545.2356	515.0049	492.0382	471.1791	472.0578	487.9847	508.9778	543.0830	565.2243 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	1.4200	10.6334	0.7300	0.7000	0.7700	5.3471 (74)
East	7.2100	19.6403	0.7300	0.7000	0.7700	50.1460 (76)

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West	7.0000		19.6403		0.7300		0.7000		0.7700		48.6855 (80)	
Solar gains	104.1786	203.5539	335.7596	492.2521	606.6636	622.7884	592.1794	506.2095	391.1845	241.5726	129.8276	85.7318 (83)
Total gains	682.5436	797.2561	902.2319	1037.4877	1121.6685	1114.8266	1063.3584	978.2673	879.1691	750.5504	672.9105	650.9561 (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	67.0625	67.2913	67.5170	68.5980	68.8041	69.7800	69.7800	69.9638	69.4008	68.8041	68.3884	67.9592
alpha	5.4708	5.4861	5.5011	5.5732	5.5869	5.6520	5.6520	5.6643	5.6267	5.5869	5.5592	5.5306
util living area	0.9986	0.9963	0.9892	0.9557	0.8561	0.6659	0.4964	0.5582	0.8296	0.9783	0.9967	0.9989 (86)
MIT	20.5098	20.5540	20.6230	20.7201	20.7921	20.8278	20.8341	20.8334	20.8094	20.7105	20.5961	20.5072 (87)
Th 2	19.9261	19.9294	19.9325	19.9476	19.9504	19.9635	19.9635	19.9659	19.9584	19.9504	19.9447	19.9387 (88)
util rest of house	0.9980	0.9949	0.9847	0.9372	0.8024	0.5713	0.3823	0.4383	0.7489	0.9659	0.9951	0.9985 (89)
MIT 2	19.3360	19.3955	19.4862	19.6204	19.7036	19.7484	19.7519	19.7544	19.7301	19.6136	19.4639	19.3445 (90)
Living area fraction	19.5329	19.5898	19.6769	19.8049	19.8861	19.9294	19.9334	19.9354	19.9111	fLA = Living area / (4) =	19.6538	0.1677 (91)
MIT	19.5329	19.5898	19.6769	19.8049	19.8861	19.9294	19.9334	19.9354	19.9111	19.7976	19.6538	19.5395 (92)
Temperature adjustment	19.3829	19.4398	19.5269	19.6549	19.7361	19.7794	19.7834	19.7854	19.7611	19.6476	19.5038	-0.1500
adjusted MIT	19.3829	19.4398	19.5269	19.6549	19.7361	19.7794	19.7834	19.7854	19.7611	19.6476	19.5038	19.3895 (93)

8. Space heating requirement												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9976	0.9940	0.9825	0.9308	0.7896	0.5533	0.3621	0.4166	0.7307	0.9609	0.9942	0.9982 (94)
Useful gains	680.9349	792.4887	886.4099	965.6680	885.6172	616.8553	385.0460	407.5355	642.4142	721.2347	669.0232	649.7813 (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	1902.2173	1827.4927	1631.8533	1326.0167	987.8438	627.7740	385.8454	409.2504	689.9064	1112.1793	1534.0087	1890.3849 (97)
Space heating kWh	908.6341	695.5227	554.6099	259.4510	76.0566	0.0000	0.0000	0.0000	0.0000	290.8628	622.7895	923.0091 (98a)
Space heating requirement - total per year (kWh/year)												4330.9357
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	908.6341	695.5227	554.6099	259.4510	76.0566	0.0000	0.0000	0.0000	0.0000	290.8628	622.7895	923.0091 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4330.9357
Space heating per m2										(98c) / (4) =		40.9467 (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 %)												88.6000 (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	908.6341	695.5227	554.6099	259.4510	76.0566	0.0000	0.0000	0.0000	0.0000	290.8628	622.7895	923.0091 (98)
Space heating efficiency (main heating system 1)	88.6000	88.6000	88.6000	88.6000	88.6000	0.0000	0.0000	0.0000	0.0000	88.6000	88.6000	88.6000 (210)
Space heating fuel (main heating system)	1025.5464	785.0143	625.9706	292.8341	85.8426	0.0000	0.0000	0.0000	0.0000	328.2875	702.9227	1041.7710 (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	231.8023	204.0860	214.5762	183.3837	174.1448	152.9745	148.1562	156.2877	160.4713	183.6337	200.9648	228.5900 (64)
Efficiency of water heater (217)m	86.6096	86.3842	85.8909	84.6371	82.1362	79.6000	79.6000	79.6000	79.6000	84.8856	86.2217	79.6000 (216)
Fuel for water heating, kWh/month	267.6404	236.2538	249.8242	216.6705	212.0194	192.1791	186.1258	196.3413	201.5971	216.3306	233.0792	86.6552 (217)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	28.8849	23.1726	20.8643	15.2861	11.8074	9.6468	10.7711	14.0007	18.1855	23.8604	26.9503	29.6877 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-33.0601	-51.3704	-81.6378	-98.5308	-109.6129	-103.2046	-101.4318	-93.7910	-79.9001	-61.4567	-37.5969	-27.7837 (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	-14.9249	-36.2530	-85.9866	-150.0681	-216.2967	-224.4244	-218.8576	-173.8982	-112.6673	-55.7180	-20.8495	-11.3176 (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												4888.1893 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.6000
Water heating fuel used												2671.8541 (219)
Space cooling fuel												0.0000 (221)

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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)	233.1179 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2200.6387 (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	5678.5225 (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	4888.1893	0.2100	1026.5197 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2671.8541	0.2100	561.0894 (264)
Space and water heating			1587.6091 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	233.1179	0.1443	33.6461 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-879.3767	0.1332	-117.1173
PV Unit electricity exported	-1321.2619	0.1223	-161.6557
Total			-278.7731 (269)
Total CO2, kg/year			1354.4114 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.8100 (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	4888.1893	1.1300	5523.6539 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2671.8541	1.1300	3019.1951 (278)
Space and water heating			8542.8489 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	233.1179	1.5338	357.5639 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-879.3767	1.4921	-1312.1603
PV Unit electricity exported	-1321.2619	0.4489	-593.1622
Total			-1905.3225 (283)
Total Primary energy kWh/year			7125.1912 (286)
Dwelling Primary energy Rate (DPER)			67.3600 (287)

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

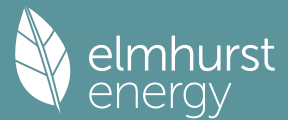
1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	25.4100 (1b)	x 2.8400 (2b)	= 72.1644 (1b) - (3b)
First floor	40.1800 (1c)	x 2.3900 (2c)	= 96.0302 (1c) - (3c)
Second floor	40.1800 (1d)	x 2.6000 (2d)	= 104.4680 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	272.6626 (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) = 0.1467 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3967 (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) = 0.3669 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4679	0.4587	0.4495	0.4036	0.3945	0.3486	0.3486	0.3394	0.3669	0.3945	0.4128	0.4312 (22b)
	0.6094	0.6052	0.6010	0.5815	0.5778	0.5608	0.5608	0.5576	0.5673	0.5778	0.5852	0.5930 (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)			15.6300	1.1450	17.8969		(27)
Ground floor			25.4100	0.1300	3.3033		(28a)
Exposed floor			14.7600	0.1300	1.9188		(28b)
Brick wall	125.8800	17.7700	108.1100	0.1800	19.4598		(29a)
Retaining wall	12.9200		12.9200	0.1800	2.3256		(29a)
Garage wall	21.3200		21.3200	0.1800	3.8376		(29a)
Plane roof	40.1800		40.1800	0.1100	4.4198		(30)
Total net area of external elements Aum(A, m2)			240.4700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	55.3018		(33)
Party Wall 1			69.1400	0.0000	0.0000		(32)

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

287.8691 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	12.3300	0.0500	0.6165
E3 Sill	9.5000	0.0500	0.4750
E4 Jamb	30.3000	0.0500	1.5150
E5 Ground floor (normal)	20.1900	0.1600	3.2304
E6 Intermediate floor within a dwelling	27.8700	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	9.1000	0.0600	0.5460
E12 Gable (insulation at ceiling level)	8.8500	0.0600	0.5310
E16 Corner (normal)	18.5000	0.0900	1.6650
E17 Corner (inverted - internal area greater than external area)	5.6800	-0.0900	-0.5112
E20 Exposed floor (normal)	7.9900	0.3200	2.5568
E21 Exposed floor (inverted)	7.5100	0.3200	2.4032
E18 Party wall between dwellings	15.6600	0.0600	0.9396
P1 Party wall - Ground floor	8.8300	0.0800	0.7064
P2 Party wall - Intermediate floor within a dwelling	8.8300	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	8.8300	0.1200	1.0596

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

15.7333 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 71.0351 (37)

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

(38)m	Jan 54.8372	Feb 54.4548	Mar 54.0799	Apr 52.3194	May 51.9900	Jun 50.4566	Jul 50.4566	Aug 50.1726	Sep 51.0472	Oct 51.9900	Nov 52.6563	Dec 53.3530 (38)
Heat transfer coeff	125.8723	125.4899	125.1151	123.3545	123.0251	121.4917	121.4917	121.2077	122.0824	123.0251	123.6915	124.3881 (39)
Average = Sum(39)m / 12 =												123.3529

HLP	Jan 1.1901	Feb 1.1864	Mar 1.1829	Apr 1.1663	May 1.1631	Jun 1.1486	Jul 1.1486	Aug 1.1460	Sep 1.1542	Oct 1.1631	Nov 1.1694	Dec 1.1760 (40)
HLP (average)												1.1662
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

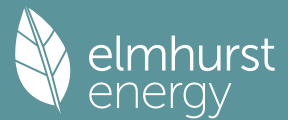
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7869 (42)
Hot water usage for mixer showers												
70.9471	69.8809	68.3272	65.3546	63.1608	60.7144	59.3238	60.8657	62.5559	65.1827	68.2192	70.6752 (42a)	
Hot water usage for baths												
30.6328	30.1778	29.5372	28.3559	27.4714	26.4907	25.9609	26.5971	27.2897	28.3392	29.5448	30.5292 (42b)	
Hot water usage for other uses												
43.1707	41.6009	40.0310	38.4612	36.8913	35.3215	35.3215	36.8913	38.4612	40.0310	41.6009	43.1707 (42c)	
Average daily hot water use (litres/day)												133.0583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	144.7505	141.6596	137.8954	132.1717	127.5236	122.5266	120.6062	124.3541	128.3069	133.5529	139.3648	144.3752 (44)
Energy content (annual)	229.2495	201.7213	211.9401	180.9364	171.6713	150.6607	145.8628	153.9764	158.2152	181.2300	198.5507	226.0566 (45)
Distribution loss (46)m = 0.15 x (45)m	34.3874	30.2582	31.7910	27.1405	25.7507	22.5991	21.8794	23.0965	23.7323	27.1845	29.7826	33.9085 (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												
	280.2084	247.7487	262.8990	230.2515	222.6302	199.9758	196.8217	204.9353	207.5303	232.1889	247.8658	277.0155 (62)
WWHRS	-32.4340	-28.6849	-30.0372	-24.8720	-23.1798	-19.8351	-18.5923	-19.7710	-20.5222	-24.1934	-27.4082	-31.8334 (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	247.7744	219.0638	232.8618	205.3795	199.4504	180.1406	178.2294	185.1643	187.0081	207.9955	220.4576	245.1821 (64)
								Total per year (kWh/year) =	Sum(64)m =			2508.7076 (64)
12Total per year (kWh/year)												2509 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) =												
Heat gains from water heating, kWh/month	88.9652	78.5792	83.2098	72.4901	69.8204	62.4234	61.2391	63.9369	64.9353	72.9987	78.3469	87.9035 (65)

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

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Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	141.9174	157.1228	141.9174	146.6480	141.9174	146.6480	141.9174	141.9174	146.6480	141.9174	146.6480	141.9174	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	265.3326	268.0859	261.1477	246.3769	227.7314	210.2073	198.5001	195.7468	202.6851	217.4559	236.1013	253.6254	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	(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)	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	(71)
Water heating gains (Table 5)	119.5769	116.9333	111.8411	100.6807	93.8447	86.6992	82.3106	85.9367	90.1879	98.1165	108.8151	118.1499	(72)
Total internal gains	594.6305	609.9457	582.7098	561.5092	531.2971	508.3581	487.5317	488.4045	504.3246	525.2934	559.3680	581.4964	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North				1.4200	10.6334		0.6300	0.7000	0.7700		4.6146 (74)	
East				7.2100	19.6403		0.6300	0.7000	0.7700		43.2767 (76)	
West				7.0000	19.6403		0.6300	0.7000	0.7700		42.0162 (80)	
Solar gains	89.9075	175.6698	289.7652	424.8203	523.5590	537.4749	511.0589	436.8657	337.5975	208.4804	112.0430	73.9877 (83)
Total gains	684.5380	785.6155	872.4750	986.3295	1054.8561	1045.8330	998.5907	925.2702	841.9222	733.7738	671.4110	655.4841 (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	67.1931	67.3979	67.5998	68.5646	68.7482	69.6159	69.6159	69.7790	69.2791	68.7482	68.3778	67.9949
alpha	5.4795	5.4932	5.5067	5.5710	5.5832	5.6411	5.6411	5.6519	5.6186	5.5832	5.5585	5.5330
util living area	0.9986	0.9966	0.9907	0.9639	0.8803	0.7018	0.5279	0.5884	0.8491	0.9804	0.9967	0.9989 (86)
MIT	19.7244	19.8866	20.1449	20.5108	20.8053	20.9606	20.9933	20.9881	20.8847	20.4941	20.0525	19.7067 (87)
Th 2	19.9280	19.9309	19.9337	19.9471	19.9496	19.9613	19.9613	19.9635	19.9568	19.9496	19.9445	19.9392 (88)
util rest of house	0.9980	0.9952	0.9868	0.9482	0.8313	0.6058	0.4074	0.4634	0.7719	0.9690	0.9952	0.9984 (89)
MIT 2	18.4464	18.6558	18.9867	19.4519	19.7896	19.9407	19.9595	19.9598	19.8812	19.4405	18.8787	18.4319 (90)
Living area fraction	fLA = Living area / (4) = 0.1677 (91)											
MIT	18.6607	18.8622	19.1809	19.6295	19.9600	20.1117	20.1329	20.1323	20.0495	19.6173	19.0756	18.6457 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.6607	18.8622	19.1809	19.6295	19.9600	20.1117	20.1329	20.1323	20.0495	19.6173	19.0756	18.6457 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9970	0.9932	0.9829	0.9421	0.8318	0.6206	0.4277	0.4845	0.7799	0.9639	0.9932	0.9976	(94)
Useful gains	682.4548	780.2986	857.5849	929.2300	877.4495	649.0893	427.1187	448.2988	656.6000	707.3172	666.8714	653.9106	(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	1807.6200	1752.1193	1586.5739	1323.5342	1016.1837	669.6302	429.2159	452.3851	726.3317	1109.3493	1481.2777	1796.8759	(97)
Space heating kWh	837.1229	653.0635	542.3678	283.8990	103.2183	0.0000	0.0000	0.0000	0.0000	299.1118	586.3725	850.3662	(98a)
Space heating requirement - total per year (kWh/year)												4155.5221	
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	837.1229	653.0635	542.3678	283.8990	103.2183	0.0000	0.0000	0.0000	0.0000	299.1118	586.3725	850.3662	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4155.5221	
Space heating per m2										(98c) / (4) =		39.2883	(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	837.1229	653.0635	542.3678	283.8990	103.2183	0.0000	0.0000	0.0000	0.0000	299.1118	586.3725	850.3662	(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)	905.9772	706.7787	586.9781	307.2499	111.7081	0.0000	0.0000	0.0000	0.0000	323.7141	634.6023	920.3098	(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	247.7744	219.0638	232.8618	205.3795	199.4504	180.1406	178.2294	185.1643	187.0081	207.9955	220.4576	245.1821	(64)
Efficiency of water heater	86.7775	86.5711	86.1292	85.0754	83.0395	80.3000	80.3000	80.3000	80.3000	85.1592	86.3724	86.8191	(216)
Fuel for water heating, kWh/month													(217)

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	285.5285	253.0449	270.3633	241.4088	240.1874	224.3345	221.9545	230.5907	232.8868	244.2433	255.2407	282.4058	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	29.4876	23.6561	21.2997	15.6051	12.0538	9.8481	10.9959	14.2929	18.5650	24.3583	27.5126	30.3072	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.9155	-55.5613	-80.8490	-92.0318	-100.1559	-93.7669	-92.5734	-86.9330	-77.1467	-64.0142	-43.0168	-33.5605	(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	-19.9013	-42.0938	-84.1047	-126.9762	-168.5551	-169.6411	-167.6836	-141.7059	-103.4811	-60.4596	-26.6523	-15.7233	(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												4497.3183	(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												2982.1891	(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)												237.9821	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1985.5029	(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												5817.9866	(238)

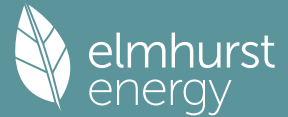
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4497.3183	0.2100	944.4368 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2982.1891	0.2100	626.2597 (264)
Space and water heating			1570.6965 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	237.9821	0.1443	34.3482 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-858.5249	0.1343	-115.3320
PV Unit electricity exported	-1126.9779	0.1257	-141.7033
Total			-257.0353 (269)
Total CO2, kg/year			1359.9387 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.8600 (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	4497.3183	1.1300	5081.9696 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2982.1891	1.1300	3369.8737 (278)
Space and water heating			8451.8433 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	237.9821	1.5338	365.0249 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-858.5249	1.4965	-1284.7605
PV Unit electricity exported	-1126.9779	0.4615	-520.1396
Total			-1804.9001 (283)
Total Primary energy kWh/year			7142.0689 (286)
Target Primary Energy Rate (TPER)			67.5200 (287)

Full SAP Calculation Printout



Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024		
Assessment Reference	Plot 64			Prop Type Ref	SAP VG 21-0282			
Property								
SAP Rating	93 A		DER	12.81		TER	12.86	
Environmental	88 B		% DER < TER				0.39	
CO ₂ Emissions (t/year)	1.3		DFEE	41.49		TFEE	44.09	
Compliance Check	See BREL		% DFEE < TFEE				5.89	
% DPER < TPER	0.23		DPER	67.36		TPER	67.52	
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	25.4100 (1b)	x 2.8400 (2b)	= 72.1644 (1b) - (3b)
First floor	40.1800 (1c)	x 2.3900 (2c)	= 96.0302 (1c) - (3c)
Second floor	40.1800 (1d)	x 2.6000 (2d)	= 104.4680 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	272.6626 (5)

2. Ventilation rate

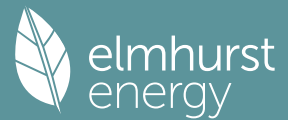
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1467 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3467 (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) = 0.3207 (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	0.4089	0.4009	0.3929	0.3528	0.3448	0.3047	0.3047	0.2966	0.3207	0.3448	0.3608	0.3768 (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	0.5836	0.5803	0.5772	0.5622	0.5594	0.5464	0.5464	0.5440	0.5514	0.5594	0.5651	0.5710 (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
Solid front door			2.1400	1.1000	2.3540		(26)
Windows (Uw = 1.30)			15.6300	1.2357	19.3146		(27)
Ground floor			25.4100	0.1300	3.3033	0.0000	0.0000 (28a)
Exposed floor			14.7600	0.2000	2.9520	20.0000	295.2000 (28b)
Brick wall	125.8800	17.7700	108.1100	0.1900	20.5409	110.0000	11892.1000 (29a)
Retaining wall	12.9200		12.9200	0.1800	2.3256	110.0000	1421.2000 (29a)
Garage wall	21.3200		21.3200	0.1400	2.9848	110.0000	2345.2000 (29a)
Plane roof	40.1800		40.1800	0.0900	3.6162	9.0000	361.6200 (30)
Total net area of external elements A _{um} (A, m ²)			240.4700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	57.3914		(33)
Party Wall 1			69.1400	0.0000	0.0000	140.0000	9679.6000 (32)
Internal Wall			18.2000			75.0000	1365.0000 (32c)
Internal Wall			146.3400			9.0000	1317.0600 (32c)
Internal Floor 1			65.5900			18.0000	1180.6200 (32d)
Internal Ceiling 1			65.5900			9.0000	590.3100 (32e)

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Heat capacity $C_m = \text{Sum}(A \times k)$
Thermal mass parameter (TMP) = C_m / TFA in $\text{kJ/m}^2\text{K}$
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
E10 Eaves (insulation at ceiling level)
E12 Gable (insulation at ceiling level)
E16 Corner (normal)
E17 Corner (inverted - internal area greater than external area)
E20 Exposed floor (normal)
E21 Exposed floor (inverted)
E18 Party wall between dwellings
P1 Party wall - Ground floor
P2 Party wall - Intermediate floor within a dwelling
P4 Party wall - Roof (insulation at ceiling level)

(28)...(30) + (32) + (32a)...(32e) = 30447.9100 (34)
287.8691 (35)

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 70.0868 (37)

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	52.5112	52.2191	51.9328	50.5881	50.3365	49.1652	49.1652	48.9483	49.6164	50.3365	50.8454	51.3776	(38)
Heat transfer coeff	122.5980	122.3059	122.0196	120.6749	120.4233	119.2521	119.2521	119.0352	119.7032	120.4233	120.9323	121.4644	(39)
Average = Sum(39)m / 12 =												120.6737	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1591	1.1563	1.1536	1.1409	1.1385	1.1275	1.1275	1.1254	1.1317	1.1385	1.1434	1.1484	(40)
HLP (average)												1.1409	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7869 (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													
30.6328	30.1778	29.5372	28.3559	27.4714	26.4907	25.9609	26.5971	27.2897	28.3392	29.5448	30.5292	30.5292	(42b)
Hot water usage for other uses													
43.1707	41.6009	40.0310	38.4612	36.8913	35.3215	35.3215	36.8913	38.4612	40.0310	41.6009	43.1707	43.1707	(42c)
Average daily hot water use (litres/day)												67.6475	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	73.8035	71.7787	69.5682	66.8171	64.3628	61.8122	61.2824	63.4884	65.7509	68.3702	71.1456	73.6999	(44)
Energy content (annual)	116.8867	102.2119	106.9237	91.4693	86.6447	76.0053	74.1157	78.6119	81.0775	92.7778	101.3600	115.3963	(45)
Distribution loss (46)m = $0.15 \times (45)\text{m}$	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	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													
99.3537	86.8801	90.8852	77.7489	73.6480	64.6045	62.9984	66.8201	68.9158	78.8611	86.1560	98.0868	98.0868	(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	99.3537	86.8801	90.8852	77.7489	73.6480	64.6045	62.9984	66.8201	68.9158	78.8611	86.1560	98.0868	(64)
Total per year (kWh/year)												954.9586	(64)
Electric shower(s)	56.8168	50.6242	55.2797	52.7527	53.7426	51.2652	52.9741	53.7426	52.7527	55.2797	54.2402	56.8168	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												646.2874	(64a)
Heat gains from water heating, kWh/month													
39.0426	34.3761	36.5412	32.6254	31.8476	28.9674	28.9931	30.1407	30.4171	33.5352	35.0991	38.7259	38.7259	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
141.9174	157.1228	141.9174	146.6480	141.9174	146.6480	141.9174	141.9174	141.9174	146.6480	141.9174	146.6480	141.9174	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
265.3326	268.0859	261.1477	246.3769	227.7314	210.2073	198.5001	195.7468	202.6851	217.4559	236.1013	253.6254	253.6254	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	(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)													
-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	(71)
Water heating gains (Table 5)													
52.4766	51.1549	49.1145	45.3131	42.8060	40.2325	38.9692	40.5117	42.2460	45.0742	48.7487	52.0509	52.0509	(72)
Total internal gains	524.5302	541.1673	516.9832	503.1415	477.2584	461.8914	444.1904	442.9795	456.3827	469.2511	496.3016	512.3974	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
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North	1.4200	10.6334	0.7300	0.7000	0.7700	5.3471 (74)
East	7.2100	19.6403	0.7300	0.7000	0.7700	50.1460 (76)
West	7.0000	19.6403	0.7300	0.7000	0.7700	48.6855 (80)

Solar gains	104.1786	203.5539	335.7596	492.2521	606.6636	622.7884	592.1794	506.2095	391.1845	241.5726	129.8276	85.7318 (83)
Total gains	628.7088	744.7212	852.7428	995.3936	1083.9220	1084.6798	1036.3697	949.1889	847.5672	710.8236	626.1292	598.1292 (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	68.9877	69.1524	69.3147	70.0871	70.2335	70.9233	70.9233	71.0525	70.6560	70.2335	69.9379	69.6315
alpha	5.5992	5.6102	5.6210	5.6725	5.6822	5.7282	5.7282	5.7368	5.7104	5.6822	5.6625	5.6421
util living area	0.9991	0.9973	0.9914	0.9607	0.8639	0.6729	0.5012	0.5662	0.8398	0.9823	0.9977	0.9993 (86)
MIT	19.7173	19.8911	20.1643	20.5433	20.8336	20.9697	20.9952	20.9908	20.8963	20.4975	20.0429	19.6937 (87)
Th 2	19.9529	19.9551	19.9573	19.9676	19.9695	19.9785	19.9785	19.9801	19.9750	19.9695	19.9656	19.9615 (88)
util rest of house	0.9987	0.9963	0.9878	0.9441	0.8121	0.5790	0.3877	0.4465	0.7616	0.9719	0.9965	0.9990 (89)
MIT 2	18.7860	18.9611	19.2338	19.6087	19.8646	19.9664	19.9775	19.9780	19.9226	19.5728	19.1212	18.7693 (90)
Living area fraction	fLA = Living area / (4) =											0.1677 (91)
MIT	18.9422	19.1171	19.3899	19.7655	20.0271	20.1347	20.1482	20.1478	20.0859	19.7279	19.2758	18.9243 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.9422	19.1171	19.3899	19.7655	20.0271	20.1347	20.1482	20.1478	20.0859	19.7279	19.2758	18.9243 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9982	0.9951	0.9851	0.9400	0.8154	0.5941	0.4068	0.4667	0.7713	0.9686	0.9954	0.9986 (94)
Useful gains	627.5596	741.0505	840.0158	935.6722	883.7931	644.4561	421.6425	442.9963	653.7261	688.5166	623.2802	597.3043 (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	1795.1033	1738.8299	1572.8199	1311.1907	1002.7827	660.0190	423.1254	446.1248	716.5316	1099.2125	1472.4462	1788.4782 (97)
Space heating kWh	868.6525	670.5078	545.2063	270.3733	88.5283	0.0000	0.0000	0.0000	0.0000	305.5577	611.3995	886.2334 (98a)
Space heating requirement - total per year (kWh/year)	4246.4589											
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	868.6525	670.5078	545.2063	270.3733	88.5283	0.0000	0.0000	0.0000	0.0000	305.5577	611.3995	886.2334 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	4246.4589											
Space heating per m2	(98c) / (4) = 40.1480 (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	1120.9695	882.4653	904.6674	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8802	0.9388	0.9077	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	986.6670	828.4914	821.1254	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1204.5730	1151.0595	1052.0312	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	156.8923	239.9906	171.7939	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	39.2231	59.9977	42.9485	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												142.1692 (107)
Energy for space heating												40.1480 (99)
Energy for space cooling												1.3441 (108)
Total												41.4922 (109)
Fabric Energy Efficiency (DFEE)												41.5 (109)

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

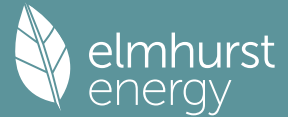
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	25.4100 (1b)	x 2.8400 (2b)	= 72.1644 (1b) - (3b)
First floor	40.1800 (1c)	x 2.3900 (2c)	= 96.0302 (1c) - (3c)
Second floor	40.1800 (1d)	x 2.6000 (2d)	= 104.4680 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 272.6626 (5)

2. Ventilation rate

m3 per hour

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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

0 * 80 = 0.0000 (6a)
0 * 20 = 0.0000 (6b)
0 * 10 = 0.0000 (6c)
0 * 20 = 0.0000 (6d)
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) = 0.1467 (8)
Pressure test
Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered
Blower Door
5.0000 (17)
0.3967 (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) = 0.3669 (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	0.4679	0.4587	0.4495	0.4036	0.3945	0.3486	0.3486	0.3394	0.3669	0.3945	0.4128	0.4312 (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	0.6094	0.6052	0.6010	0.5815	0.5778	0.5608	0.5608	0.5576	0.5673	0.5778	0.5852	0.5930 (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)			15.6300	1.1450	17.8969		(27)
Ground floor			25.4100	0.1300	3.3033		(28a)
Exposed floor			14.7600	0.1300	1.9188		(28b)
Brick wall	125.8800	17.7700	108.1100	0.1800	19.4598		(29a)
Retaining wall	12.9200		12.9200	0.1800	2.3256		(29a)
Garage wall	21.3200		21.3200	0.1800	3.8376		(29a)
Plane roof	40.1800		40.1800	0.1100	4.4198		(30)
Total net area of external elements Aum(A, m2)			240.4700				(31)
Fabric heat loss, W/K = Sum (A x U)					55.3018		(33)
Party Wall 1			69.1400	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 287.8691 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	12.3300	0.0500	0.6165
E3 Sill	9.5000	0.0500	0.4750
E4 Jamb	30.3000	0.0500	1.5150
E5 Ground floor (normal)	20.1900	0.1600	3.2304
E6 Intermediate floor within a dwelling	27.8700	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	9.1000	0.0600	0.5460
E12 Gable (insulation at ceiling level)	8.8500	0.0600	0.5310
E16 Corner (normal)	18.5000	0.0900	1.6650
E17 Corner (inverted - internal area greater than external area)	5.6800	-0.0900	-0.5112
E20 Exposed floor (normal)	7.9900	0.3200	2.5568
E21 Exposed floor (inverted)	7.5100	0.3200	2.4032
E18 Party wall between dwellings	15.6600	0.0600	0.9396
P1 Party wall - Ground floor	8.8300	0.0800	0.7064
P2 Party wall - Intermediate floor within a dwelling	8.8300	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	8.8300	0.1200	1.0596

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.7333 (36)

Point Thermal Bridges

Total fabric heat loss (33) + (36) + (36a) = 71.0351 (37)

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

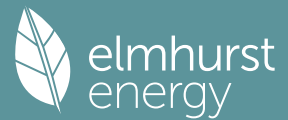
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	54.8372	54.4548	54.0799	52.3194	51.9900	50.4566	50.4566	50.1726	51.0472	51.9900	52.6563	53.3530 (38)
Heat transfer coeff	125.8723	125.4899	125.1151	123.3545	123.0251	121.4917	121.4917	121.2077	122.0824	123.0251	123.6915	124.3881 (39)
Average = Sum(39)m / 12 =												123.3529

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1901	1.1864	1.1829	1.1663	1.1631	1.1486	1.1486	1.1460	1.1542	1.1631	1.1694	1.1760 (40)
HLP (average)												1.1662
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.7869 (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 30.6328 30.1778 29.5372 28.3559 27.4714 26.4907 25.9609 26.5971 27.2897 28.3392 29.5448 30.5292 (42b)
Hot water usage for other uses 43.1707 41.6009 40.0310 38.4612 36.8913 35.3215 35.3215 36.8913 38.4612 40.0310 41.6009 43.1707 (42c)
Average daily hot water use (litres/day) 67.6475 (43)
Daily hot water use
Jan 73.8035 Feb 71.7787 Mar 69.5682 Apr 66.8171 May 64.3628 Jun 61.8122 Jul 61.2824 Aug 63.4884 Sep 65.7509 Oct 68.3702 Nov 71.1456 Dec 73.6999 (44)
Energy conte 116.8867 102.2119 106.9237 91.4693 86.6447 76.0053 74.1157 78.6119 81.0775 92.7778 101.3600 115.3963 (45)
Energy content (annual)
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

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	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												
	99.3537	86.8801	90.8852	77.7489	73.6480	64.6045	62.9984	66.8201	68.9158	78.8611	86.1560	98.0868 (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												
	99.3537	86.8801	90.8852	77.7489	73.6480	64.6045	62.9984	66.8201	68.9158	78.8611	86.1560	98.0868 (64)
12Total per year (kWh/year)												954.9586 (64)
Electric shower(s)												955 (64)
	56.8168	50.6242	55.2797	52.7527	53.7426	51.2652	52.9741	53.7426	52.7527	55.2797	54.2402	56.8168 (64a)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	141.9174	157.1228	141.9174	146.6480	141.9174	146.6480	141.9174	141.9174	146.6480	141.9174	146.6480	141.9174	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	265.3326	268.0859	261.1477	246.3769	227.7314	210.2073	198.5001	195.7468	202.6851	217.4559	236.1013	253.6254	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	(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)	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	(71)
Water heating gains (Table 5)	52.4766	51.1549	49.1145	45.3131	42.8060	40.2325	38.9692	40.5117	42.2460	45.0742	48.7487	52.0509	(72)
Total internal gains	524.5302	541.1673	516.9832	503.1415	477.2584	461.8914	444.1904	442.9795	456.3827	469.2511	496.3016	512.3974	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	FF	Specific data or Table 6c	Access factor Table 6d	Gains W	
North					1.4200	10.6334		0.6300		0.7000	0.7700	4.6146 (74)	
East					7.2100	19.6403		0.6300		0.7000	0.7700	43.2767 (76)	
West					7.0000	19.6403		0.6300		0.7000	0.7700	42.0162 (80)	
Solar gains	89.9075	175.6698	289.7652	424.8203	523.5590	537.4749	511.0589	436.8657	337.5975	208.4804	112.0430	73.9877 (83)	
Total gains	614.4378	716.8371	806.7484	927.9618	1000.8174	999.3663	955.2493	879.8452	793.9802	677.7315	608.3446	586.3851 (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	67.1931	67.3979	67.5998	68.5646	68.7482	69.6159	69.6159	69.7790	69.2791	68.7482	68.3778	67.9949	
alpha	5.4795	5.4932	5.5067	5.5710	5.5832	5.6411	5.6411	5.6519	5.6186	5.5832	5.5585	5.5330	
util living area	0.9992	0.9978	0.9936	0.9720	0.8987	0.7264	0.5501	0.6152	0.8728	0.9863	0.9980	0.9994	(86)
MIT	19.6618	19.8257	20.0884	20.4668	20.7790	20.9532	20.9918	20.9853	20.8649	20.4481	19.9965	19.6447	(87)
Th 2	19.9280	19.9309	19.9337	19.9471	19.9496	19.9613	19.9613	19.9635	19.9568	19.9496	19.9445	19.9392	(88)
util rest of house	0.9988	0.9969	0.9908	0.9592	0.8540	0.6302	0.4255	0.4864	0.8011	0.9779	0.9970	0.9991	(89)
MIT 2	18.7109	18.8767	19.1402	19.5205	19.8049	19.9418	19.9595	19.9599	19.8854	19.5093	19.0583	18.7027	(90)
Living area fraction	18.8704	19.0359	19.2992	19.6792	19.9683	20.1115	20.1327	20.1319	20.0497	19.6668	19.2157	18.8607	(91)
MIT	18.8704	19.0359	19.2992	19.6792	19.9683	20.1115	20.1327	20.1319	20.0497	19.6668	19.2157	18.8607	(92)
Temperature adjustment	18.8704	19.0359	19.2992	19.6792	19.9683	20.1115	20.1327	20.1319	20.0497	19.6668	19.2157	18.8607	(93)
adjusted MIT	18.8704	19.0359	19.2992	19.6792	19.9683	20.1115	20.1327	20.1319	20.0497	19.6668	19.2157	18.8607	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9983	0.9959	0.9885	0.9550	0.8549	0.6452	0.4466	0.5082	0.8087	0.9748	0.9960	0.9987	(94)
Ext temp.	613.4162	713.8847	797.4624	886.2407	855.5972	644.7782	426.5867	447.1525	642.0873	660.6192	605.9303	585.6377	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Space heating kWh	1834.0094	1773.9098	1601.3713	1329.6631	1017.2025	669.5961	429.1906	452.3297	726.3517	1115.4407	1498.6051	1823.6207	(97)
Space heating requirement - total per year (kWh/year)	908.1213	712.3368	598.1082	319.2642	120.2343	0.0000	0.0000	0.0000	0.0000	338.3872	642.7258	921.0594	(98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)	908.1213	712.3368	598.1082	319.2642	120.2343	0.0000	0.0000	0.0000	0.0000	338.3872	642.7258	921.0594	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)	908.1213	712.3368	598.1082	319.2642	120.2343	0.0000	0.0000	0.0000	0.0000	338.3872	642.7258	921.0594	(98c)
Space heating per m ²													(98c) / (4) =

8c. Space cooling requirement

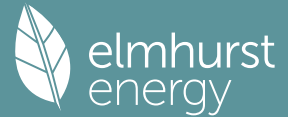
Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	1142.0221	899.0387	921.1789	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8350	0.9087	0.8711	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	953.6088	816.9877	802.4355	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1104.8559	1056.2434	970.9800	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	108.8979	178.0062	125.3971	0.0000	0.0000	0.0000	0.0000 (104)
Intermittency factor (Table 10b)									FC = cooled area / (4) =			1.0000 (105)
Space cooling kWh	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 requirement	0.0000	0.0000	0.0000	0.0000	0.0000	27.2245	44.5015	31.3493	0.0000	0.0000	0.0000	0.0000 (107)
Energy for space heating												103.0753 (107)
Energy for space cooling												43.1147 (99)
Total												0.9745 (108)
Fabric Energy Efficiency (TFEE)												44.0892 (109)
												44.1 (109)

Full SAP Calculation Printout



Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 64			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	93 A	DER	12.81	TER	12.86		
Environmental	88 B	% DER < TER				0.39	
CO ₂ Emissions (t/year)	1.3	DFEE	41.49	TFEE	44.09		
Compliance Check	See BREL	% DFEE < TFEE				5.89	
% DPER < TPER	0.23	DPER	67.36	TPER	67.52		
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	25.4100 (1b)	x 2.8400 (2b)	= 72.1644 (1b) - (3b)
First floor	40.1800 (1c)	x 2.3900 (2c)	= 96.0302 (1c) - (3c)
Second floor	40.1800 (1d)	x 2.6000 (2d)	= 104.4680 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	272.6626 (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	6 * 10 = 60.0000 (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) =	60.0000 / (5) = 0.2201 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.4201 (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) = 0.3885 (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	0.4954	0.4857	0.4760	0.4274	0.4177	0.3691	0.3691	0.3594	0.3885	0.4177	0.4371	0.4565 (22b)
Effective ac	0.6227	0.6179	0.6133	0.5913	0.5872	0.5681	0.5681	0.5646	0.5755	0.5872	0.5955	0.6042 (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
Solid front door			2.1400	1.1000	2.3540		(26)
Windows (Uw = 1.30)			15.6300	1.2357	19.3146		(27)
Ground floor			25.4100	0.1300	3.3033	0.0000	0.0000 (28a)
Exposed floor			14.7600	0.2000	2.9520	20.0000	295.2000 (28b)
Brick wall	125.8800	17.7700	108.1100	0.1900	20.5409	110.0000	11892.1000 (29a)
Retaining wall	12.9200		12.9200	0.1800	2.3256	110.0000	1421.2000 (29a)
Garage wall	21.3200		21.3200	0.1400	2.9848	110.0000	2345.2000 (29a)
Plane roof	40.1800		40.1800	0.0900	3.6162	9.0000	361.6200 (30)
Total net area of external elements Aum(A, m ²)			240.4700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	57.3914		(33)
Party Wall 1			69.1400	0.0000	0.0000	140.0000	9679.6000 (32)
Internal Wall			18.2000			75.0000	1365.0000 (32c)
Internal Wall			146.3400			9.0000	1317.0600 (32c)
Internal Floor 1			65.5900			18.0000	1180.6200 (32d)
Internal Ceiling 1			65.5900			9.0000	590.3100 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	30447.9100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							287.8691 (35)

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List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	12.3300	0.0240	0.2959
E2 Other lintels (including other steel lintels)	9.5000	0.0220	0.2090
E3 Sill	30.3000	0.0170	0.5151
E4 Jamb	20.1900	0.0920	1.8575
E5 Ground floor (normal)	27.8700	0.0010	0.0279
E6 Intermediate floor within a dwelling	9.1000	0.0600	0.5460
E10 Eaves (insulation at ceiling level)	8.8500	0.0560	0.4956
E12 Gable (insulation at ceiling level)	18.5000	0.0460	0.8510
E16 Corner (normal)	5.6800	-0.0880	-0.4998
E17 Corner (inverted - internal area greater than external area)	7.9900	0.0690	0.5513
E20 Exposed floor (normal)	7.5100	0.3200	2.4032
E21 Exposed floor (inverted)	15.6600	0.0380	0.5951
E18 Party wall between dwellings	8.8300	0.0690	0.6093
P1 Party wall - Ground floor	8.8300	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	8.8300	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	8.8300	0.4800	4.2384
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			12.6954 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	70.0868 (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	56.0306	55.6019	55.1816	53.2077	52.8384	51.1191	51.1191	50.8008	51.7814	52.8384	53.5855	54.3666 (38)
Heat transfer coeff	126.1174	125.6887	125.2684	123.2945	122.9252	121.2060	121.2060	120.8876	121.8682	122.9252	123.6723	124.4534 (39)
Average = Sum(39)m / 12 =												123.2927
HLP	1.1924	1.1883	1.1843	1.1657	1.1622	1.1459	1.1459	1.1429	1.1522	1.1622	1.1693	1.1766 (40)
HLP (average)												1.1657
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7869 (42)
Hot water usage for mixer showers													
70.9471	69.8809	68.3272	65.3546	63.1608	60.7144	59.3238	60.8657	62.5559	65.1827	68.2192	70.6752	(42a)	
Hot water usage for baths													
30.6328	30.1778	29.5372	28.3559	27.4714	26.4907	25.9609	26.5971	27.2897	28.3392	29.5448	30.5292	(42b)	
Hot water usage for other uses													
43.1707	41.6009	40.0310	38.4612	36.8913	35.3215	35.3215	36.8913	38.4612	40.0310	41.6009	43.1707	(42c)	
Average daily hot water use (litres/day)												133.0583 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	144.7505	141.6596	137.8954	132.1717	127.5236	122.5266	120.6062	124.3541	128.3069	133.5529	139.3648	144.3752 (44)	
Energy conte	229.2495	201.7213	211.9401	180.9364	171.6713	150.6607	145.8628	153.9764	158.2152	181.2300	198.5507	226.0566 (45)	
Energy content (annual)										Total = Sum(45)m =		2210.0711	
Distribution loss (46)m = 0.15 x (45)m													
34.3874	30.2582	31.7910	27.1405	25.7507	22.5991	21.8794	23.0965	23.7323	27.1845	29.7826	33.9085	(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	2.5528	2.3647	2.6361	2.4472	2.4735	2.3138	2.2934	2.3113	2.2561	2.4036	2.4141	2.5334 (61)	
Total heat required for water heating calculated for each month													
231.8023	204.0860	214.5762	183.3837	174.1448	152.9745	148.1562	156.2877	160.4713	183.6337	200.9648	228.5900	(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	231.8023	204.0860	214.5762	183.3837	174.1448	152.9745	148.1562	156.2877	160.4713	183.6337	200.9648	228.5900 (64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2239.0711 (64)	
Electric shower(s)												2239 (64)	
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													
76.8636	67.6635	71.1291	60.7732	57.6991	50.6731	49.0727	51.7750	53.1706	60.8599	66.6216	75.7972	(65)	

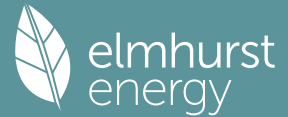
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	141.9174	157.1228	141.9174	146.6480	141.9174	146.6480	141.9174	141.9174	146.6480	141.9174	146.6480	141.9174 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	265.3326	268.0859	261.1477	246.3769	227.7314	210.2073	198.5001	195.7468	202.6851	217.4559	236.1013	253.6254 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345 (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)	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763 (71)
Water heating gains (Table 5)	103.3114	100.6898	95.6036	84.4072	77.5525	70.3794	65.9580	69.5900	73.8480	81.8009	92.5301	101.8779 (72)
Total internal gains	578.3650	593.7021	566.4723	545.2356	515.0049	492.0382	471.1791	472.0578	487.9847	508.9778	543.0830	565.2243 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	1.4200	10.6334	0.7300	0.7000	0.7700	5.3471 (74)
East	7.2100	19.6403	0.7300	0.7000	0.7700	50.1460 (76)

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West	7.0000		19.6403		0.7300		0.7000		0.7700		48.6855 (80)	
Solar gains	104.1786	203.5539	335.7596	492.2521	606.6636	622.7884	592.1794	506.2095	391.1845	241.5726	129.8276	85.7318 (83)
Total gains	682.5436	797.2561	902.2319	1037.4877	1121.6685	1114.8266	1063.3584	978.2673	879.1691	750.5504	672.9105	650.9561 (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	67.0625	67.2913	67.5170	68.5980	68.8041	69.7800	69.7800	69.9638	69.4008	68.8041	68.3884	67.9592
alpha	5.4708	5.4861	5.5011	5.5732	5.5869	5.6520	5.6520	5.6643	5.6267	5.5869	5.5592	5.5306
util living area	0.9986	0.9963	0.9892	0.9557	0.8561	0.6659	0.4964	0.5582	0.8296	0.9783	0.9967	0.9989 (86)
MIT	20.5098	20.5540	20.6230	20.7201	20.7921	20.8278	20.8341	20.8334	20.8094	20.7105	20.5961	20.5072 (87)
Th 2	19.9261	19.9294	19.9325	19.9476	19.9504	19.9635	19.9635	19.9659	19.9584	19.9504	19.9447	19.9387 (88)
util rest of house	0.9980	0.9949	0.9847	0.9372	0.8024	0.5713	0.3823	0.4383	0.7489	0.9659	0.9951	0.9985 (89)
MIT 2	19.3360	19.3955	19.4862	19.6204	19.7036	19.7484	19.7519	19.7544	19.7301	19.6136	19.4639	19.3445 (90)
Living area fraction	19.5329	19.5898	19.6769	19.8049	19.8861	19.9294	19.9334	19.9354	19.9111	fLA = Living area / (4) =	19.6538	0.1677 (91)
MIT	19.5329	19.5898	19.6769	19.8049	19.8861	19.9294	19.9334	19.9354	19.9111	19.7976	19.6538	19.5395 (92)
Temperature adjustment	19.3829	19.4398	19.5269	19.6549	19.7361	19.7794	19.7834	19.7854	19.7611	19.6476	19.5038	-0.1500
adjusted MIT	19.3829	19.4398	19.5269	19.6549	19.7361	19.7794	19.7834	19.7854	19.7611	19.6476	19.5038	19.3895 (93)

8. Space heating requirement												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9976	0.9940	0.9825	0.9308	0.7896	0.5533	0.3621	0.4166	0.7307	0.9609	0.9942	0.9982 (94)
Useful gains	680.9349	792.4887	886.4099	965.6680	885.6172	616.8553	385.0460	407.5355	642.4142	721.2347	669.0232	649.7813 (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	1902.2173	1827.4927	1631.8533	1326.0167	987.8438	627.7740	385.8454	409.2504	689.9064	1112.1793	1534.0087	1890.3849 (97)
Space heating kWh	908.6341	695.5227	554.6099	259.4510	76.0566	0.0000	0.0000	0.0000	0.0000	290.8628	622.7895	923.0091 (98a)
Space heating requirement - total per year (kWh/year)												4330.9357
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	908.6341	695.5227	554.6099	259.4510	76.0566	0.0000	0.0000	0.0000	0.0000	290.8628	622.7895	923.0091 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4330.9357
Space heating per m2										(98c) / (4) =		40.9467 (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 %)												88.6000 (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	908.6341	695.5227	554.6099	259.4510	76.0566	0.0000	0.0000	0.0000	0.0000	290.8628	622.7895	923.0091 (98)
Space heating efficiency (main heating system 1)	88.6000	88.6000	88.6000	88.6000	88.6000	0.0000	0.0000	0.0000	0.0000	88.6000	88.6000	88.6000 (210)
Space heating fuel (main heating system)	1025.5464	785.0143	625.9706	292.8341	85.8426	0.0000	0.0000	0.0000	0.0000	328.2875	702.9227	1041.7710 (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	231.8023	204.0860	214.5762	183.3837	174.1448	152.9745	148.1562	156.2877	160.4713	183.6337	200.9648	228.5900 (64)
Efficiency of water heater (217)m	86.6096	86.3842	85.8909	84.6371	82.1362	79.6000	79.6000	79.6000	79.6000	84.8856	86.2217	79.6000 (216)
Fuel for water heating, kWh/month	267.6404	236.2538	249.8242	216.6705	212.0194	192.1791	186.1258	196.3413	201.5971	216.3306	233.0792	86.6552 (217)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	28.8849	23.1726	20.8643	15.2861	11.8074	9.6468	10.7711	14.0007	18.1855	23.8604	26.9503	29.6877 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-33.0601	-51.3704	-81.6378	-98.5308	-109.6129	-103.2046	-101.4318	-93.7910	-79.9001	-61.4567	-37.5969	-27.7837 (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	-14.9249	-36.2530	-85.9866	-150.0681	-216.2967	-224.4244	-218.8576	-173.8982	-112.6673	-55.7180	-20.8495	-11.3176 (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												4888.1893 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.6000
Water heating fuel used												2671.8541 (219)
Space cooling fuel												0.0000 (221)

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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)	233.1179 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2200.6387 (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	5678.5225 (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	4888.1893	0.2100	1026.5197 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2671.8541	0.2100	561.0894 (264)
Space and water heating			1587.6091 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	233.1179	0.1443	33.6461 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-879.3767	0.1332	-117.1173
PV Unit electricity exported	-1321.2619	0.1223	-161.6557
Total			-278.7731 (269)
Total CO2, kg/year			1354.4114 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.8100 (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	4888.1893	1.1300	5523.6539 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2671.8541	1.1300	3019.1951 (278)
Space and water heating			8542.8489 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	233.1179	1.5338	357.5639 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-879.3767	1.4921	-1312.1603
PV Unit electricity exported	-1321.2619	0.4489	-593.1622
Total			-1905.3225 (283)
Total Primary energy kWh/year			7125.1912 (286)
Dwelling Primary energy Rate (DPER)			67.3600 (287)

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

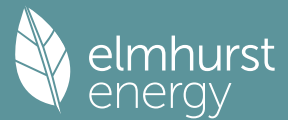
1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	25.4100 (1b)	x 2.8400 (2b)	= 72.1644 (1b) - (3b)
First floor	40.1800 (1c)	x 2.3900 (2c)	= 96.0302 (1c) - (3c)
Second floor	40.1800 (1d)	x 2.6000 (2d)	= 104.4680 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 272.6626 (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) = 0.1467 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3967 (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) = 0.3669 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4679	0.4587	0.4495	0.4036	0.3945	0.3486	0.3486	0.3394	0.3669	0.3945	0.4128	0.4312 (22b)
	0.6094	0.6052	0.6010	0.5815	0.5778	0.5608	0.5608	0.5576	0.5673	0.5778	0.5852	0.5930 (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)			15.6300	1.1450	17.8969		(27)
Ground floor			25.4100	0.1300	3.3033		(28a)
Exposed floor			14.7600	0.1300	1.9188		(28b)
Brick wall	125.8800	17.7700	108.1100	0.1800	19.4598		(29a)
Retaining wall	12.9200		12.9200	0.1800	2.3256		(29a)
Garage wall	21.3200		21.3200	0.1800	3.8376		(29a)
Plane roof	40.1800		40.1800	0.1100	4.4198		(30)
Total net area of external elements Aum(A, m2)			240.4700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	55.3018		(33)
Party Wall 1			69.1400	0.0000	0.0000		(32)

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

287.8691 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	12.3300	0.0500	0.6165
E3 Sill	9.5000	0.0500	0.4750
E4 Jamb	30.3000	0.0500	1.5150
E5 Ground floor (normal)	20.1900	0.1600	3.2304
E6 Intermediate floor within a dwelling	27.8700	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	9.1000	0.0600	0.5460
E12 Gable (insulation at ceiling level)	8.8500	0.0600	0.5310
E16 Corner (normal)	18.5000	0.0900	1.6650
E17 Corner (inverted - internal area greater than external area)	5.6800	-0.0900	-0.5112
E20 Exposed floor (normal)	7.9900	0.3200	2.5568
E21 Exposed floor (inverted)	7.5100	0.3200	2.4032
E18 Party wall between dwellings	15.6600	0.0600	0.9396
P1 Party wall - Ground floor	8.8300	0.0800	0.7064
P2 Party wall - Intermediate floor within a dwelling	8.8300	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	8.8300	0.1200	1.0596

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

15.7333 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 71.0351 (37)

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

(38)m	Jan 54.8372	Feb 54.4548	Mar 54.0799	Apr 52.3194	May 51.9900	Jun 50.4566	Jul 50.4566	Aug 50.1726	Sep 51.0472	Oct 51.9900	Nov 52.6563	Dec 53.3530 (38)
Heat transfer coeff	125.8723	125.4899	125.1151	123.3545	123.0251	121.4917	121.4917	121.2077	122.0824	123.0251	123.6915	124.3881 (39)
Average = Sum(39)m / 12 =												123.3529

HLP	Jan 1.1901	Feb 1.1864	Mar 1.1829	Apr 1.1663	May 1.1631	Jun 1.1486	Jul 1.1486	Aug 1.1460	Sep 1.1542	Oct 1.1631	Nov 1.1694	Dec 1.1760 (40)
HLP (average)												1.1662
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

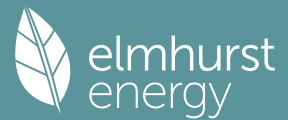
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7869 (42)
Hot water usage for mixer showers												
70.9471	69.8809	68.3272	65.3546	63.1608	60.7144	59.3238	60.8657	62.5559	65.1827	68.2192	70.6752 (42a)	
Hot water usage for baths												
30.6328	30.1778	29.5372	28.3559	27.4714	26.4907	25.9609	26.5971	27.2897	28.3392	29.5448	30.5292 (42b)	
Hot water usage for other uses												
43.1707	41.6009	40.0310	38.4612	36.8913	35.3215	35.3215	36.8913	38.4612	40.0310	41.6009	43.1707 (42c)	
Average daily hot water use (litres/day)												133.0583 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	144.7505	141.6596	137.8954	132.1717	127.5236	122.5266	120.6062	124.3541	128.3069	133.5529	139.3648	144.3752 (44)
Energy content (annual)	229.2495	201.7213	211.9401	180.9364	171.6713	150.6607	145.8628	153.9764	158.2152	181.2300	198.5507	226.0566 (45)
Distribution loss (46)m = 0.15 x (45)m	34.3874	30.2582	31.7910	27.1405	25.7507	22.5991	21.8794	23.0965	23.7323	27.1845	29.7826	33.9085 (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	280.2084	247.7487	262.8990	230.2515	222.6302	199.9758	196.8217	204.9353	207.5303	232.1889	247.8658	277.0155 (62)
WWHRS	-32.4340	-28.6849	-30.0372	-24.8720	-23.1798	-19.8351	-18.5923	-19.7710	-20.5222	-24.1934	-27.4082	-31.8334 (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	247.7744	219.0638	232.8618	205.3795	199.4504	180.1406	178.2294	185.1643	187.0081	207.9955	220.4576	245.1821 (64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				2508.7076 (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	88.9652	78.5792	83.2098	72.4901	69.8204	62.4234	61.2391	63.9369	64.9353	72.9987	78.3469	87.9035 (65)

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

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Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	139.3453	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	141.9174	157.1228	141.9174	146.6480	141.9174	146.6480	141.9174	141.9174	146.6480	141.9174	146.6480	141.9174	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	265.3326	268.0859	261.1477	246.3769	227.7314	210.2073	198.5001	195.7468	202.6851	217.4559	236.1013	253.6254	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	36.9345	(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)	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	(71)
Water heating gains (Table 5)	119.5769	116.9333	111.8411	100.6807	93.8447	86.6992	82.3106	85.9367	90.1879	98.1165	108.8151	118.1499	(72)
Total internal gains	594.6305	609.9457	582.7098	561.5092	531.2971	508.3581	487.5317	488.4045	504.3246	525.2934	559.3680	581.4964	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North				1.4200	10.6334		0.6300	0.7000	0.7700		4.6146 (74)	
East				7.2100	19.6403		0.6300	0.7000	0.7700		43.2767 (76)	
West				7.0000	19.6403		0.6300	0.7000	0.7700		42.0162 (80)	
Solar gains	89.9075	175.6698	289.7652	424.8203	523.5590	537.4749	511.0589	436.8657	337.5975	208.4804	112.0430	73.9877 (83)
Total gains	684.5380	785.6155	872.4750	986.3295	1054.8561	1045.8330	998.5907	925.2702	841.9222	733.7738	671.4110	655.4841 (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	67.1931	67.3979	67.5998	68.5646	68.7482	69.6159	69.6159	69.7790	69.2791	68.7482	68.3778	67.9949	
alpha	5.4795	5.4932	5.5067	5.5710	5.5832	5.6411	5.6411	5.6519	5.6186	5.5832	5.5585	5.5330	
util living area	0.9986	0.9966	0.9907	0.9639	0.8803	0.7018	0.5279	0.5884	0.8491	0.9804	0.9967	0.9989	(86)
MIT	19.7244	19.8866	20.1449	20.5108	20.8053	20.9606	20.9933	20.9881	20.8847	20.4941	20.0525	19.7067	(87)
Th 2	19.9280	19.9309	19.9337	19.9471	19.9496	19.9613	19.9613	19.9635	19.9568	19.9496	19.9445	19.9392	(88)
util rest of house	0.9980	0.9952	0.9868	0.9482	0.8313	0.6058	0.4074	0.4634	0.7719	0.9690	0.9952	0.9984	(89)
MIT 2	18.4464	18.6558	18.9867	19.4519	19.7896	19.9407	19.9595	19.9598	19.8812	19.4405	18.8787	18.4319	(90)
Living area fraction									fLA = Living area / (4) =			0.1677	(91)
MIT	18.6607	18.8622	19.1809	19.6295	19.9600	20.1117	20.1329	20.1323	20.0495	19.6173	19.0756	18.6457	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6607	18.8622	19.1809	19.6295	19.9600	20.1117	20.1329	20.1323	20.0495	19.6173	19.0756	18.6457	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9970	0.9932	0.9829	0.9421	0.8318	0.6206	0.4277	0.4845	0.7799	0.9639	0.9932	0.9976	(94)
Useful gains	682.4548	780.2986	857.5849	929.2300	877.4495	649.0893	427.1187	448.2988	656.6000	707.3172	666.8714	653.9106	(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	1807.6200	1752.1193	1586.5739	1323.5342	1016.1837	669.6302	429.2159	452.3851	726.3317	1109.3493	1481.2777	1796.8759	(97)
Space heating kWh	837.1229	653.0635	542.3678	283.8990	103.2183	0.0000	0.0000	0.0000	0.0000	299.1118	586.3725	850.3662	(98a)
Space heating requirement - total per year (kWh/year)												4155.5221	
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	837.1229	653.0635	542.3678	283.8990	103.2183	0.0000	0.0000	0.0000	0.0000	299.1118	586.3725	850.3662	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4155.5221	
Space heating per m2										(98c) / (4) =		39.2883	(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	837.1229	653.0635	542.3678	283.8990	103.2183	0.0000	0.0000	0.0000	0.0000	299.1118	586.3725	850.3662	(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)	905.9772	706.7787	586.9781	307.2499	111.7081	0.0000	0.0000	0.0000	0.0000	323.7141	634.6023	920.3098	(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	247.7744	219.0638	232.8618	205.3795	199.4504	180.1406	178.2294	185.1643	187.0081	207.9955	220.4576	245.1821	(64)
Efficiency of water heater	86.7775	86.5711	86.1292	85.0754	83.0395	80.3000	80.3000	80.3000	80.3000	85.1592	86.3724	86.8191	(216)
(217)m													(217)
Fuel for water heating, kWh/month													

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	285.5285	253.0449	270.3633	241.4088	240.1874	224.3345	221.9545	230.5907	232.8868	244.2433	255.2407	282.4058	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	29.4876	23.6561	21.2997	15.6051	12.0538	9.8481	10.9959	14.2929	18.5650	24.3583	27.5126	30.3072	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.9155	-55.5613	-80.8490	-92.0318	-100.1559	-93.7669	-92.5734	-86.9330	-77.1467	-64.0142	-43.0168	-33.5605	(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	-19.9013	-42.0938	-84.1047	-126.9762	-168.5551	-169.6411	-167.6836	-141.7059	-103.4811	-60.4596	-26.6523	-15.7233	(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												4497.3183	(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												2982.1891	(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)												237.9821	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1985.5029	(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												5817.9866	(238)

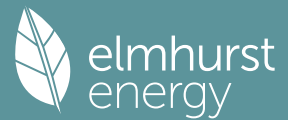
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4497.3183	0.2100	944.4368 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2982.1891	0.2100	626.2597 (264)
Space and water heating			1570.6965 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	237.9821	0.1443	34.3482 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-858.5249	0.1343	-115.3320
PV Unit electricity exported	-1126.9779	0.1257	-141.7033
Total			-257.0353 (269)
Total CO2, kg/year			1359.9387 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.8600 (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	4497.3183	1.1300	5081.9696 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2982.1891	1.1300	3369.8737 (278)
Space and water heating			8451.8433 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	237.9821	1.5338	365.0249 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-858.5249	1.4965	-1284.7605
PV Unit electricity exported	-1126.9779	0.4615	-520.1396
Total			-1804.9001 (283)
Total Primary energy kWh/year			7142.0689 (286)
Target Primary Energy Rate (TPER)			67.5200 (287)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 64			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	93 A	DER	12.81	TER	12.86		
Environmental	88 B	% DER < TER				0.39	
CO ₂ Emissions (t/year)	1.3	DFEE	41.49	TFEE	44.09		
Compliance Check	See BREL	% DFEE < TFEE				5.89	
% DPER < TPER	0.23	DPER	67.36	TPER	67.52		
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	25.4100 (1b)	x 2.8400 (2b)	= 72.1644 (1b) - (3b)
First floor	40.1800 (1c)	x 2.3900 (2c)	= 96.0302 (1c) - (3c)
Second floor	40.1800 (1d)	x 2.6000 (2d)	= 104.4680 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	272.6626 (5)

2. Ventilation rate

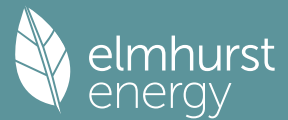
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	6 * 10 = 60.0000 (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) =	60.0000 / (5) = 0.2201 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.4201 (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) = 0.3885 (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	0.4954	0.4857	0.4760	0.4274	0.4177	0.3691	0.3691	0.3594	0.3885	0.4177	0.4371	0.4565 (22b)
Effective ac	0.6227	0.6179	0.6133	0.5913	0.5872	0.5681	0.5681	0.5646	0.5755	0.5872	0.5955	0.6042 (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
Solid front door			2.1400	1.1000	2.3540		(26)
Windows (Uw = 1.30)			15.6300	1.2357	19.3146		(27)
Ground floor			25.4100	0.1300	3.3033	0.0000	0.0000 (28a)
Exposed floor			14.7600	0.2000	2.9520	20.0000	295.2000 (28b)
Brick wall	125.8800	17.7700	108.1100	0.1900	20.5409	110.0000	11892.1000 (29a)
Retaining wall	12.9200		12.9200	0.1800	2.3256	110.0000	1421.2000 (29a)
Garage wall	21.3200		21.3200	0.1400	2.9848	110.0000	2345.2000 (29a)
Plane roof	40.1800		40.1800	0.0900	3.6162	9.0000	361.6200 (30)
Total net area of external elements Aum(A, m ²)			240.4700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	57.3914		(33)
Party Wall 1			69.1400	0.0000	0.0000	140.0000	9679.6000 (32)
Internal Wall			18.2000			75.0000	1365.0000 (32c)
Internal Wall			146.3400			9.0000	1317.0600 (32c)
Internal Floor 1			65.5900			18.0000	1180.6200 (32d)
Internal Ceiling 1			65.5900			9.0000	590.3100 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	30447.9100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							287.8691 (35)

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List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	12.3300	0.0240	0.2959
E2 Other lintels (including other steel lintels)	9.5000	0.0220	0.2090
E3 Sill	30.3000	0.0170	0.5151
E4 Jamb	20.1900	0.0920	1.8575
E5 Ground floor (normal)	27.8700	0.0010	0.0279
E6 Intermediate floor within a dwelling	9.1000	0.0600	0.5460
E10 Eaves (insulation at ceiling level)	8.8500	0.0560	0.4956
E12 Gable (insulation at ceiling level)	18.5000	0.0460	0.8510
E16 Corner (normal)	5.6800	-0.0880	-0.4998
E17 Corner (inverted - internal area greater than external area)	7.9900	0.0690	0.5513
E20 Exposed floor (normal)	7.5100	0.3200	2.4032
E21 Exposed floor (inverted)	15.6600	0.0380	0.5951
E18 Party wall between dwellings	8.8300	0.0690	0.6093
P1 Party wall - Ground floor	8.8300	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	8.8300	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	8.8300	0.4800	4.2384
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			12.6954 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	70.0868 (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	56.0306	55.6019	55.1816	53.2077	52.8384	51.1191	51.1191	50.8008	51.7814	52.8384	53.5855	54.3666 (38)
Heat transfer coeff	126.1174	125.6887	125.2684	123.2945	122.9252	121.2060	121.2060	120.8876	121.8682	122.9252	123.6723	124.4534 (39)
Average = Sum(39)m / 12 =												123.2927
HLP	1.1924	1.1883	1.1843	1.1657	1.1622	1.1459	1.1459	1.1429	1.1522	1.1622	1.1693	1.1766 (40)
HLP (average)												1.1657
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7869 (42)
Hot water usage for mixer showers													
70.9471	69.8809	68.3272	65.3546	63.1608	60.7144	59.3238	60.8657	62.5559	65.1827	68.2192	70.6752	(42a)	
Hot water usage for baths													
30.6328	30.1778	29.5372	28.3559	27.4714	26.4907	25.9609	26.5971	27.2897	28.3392	29.5448	30.5292	(42b)	
Hot water usage for other uses													
43.1707	41.6009	40.0310	38.4612	36.8913	35.3215	35.3215	36.8913	38.4612	40.0310	41.6009	43.1707	(42c)	
Average daily hot water use (litres/day)												133.0583 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	144.7505	141.6596	137.8954	132.1717	127.5236	122.5266	120.6062	124.3541	128.3069	133.5529	139.3648	144.3752 (44)	
Energy conte	229.2495	201.7213	211.9401	180.9364	171.6713	150.6607	145.8628	153.9764	158.2152	181.2300	198.5507	226.0566 (45)	
Energy content (annual)										Total =	Sum(45)m =	2210.0711	
Distribution loss (46)m = 0.15 x (45)m													
34.3874	30.2582	31.7910	27.1405	25.7507	22.5991	21.8794	23.0965	23.7323	27.1845	29.7826	33.9085	(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	2.5528	2.3647	2.6361	2.4472	2.4735	2.3138	2.2934	2.3113	2.2561	2.4036	2.4141	2.5334 (61)	
Total heat required for water heating calculated for each month													
231.8023	204.0860	214.5762	183.3837	174.1448	152.9745	148.1562	156.2877	160.4713	183.6337	200.9648	228.5900	(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	231.8023	204.0860	214.5762	183.3837	174.1448	152.9745	148.1562	156.2877	160.4713	183.6337	200.9648	228.5900 (64)	
								Total per year (kWh/year) =	Sum(64)m =			2239.0711 (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													
76.8636	67.6635	71.1291	60.7732	57.6991	50.6731	49.0727	51.7750	53.1706	60.8599	66.6216	75.7972	(65)	

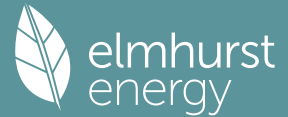
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	167.2144	167.2144	167.2144	167.2144	167.2144	167.2144	167.2144	167.2144	167.2144	167.2144	167.2144	167.2144 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.0002	29.3105	23.8369	18.0461	13.4897	11.3885	12.3057	15.9954	21.4690	27.2599	31.8163	33.9174 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	396.0188	400.1283	389.7726	367.7267	339.8976	313.7422	296.2688	292.1594	302.5151	324.5610	352.3901	378.5454 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.5083	54.5083	54.5083	54.5083	54.5083	54.5083	54.5083	54.5083	54.5083	54.5083	54.5083	54.5083 (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)	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763 (71)
Water heating gains (Table 5)	103.3114	100.6898	95.6036	84.4072	77.5525	70.3794	65.9580	69.5900	73.8480	81.8009	92.5301	101.8779 (72)
Total internal gains	645.5769	643.3750	622.4597	583.4264	544.1863	505.7566	484.7790	487.9913	508.0786	546.8683	589.9829	627.5872 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	1.4200	10.6334	0.7300	0.7000	0.7700	5.3471 (74)
East	7.2100	19.6403	0.7300	0.7000	0.7700	50.1460 (76)
West	7.0000	19.6403	0.7300	0.7000	0.7700	48.6855 (80)

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Solar gains	104.1786	203.5539	335.7596	492.2521	606.6636	622.7884	592.1794	506.2095	391.1845	241.5726	129.8276	85.7318 (83)
Total gains	749.7555	846.9290	958.2193	1075.6785	1150.8499	1128.5450	1076.9584	994.2008	899.2630	788.4409	719.8105	713.3190 (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	67.0625	67.2913	67.5170	68.5980	68.8041	69.7800	69.7800	69.9638	69.4008	68.8041	68.3884	67.9592
alpha	5.4708	5.4861	5.5011	5.5732	5.5869	5.6520	5.6520	5.6643	5.6267	5.5869	5.5592	5.5306
util living area	0.9977	0.9951	0.9858	0.9490	0.8453	0.6592	0.4904	0.5500	0.8192	0.9731	0.9954	0.9983 (86)
MIT	20.5247	20.5649	20.6347	20.7267	20.7950	20.8281	20.8342	20.8336	20.8110	20.7180	20.6065	20.5211 (87)
Th 2	19.9261	19.9294	19.9325	19.9476	19.9504	19.9635	19.9635	19.9659	19.9584	19.9504	19.9447	19.9387 (88)
util rest of house	0.9969	0.9932	0.9800	0.9284	0.7899	0.5649	0.3776	0.4314	0.7369	0.9583	0.9933	0.9976 (89)
MIT 2	19.3551	19.4094	19.5008	19.6280	19.7062	19.7486	19.7519	19.7545	19.7313	19.6225	19.4770	19.3623 (90)
Living area fraction	19.5513	19.6032	19.6910	19.8123	19.8888	19.9296	19.9334	19.9354	19.9124	19.8062	19.6665	19.5567 (91)
MIT	19.5513	19.6032	19.6910	19.8123	19.8888	19.9296	19.9334	19.9354	19.9124	19.8062	19.6665	19.5567 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.4013	19.4532	19.5410	19.6623	19.7388	19.7796	19.7834	19.7854	19.7624	19.6562	19.5165	19.4067 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9963	0.9921	0.9773	0.9215	0.7769	0.5471	0.3576	0.4101	0.7187	0.9527	0.9921	0.9972 (94)
Useful gains	746.9777	840.2274	936.4880	991.2024	894.0686	617.4684	385.0996	407.6762	646.3163	751.1155	714.1054	711.3010 (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	1904.5374	1829.1706	1633.6252	1326.9349	988.1686	627.8019	385.8489	409.2588	690.0672	1113.2410	1535.5734	1892.5217 (97)
Space heating kWh	861.2244	664.5699	518.6701	241.7274	70.0104	0.0000	0.0000	0.0000	0.0000	269.4214	591.4570	878.8282 (98a)
Space heating requirement - total per year (kWh/year)												4095.9088
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	861.2244	664.5699	518.6701	241.7274	70.0104	0.0000	0.0000	0.0000	0.0000	269.4214	591.4570	878.8282 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4095.9088
Space heating per m2										(98c) / (4) =		38.7247 (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 %)												88.6000 (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	861.2244	664.5699	518.6701	241.7274	70.0104	0.0000	0.0000	0.0000	0.0000	269.4214	591.4570	878.8282 (98)
Space heating efficiency (main heating system 1)	88.6000	88.6000	88.6000	88.6000	88.6000	0.0000	0.0000	0.0000	0.0000	88.6000	88.6000	88.6000 (210)
Space heating fuel (main heating system)	972.0366	750.0789	585.4065	272.8301	79.0185	0.0000	0.0000	0.0000	0.0000	304.0873	667.5587	991.9054 (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	231.8023	204.0860	214.5762	183.3837	174.1448	152.9745	148.1562	156.2877	160.4713	183.6337	200.9648	228.5900 (64)
Efficiency of water heater (217)m	86.5253	86.3073	85.7624	84.4796	81.9881	79.6000	79.6000	79.6000	79.6000	84.7176	86.1303	86.5794 (216)
Fuel for water heating, kWh/month	267.9012	236.4643	250.1986	217.0745	212.4025	192.1791	186.1258	196.3413	201.5971	216.7599	233.3266	264.0236 (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	28.8849	23.1726	20.8643	15.2861	11.8074	9.6468	10.7711	14.0007	18.1855	23.8604	26.9503	29.6877 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-33.0601	-51.3704	-81.6378	-98.5308	-109.6129	-103.2046	-101.4318	-93.7910	-79.9001	-61.4567	-37.5969	-27.7837 (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	-14.9249	-36.2530	-85.9866	-150.0681	-216.2967	-224.4244	-218.8576	-173.8982	-112.6673	-55.7180	-20.8495	-11.3176 (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												4622.9219 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.6000
Water heating fuel used												2674.3945 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:

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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)	233.1179 (232)

Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2200.6387 (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	5415.7956 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4622.9219	3.6400	168.2744 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2674.3945	3.6400	97.3480 (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	233.1179	16.4900	38.4411 (250)
Additional standing charges			92.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-879.3767	16.4900	-145.0092
PV Unit electricity exported	-1321.2619	5.5900	-73.8585
Total			-218.8678 (252)
Total energy cost			191.3771 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	0.4570 (257)
SAP value	92.5927
SAP rating (Section 12)	93 (258)
SAP band	A

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4622.9219	0.2100	970.8136 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2674.3945	0.2100	561.6228 (264)
Space and water heating			1532.4364 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	233.1179	0.1443	33.6461 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-879.3767	0.1332	-117.1173
PV Unit electricity exported	-1321.2619	0.1223	-161.6557
Total			-278.7731 (269)
Total CO2, kg/year			1299.2388 (272)
CO2 emissions per m2			12.2800 (273)
EI value			88.4527
EI rating			88 (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

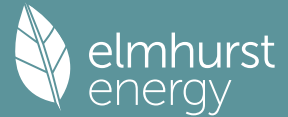
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	25.4100 (1b)	x 2.8400 (2b)	= 72.1644 (1b) - (3b)
First floor	40.1800 (1c)	x 2.3900 (2c)	= 96.0302 (1c) - (3c)
Second floor	40.1800 (1d)	x 2.6000 (2d)	= 104.4680 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.7700		(4)
Dwelling volume		(3a) + (3b) + (3c) + (3d) + (3e) ... (3n) =	272.6626 (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	6 * 10 = 60.0000 (7a)

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Number of passive vents
Number of flueless gas fires

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

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

Air changes per hour
60.0000 / (5) = 0.2201 (8)
Yes
Blower Door
4.0000 (17)
0.4201 (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) = 0.3885 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Effective ac	0.4954	0.4857	0.4760	0.4274	0.4177	0.3691	0.3691	0.3594	0.3885	0.4177	0.4371	0.4565 (22b)
	0.6227	0.6179	0.6133	0.5913	0.5872	0.5681	0.5681	0.5646	0.5755	0.5872	0.5955	0.6042 (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
Solid front door			2.1400	1.1000	2.3540		(26)
Windows (Uw = 1.30)			15.6300	1.2357	19.3146		(27)
Ground floor			25.4100	0.1300	3.3033	0.0000	0.0000 (28a)
Exposed floor			14.7600	0.2000	2.9520	20.0000	295.2000 (28b)
Brick wall	125.8800	17.7700	108.1100	0.1900	20.5409	110.0000	11892.1000 (29a)
Retaining wall	12.9200		12.9200	0.1800	2.3256	110.0000	1421.2000 (29a)
Garage wall	21.3200		21.3200	0.1400	2.9848	110.0000	2345.2000 (29a)
Plane roof	40.1800		40.1800	0.0900	3.6162	9.0000	361.6200 (30)
Total net area of external elements Aum(A, m ²)			240.4700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	57.3914		(33)
Party Wall 1			69.1400	0.0000	0.0000	140.0000	9679.6000 (32)
Internal Wall			18.2000			75.0000	1365.0000 (32c)
Internal Wall			146.3400			9.0000	1317.0600 (32c)
Internal Floor 1			65.5900			18.0000	1180.6200 (32d)
Internal Ceiling 1			65.5900			9.0000	590.3100 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
List of Thermal Bridges (28)...(30) + (32) + (32a)...(32e) = 30447.9100 (34)
287.8691 (35)

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	12.3300	0.0240	0.2959
E3 Sill	9.5000	0.0220	0.2090
E4 Jamb	30.3000	0.0170	0.5151
E5 Ground floor (normal)	20.1900	0.0920	1.8575
E6 Intermediate floor within a dwelling	27.8700	0.0010	0.0279
E10 Eaves (insulation at ceiling level)	9.1000	0.0600	0.5460
E12 Gable (insulation at ceiling level)	8.8500	0.0560	0.4956
E16 Corner (normal)	18.5000	0.0460	0.8510
E17 Corner (inverted - internal area greater than external area)	5.6800	-0.0880	-0.4998
E20 Exposed floor (normal)	7.9900	0.0690	0.5513
E21 Exposed floor (inverted)	7.5100	0.3200	2.4032
E18 Party wall between dwellings	15.6600	0.0380	0.5951
P1 Party wall - Ground floor	8.8300	0.0690	0.6093
P2 Party wall - Intermediate floor within a dwelling	8.8300	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	8.8300	0.4800	4.2384
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			12.6954 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 70.0868 (37)

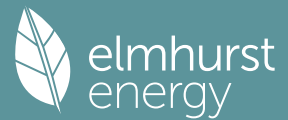
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	56.0306	55.6019	55.1816	53.2077	52.8384	51.1191	51.1191	50.8008	51.7814	52.8384	53.5855	54.3666 (38)
Average = Sum(39)m / 12 =	126.1174	125.6887	125.2684	123.2945	122.9252	121.2060	121.2060	120.8876	121.8682	122.9252	123.6723	124.4534 (39)
												123.2927

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1924	1.1883	1.1843	1.1657	1.1622	1.1459	1.1459	1.1429	1.1522	1.1622	1.1693	1.1766 (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												2.7869 (42)
Hot water usage for mixer showers												
70.9471	69.8809	68.3272	65.3546	63.1608	60.7144	59.3238	60.8657	62.5559	65.1827	68.2192	70.6752 (42a)	
Hot water usage for baths												
30.6328	30.1778	29.5372	28.3559	27.4714	26.4907	25.9609	26.5971	27.2897	28.3392	29.5448	30.5292 (42b)	
Hot water usage for other uses												
43.1707	41.6009	40.0310	38.4612	36.8913	35.3215	35.3215	36.8913	38.4612	40.0310	41.6009	43.1707 (42c)	
Average daily hot water use (litres/day)												133.0583 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
144.7505	141.6596	137.8954	132.1717	127.5236	122.5266	120.6062	124.3541	128.3069	133.5529	139.3648	144.3752 (44)	
Energy conte	229.2495	201.7213	211.9401	180.9364	171.6713	150.6607	145.8628	153.9764	158.2152	181.2300	198.5507	226.0566 (45)
Energy content (annual)										Total = Sum(45)m =		2210.0711
Distribution loss (46)m = 0.15 x (45)m												
34.3874	30.2582	31.7910	27.1405	25.7507	22.5991	21.8794	23.0965	23.7323	27.1845	29.7826	33.9085 (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 (59)	
Combi loss	2.5528	2.3647	2.6361	2.4472	2.4735	2.3138	2.2934	2.3113	2.2561	2.4036	2.4141	2.5334 (61)
Total heat required for water heating calculated for each month												
231.8023	204.0860	214.5762	183.3837	174.1448	152.9745	148.1562	156.2877	160.4713	183.6337	200.9648	228.5900 (62)	

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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	231.8023	204.0860	214.5762	183.3837	174.1448	152.9745	148.1562	156.2877	160.4713	183.6337	200.9648	228.5900 (64)
	Total per year (kWh/year) = Sum(64)m =										2239.0711 (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	76.8636	67.6635	71.1291	60.7732	57.6991	50.6731	49.0727	51.7750	53.1706	60.8599	66.6216	75.7972 (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	167.2144	167.2144	167.2144	167.2144	167.2144	167.2144	167.2144	167.2144	167.2144	167.2144	167.2144	167.2144	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.0002	29.3105	23.8369	18.0461	13.4897	11.3885	12.3057	15.9954	21.4690	27.2599	31.8163	33.9174	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	396.0188	400.1283	389.7726	367.7267	339.8976	313.7422	296.2688	292.1594	302.5151	324.5610	352.3901	378.5454	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.5083	54.5083	54.5083	54.5083	54.5083	54.5083	54.5083	54.5083	54.5083	54.5083	54.5083	54.5083	(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)	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	(71)
Water heating gains (Table 5)	103.3114	100.6898	95.6036	84.4072	77.5525	70.3794	65.9580	69.5900	73.8480	81.8009	92.5301	101.8779	(72)
Total internal gains	645.5769	643.3750	622.4597	583.4264	544.1863	505.7566	484.7790	487.9913	508.0786	546.8683	589.9829	627.5872	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W		
North					1.4200	10.6334	0.7300	0.7000	0.7700		5.3471 (74)		
East					7.2100	19.6403	0.7300	0.7000	0.7700		50.1460 (76)		
West					7.0000	19.6403	0.7300	0.7000	0.7700		48.6855 (80)		
Solar gains	104.1786	203.5539	335.7596	492.2521	606.6636	622.7884	592.1794	506.2095	391.1845	241.5726	129.8276	85.7318	(83)
Total gains	749.7555	846.9290	958.2193	1075.6785	1150.8499	1128.5450	1076.9584	994.2008	899.2630	788.4409	719.8105	713.3190	(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	67.0625	67.2913	67.5170	68.5980	68.8041	69.7800	69.7800	69.9638	69.4008	68.8041	68.3884	67.9592
alpha	5.4708	5.4861	5.5011	5.5732	5.5869	5.6520	5.6520	5.6643	5.6267	5.5869	5.5592	5.5306
util living area	0.9977	0.9951	0.9858	0.9490	0.8453	0.6592	0.4904	0.5500	0.8192	0.9731	0.9954	0.9983 (86)
MIT	20.5247	20.5649	20.6347	20.7267	20.7950	20.8281	20.8342	20.8336	20.8110	20.7180	20.6065	20.5211 (87)
Th 2	19.9261	19.9294	19.9325	19.9476	19.9504	19.9635	19.9635	19.9659	19.9584	19.9504	19.9447	19.9387 (88)
util rest of house	0.9969	0.9932	0.9800	0.9284	0.7899	0.5649	0.3776	0.4314	0.7369	0.9583	0.9933	0.9976 (89)
MIT 2	19.3551	19.4094	19.5008	19.6280	19.7062	19.7486	19.7519	19.7545	19.7313	19.6225	19.4770	19.3623 (90)
Living area fraction	fLA = Living area / (4) =											0.1677 (91)
MIT	19.5513	19.6032	19.6910	19.8123	19.8888	19.9296	19.9334	19.9354	19.9124	19.8062	19.6665	19.5567 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.4013	19.4532	19.5410	19.6623	19.7388	19.7796	19.7834	19.7854	19.7624	19.6562	19.5165	19.4067 (93)

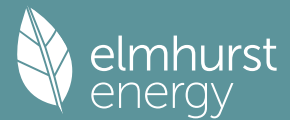
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9963	0.9921	0.9773	0.9215	0.7769	0.5471	0.3576	0.4101	0.7187	0.9527	0.9921	0.9972	(94)
Ext temp.	746.9777	840.2274	936.4880	991.2024	894.0686	617.4684	385.0996	407.6762	646.3163	751.1155	714.1054	711.3010	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Space heating kWh	1904.5374	1829.1706	1633.6252	1326.9349	988.1686	627.8019	385.8489	409.2588	690.0672	1113.2410	1535.5734	1892.5217	(97)
Space heating requirement - total per year (kWh/year)	861.2244	664.5699	518.6701	241.7274	70.0104	0.0000	0.0000	0.0000	0.0000	269.4214	591.4570	878.8282	(98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)	861.2244	664.5699	518.6701	241.7274	70.0104	0.0000	0.0000	0.0000	0.0000	269.4214	591.4570	878.8282	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4095.9088	
Space heating per m ²												38.7247	(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 %)												88.6000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement												

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Space heating efficiency (main heating system 1)	861.2244	664.5699	518.6701	241.7274	70.0104	0.0000	0.0000	0.0000	0.0000	269.4214	591.4570	878.8282	(98)
Space heating fuel (main heating system)	88.6000	88.6000	88.6000	88.6000	88.6000	0.0000	0.0000	0.0000	0.0000	88.6000	88.6000	88.6000	(210)
Space heating efficiency (main heating system 2)	972.0366	750.0789	585.4065	272.8301	79.0185	0.0000	0.0000	0.0000	0.0000	304.0873	667.5587	991.9054	(211)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	231.8023	204.0860	214.5762	183.3837	174.1448	152.9745	148.1562	156.2877	160.4713	183.6337	200.9648	228.5900	(64)
Efficiency of water heater (217)m	86.5253	86.3073	85.7624	84.4796	81.9881	79.6000	79.6000	79.6000	79.6000	84.7176	86.1303	79.6000	(216)
Fuel for water heating, kWh/month	267.9012	236.4643	250.1986	217.0745	212.4025	192.1791	186.1258	196.3413	201.5971	216.7599	233.3266	264.0236	(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	28.8849	23.1726	20.8643	15.2861	11.8074	9.6468	10.7711	14.0007	18.1855	23.8604	26.9503	29.6877	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-33.0601	-51.3704	-81.6378	-98.5308	-109.6129	-103.2046	-101.4318	-93.7910	-79.9001	-61.4567	-37.5969	-27.7837	(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	-14.9249	-36.2530	-85.9866	-150.0681	-216.2967	-224.4244	-218.8576	-173.8982	-112.6673	-55.7180	-20.8495	-11.3176	(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												4622.9219	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.6000	
Water heating fuel used												2674.3945	(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)												233.1179	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2200.6387	(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												5415.7956	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4622.9219	5.6000	258.8836	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2674.3945	5.6000	149.7661	(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	233.1179	26.0600	60.7505	(250)
Additional standing charges			99.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-879.3767	26.0600	-229.1656	
PV Unit electricity exported	-1321.2619	5.8100	-76.7653	
Total			-305.9309	(252)
Total energy cost			284.8809	(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	4622.9219	0.2100	970.8136	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2674.3945	0.2100	561.6228	(264)
Space and water heating			1532.4364	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	233.1179	0.1443	33.6461	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-879.3767	0.1332	-117.1173	
PV Unit electricity exported	-1321.2619	0.1223	-161.6557	
Total			-278.7731	(269)
Total CO2, kg/year			1299.2388	(272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
--	-----------------	----------------------------------	-------------------------	--

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Space heating - main system 1	4622.9219	1.1300	5223.9017 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2674.3945	1.1300	3022.0658 (278)
Space and water heating			8245.9675 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	233.1179	1.5338	357.5639 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-879.3767	1.4921	-1312.1603
PV Unit electricity exported	-1321.2619	0.4489	-593.1622
Total			-1905.3225 (283)
Total Primary energy kWh/year			6828.3097 (286)

SAP 10 EPC IMPROVEMENTS

Plot 64

Current energy efficiency rating: A 93
Current environmental impact rating: B 88

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

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

Measures omitted - SAP change or cost saving too small:
N Solar water heating + 0.6 -£ 22 -144 kg (11.0%)

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

Potential energy efficiency rating: A 93
Potential environmental impact rating: B 88

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	£83	£83	£0
Mains gas	£508	£508	£0
Space heating	£380	£380	£0
Water heating	£150	£150	£0
Lighting	£61	£61	£0
Generated (PV)	-£306	-£306	£0
Total cost of fuels	£285	£285	£0
Total cost of uses	£285	£285	£0
Delivered energy	51 kWh/m²	51 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.3 tonnes	1.3 tonnes	0.0 tonnes
CO2 emissions per m²	12 kg/m²	12 kg/m²	0 kg/m²
Primary energy	65 kWh/m²	65 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

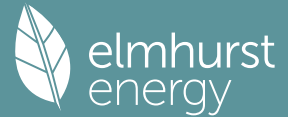
1. Overall dwelling characteristics

	Area (m²)	Storey height (m)	Volume (m³)
Ground floor	25.4100 (1b)	x 2.8400 (2b)	= 72.1644 (1b) - (3b)
First floor	40.1800 (1c)	x 2.3900 (2c)	= 96.0302 (1c) - (3c)
Second floor	40.1800 (1d)	x 2.6000 (2d)	= 104.4680 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 272.6626 (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	6 * 10 = 60.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	

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Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 60.0000 / (5) = 0.2201 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 4.0000 (17)
Infiltration rate 0.4201 (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) = 0.3885 (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 infiltr rate													
	0.4954	0.4857	0.4760	0.4274	0.4177	0.3691	0.3691	0.3594	0.3885	0.4177	0.4371	0.4565	(22b)
Effective ac	0.6227	0.6179	0.6133	0.5913	0.5872	0.5681	0.5681	0.5646	0.5755	0.5872	0.5955	0.6042	(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	
Solid front door			2.1400	1.1000	2.3540			(26)
Windows (Uw = 1.30)			15.6300	1.2357	19.3146			(27)
Ground floor			25.4100	0.1300	3.3033	0.0000	0.0000	(28a)
Exposed floor			14.7600	0.2000	2.9520	20.0000	295.2000	(28b)
Brick wall	125.8800	17.7700	108.1100	0.1900	20.5409	110.0000	11892.1000	(29a)
Retaining wall			12.9200	0.1800	2.3256	110.0000	1421.2000	(29a)
Garage wall			21.3200	0.1400	2.9848	110.0000	2345.2000	(29a)
Plane roof			40.1800	0.0900	3.6162	9.0000	361.6200	(30)
Total net area of external elements Aum(A, m2)			240.4700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	57.3914			(33)
Party Wall 1			69.1400	0.0000	0.0000	140.0000	9679.6000	(32)
Internal Wall			18.2000			75.0000	1365.0000	(32c)
Internal Wall			146.3400			9.0000	1317.0600	(32c)
Internal Floor 1			65.5900			18.0000	1180.6200	(32d)
Internal Ceiling 1			65.5900			9.0000	590.3100	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 30447.9100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 287.8691 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	12.3300	0.0240	0.2959
E3 Sill	9.5000	0.0220	0.2090
E4 Jamb	30.3000	0.0170	0.5151
E5 Ground floor (normal)	20.1900	0.0920	1.8575
E6 Intermediate floor within a dwelling	27.8700	0.0010	0.0279
E10 Eaves (insulation at ceiling level)	9.1000	0.0600	0.5460
E12 Gable (insulation at ceiling level)	8.8500	0.0560	0.4956
E16 Corner (normal)	18.5000	0.0460	0.8510
E17 Corner (inverted - internal area greater than external area)	5.6800	-0.0880	-0.4998
E20 Exposed floor (normal)	7.9900	0.0690	0.5513
E21 Exposed floor (inverted)	7.5100	0.3200	2.4032
E18 Party wall between dwellings	15.6600	0.0380	0.5951
P1 Party wall - Ground floor	8.8300	0.0690	0.6093
P2 Party wall - Intermediate floor within a dwelling	8.8300	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	8.8300	0.4800	4.2384

Thermal bridges (Sum(L x Psi) calculated using Appendix K) (36)...(36a) = 12.6954 (36)
Point Thermal bridges (33) + (36) + (36a) = 70.0868 (37)
Total fabric heat loss

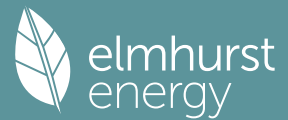
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	56.0306	55.6019	55.1816	53.2077	52.8384	51.1191	51.1191	50.8008	51.7814	52.8384	53.5855	54.3666	(38)
Heat transfer coeff	126.1174	125.6887	125.2684	123.2945	122.9252	121.2060	121.2060	120.8876	121.8682	122.9252	123.6723	124.4534	(39)
Average = Sum(39)m / 12 =												123.2927	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	1.1924	1.1883	1.1843	1.1657	1.1622	1.1459	1.1459	1.1429	1.1522	1.1622	1.1693	1.1766	(40)
HLP (average)												1.1657	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7869 (42)
Hot water usage for mixer showers													
	70.9471	69.8809	68.3272	65.3546	63.1608	60.7144	59.3238	60.8657	62.5559	65.1827	68.2192	70.6752	(42a)
Hot water usage for baths													
	30.6328	30.1778	29.5372	28.3559	27.4714	26.4907	25.9609	26.5971	27.2897	28.3392	29.5448	30.5292	(42b)
Hot water usage for other uses													
	43.1707	41.6009	40.0310	38.4612	36.8913	35.3215	35.3215	36.8913	38.4612	40.0310	41.6009	43.1707	(42c)
Average daily hot water use (litres/day)												133.0583	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	144.7505	141.6596	137.8954	132.1717	127.5236	122.5266	120.6062	124.3541	128.3069	133.5529	139.3648	144.3752	(44)
Energy conte	229.2495	201.7213	211.9401	180.9364	171.6713	150.6607	145.8628	153.9764	158.2152	181.2300	198.5507	226.0566	(45)
Energy content (annual)										Total = Sum(45)m =		2210.0711	
Distribution loss (46)m = 0.15 x (45)m													
	34.3874	30.2582	31.7910	27.1405	25.7507	22.5991	21.8794	23.0965	23.7323	27.1845	29.7826	33.9085	(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	2.5528	2.3647	2.6361	2.4472	2.4735	2.3138	2.2934	2.3113	2.2561	2.4036	2.4141	2.5334	(61)
Total heat required for water heating calculated for each month													
	231.8023	204.0860	214.5762	183.3837	174.1448	152.9745	148.1562	156.2877	160.4713	183.6337	200.9648	228.5900	(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)

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Output from w/h	231.8023	204.0860	214.5762	183.3837	174.1448	152.9745	148.1562	156.2877	160.4713	183.6337	200.9648	228.5900 (64)
	Total per year (kWh/year) = Sum(64)m =											2239.0711 (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	76.8636	67.6635	71.1291	60.7732	57.6991	50.6731	49.0727	51.7750	53.1706	60.8599	66.6216	75.7972 (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	167.2144	167.2144	167.2144	167.2144	167.2144	167.2144	167.2144	167.2144	167.2144	167.2144	167.2144	167.2144 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.0002	29.3105	23.8369	18.0461	13.4897	11.3885	12.3057	15.9954	21.4690	27.2599	31.8163	33.9174 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	396.0188	400.1283	389.7726	367.7267	339.8976	313.7422	296.2688	292.1594	302.5151	324.5610	352.3901	378.5454 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.5083	54.5083	54.5083	54.5083	54.5083	54.5083	54.5083	54.5083	54.5083	54.5083	54.5083	54.5083 (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)	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763 (71)
Water heating gains (Table 5)	103.3114	100.6898	95.6036	84.4072	77.5525	70.3794	65.9580	69.5900	73.8480	81.8009	92.5301	101.8779 (72)
Total internal gains	645.5769	643.3750	622.4597	583.4264	544.1863	505.7566	484.7790	487.9913	508.0786	546.8683	589.9829	627.5872 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF			Access factor Table 6d			Gains W
North					1.4200	10.6334	0.7300		0.7000			0.7700			5.3471 (74)
East					7.2100	19.6403	0.7300		0.7000			0.7700			50.1460 (76)
West					7.0000	19.6403	0.7300		0.7000			0.7700			48.6855 (80)
Solar gains	104.1786	203.5539	335.7596	492.2521	606.6636	622.7884	592.1794	506.2095	391.1845	241.5726	129.8276	85.7318	(83)		
Total gains	749.7555	846.9290	958.2193	1075.6785	1150.8499	1128.5450	1076.9584	994.2008	899.2630	788.4409	719.8105	713.3190	(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	67.0625	67.2913	67.5170	68.5980	68.8041	69.7800	69.7800	69.9638	69.4008	68.8041	68.3884	67.9592
alpha	5.4708	5.4861	5.5011	5.5732	5.5869	5.6520	5.6520	5.6643	5.6267	5.5869	5.5592	5.5306
util living area	0.9977	0.9951	0.9858	0.9490	0.8453	0.6592	0.4904	0.5500	0.8192	0.9731	0.9954	0.9983 (86)
MIT	20.5247	20.5649	20.6347	20.7267	20.7950	20.8281	20.8342	20.8336	20.8110	20.7180	20.6065	20.5211 (87)
Th 2	19.9261	19.9294	19.9325	19.9476	19.9504	19.9635	19.9635	19.9659	19.9584	19.9504	19.9447	19.9387 (88)
util rest of house	0.9969	0.9932	0.9800	0.9284	0.7899	0.5649	0.3776	0.4314	0.7369	0.9583	0.9933	0.9976 (89)
MIT 2	19.3551	19.4094	19.5008	19.6280	19.7062	19.7486	19.7519	19.7545	19.7313	19.6225	19.4770	19.3623 (90)
Living area fraction	fLA = Living area / (4) =											0.1677 (91)
MIT	19.5513	19.6032	19.6910	19.8123	19.8888	19.9296	19.9334	19.9354	19.9124	19.8062	19.6665	19.5567 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.4013	19.4532	19.5410	19.6623	19.7388	19.7796	19.7834	19.7854	19.7624	19.6562	19.5165	19.4067 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9963	0.9921	0.9773	0.9215	0.7769	0.5471	0.3576	0.4101	0.7187	0.9527	0.9921	0.9972 (94)
Useful gains	746.9777	840.2274	936.4880	991.2024	894.0686	617.4684	385.0996	407.6762	646.3163	751.1155	714.1054	711.3010 (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	1904.5374	1829.1706	1633.6252	1326.9349	988.1686	627.8019	385.8489	409.2588	690.0672	1113.2410	1535.5734	1892.5217 (97)
Space heating kWh	861.2244	664.5699	518.6701	241.7274	70.0104	0.0000	0.0000	0.0000	0.0000	269.4214	591.4570	878.8282 (98a)
Space heating requirement - total per year (kWh/year)												4095.9088
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	861.2244	664.5699	518.6701	241.7274	70.0104	0.0000	0.0000	0.0000	0.0000	269.4214	591.4570	878.8282 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4095.9088
Space heating per m2												(98c) / (4) = 38.7247 (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 %)												88.6000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	861.2244	664.5699	518.6701	241.7274	70.0104	0.0000	0.0000	0.0000	0.0000	269.4214	591.4570	878.8282 (98)
Space heating efficiency (main heating system 1)	88.6000	88.6000	88.6000	88.6000	88.6000	0.0000	0.0000	0.0000	0.0000	88.6000	88.6000	88.6000 (210)
Space heating fuel (main heating system)												

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972.0366	750.0789	585.4065	272.8301	79.0185	0.0000	0.0000	0.0000	0.0000	304.0873	667.5587	991.9054	(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												
231.8023	204.0860	214.5762	183.3837	174.1448	152.9745	148.1562	156.2877	160.4713	183.6337	200.9648	228.5900	(64)
Efficiency of water heater												
(217)m	86.5253	86.3073	85.7624	84.4796	81.9881	79.6000	79.6000	79.6000	79.6000	84.7176	86.1303	(216)
Fuel for water heating, kWh/month												
267.9012	236.4643	250.1986	217.0745	212.4025	192.1791	186.1258	196.3413	201.5971	216.7599	233.3266	264.0236	(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	(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												
28.8849	23.1726	20.8643	15.2861	11.8074	9.6468	10.7711	14.0007	18.1855	23.8604	26.9503	29.6877	(232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-33.0601	-51.3704	-81.6378	-98.5308	-109.6129	-103.2046	-101.4318	-93.7910	-79.9001	-61.4567	-37.5969	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-14.9249	-36.2530	-85.9866	-150.0681	-216.2967	-224.4244	-218.8576	-173.8982	-112.6673	-55.7180	-20.8495	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1											4622.9219	(211)
Space heating fuel - main system 2											0.0000	(213)
Space heating fuel - secondary											0.0000	(215)
Efficiency of water heater											79.6000	
Water heating fuel used											2674.3945	(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)											233.1179	(232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation											-2200.6387	(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											5415.7956	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4622.9219	3.6400	168.2744 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2674.3945	3.6400	97.3480 (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	233.1179	16.4900	38.4411 (250)
Additional standing charges			92.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-879.3767	16.4900	-145.0092
PV Unit electricity exported	-1321.2619	5.5900	-73.8585
Total			-218.8678 (252)
Total energy cost			191.3771 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	0.4570 (257)
SAP value	92.5927
SAP rating (Section 12)	93 (258)
SAP band	A

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4622.9219	0.2100	970.8136 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2674.3945	0.2100	561.6228 (264)
Space and water heating			1532.4364 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	233.1179	0.1443	33.6461 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-879.3767	0.1332	-117.1173
PV Unit electricity exported	-1321.2619	0.1223	-161.6557
Total			-278.7731 (269)
Total CO2, kg/year			1299.2388 (272)
CO2 emissions per m2			12.2800 (273)

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EI value 88.4527
EI rating 88 (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	25.4100 (1b)	x	2.8400 (2b)	=	72.1644 (1b) - (3b)	
First floor	40.1800 (1c)	x	2.3900 (2c)	=	96.0302 (1c) - (3c)	
Second floor	40.1800 (1d)	x	2.6000 (2d)	=	104.4680 (1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	105.7700				(4)	
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	272.6626 (5)	

2. Ventilation rate

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	6 * 10 =	60.0000 (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) =	Air changes per hour 60.0000 / (5) =	0.2201 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	(17)
Infiltration rate	0.4201	(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) =	0.3885 (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	0.4954	0.4857	0.4760	0.4274	0.4177	0.3691	0.3691	0.3594	0.3885	0.4177	0.4371	0.4565 (22b)
	0.6227	0.6179	0.6133	0.5913	0.5872	0.5681	0.5681	0.5646	0.5755	0.5872	0.5955	0.6042 (25)

3. Heat losses and heat loss parameter

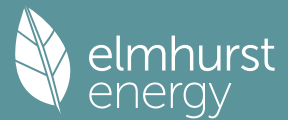
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid front door			2.1400	1.1000	2.3540		(26)
Windows (Uw = 1.30)			15.6300	1.2357	19.3146		(27)
Ground floor			25.4100	0.1300	3.3033	0.0000	0.0000 (28a)
Exposed floor			14.7600	0.2000	2.9520	20.0000	295.2000 (28b)
Brick wall	125.8800	17.7700	108.1100	0.1900	20.5409	110.0000	11892.1000 (29a)
Retaining wall	12.9200		12.9200	0.1800	2.3256	110.0000	1421.2000 (29a)
Garage wall	21.3200		21.3200	0.1400	2.9848	110.0000	2345.2000 (29a)
Plane roof	40.1800		40.1800	0.0900	3.6162	9.0000	361.6200 (30)
Total net area of external elements Aum(A, m ²)			240.4700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	57.3914		(33)
Party Wall 1			69.1400	0.0000	0.0000	140.0000	9679.6000 (32)
Internal Wall			18.2000			75.0000	1365.0000 (32c)
Internal Wall			146.3400			9.0000	1317.0600 (32c)
Internal Floor 1			65.5900			18.0000	1180.6200 (32d)
Internal Ceiling 1			65.5900			9.0000	590.3100 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
(28)...(30) + (32) + (32a)...(32e) = 30447.9100 (34)
287.8691 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	12.3300	0.0240	0.2959
E3 Sill	9.5000	0.0220	0.2090
E4 Jamb	30.3000	0.0170	0.5151
E5 Ground floor (normal)	20.1900	0.0920	1.8575
E6 Intermediate floor within a dwelling	27.8700	0.0010	0.0279
E10 Eaves (insulation at ceiling level)	9.1000	0.0600	0.5460
E12 Gable (insulation at ceiling level)	8.8500	0.0560	0.4956
E16 Corner (normal)	18.5000	0.0460	0.8510
E17 Corner (inverted - internal area greater than external area)	5.6800	-0.0880	-0.4998
E20 Exposed floor (normal)	7.9900	0.0690	0.5513
E21 Exposed floor (inverted)	7.5100	0.3200	2.4032
E18 Party wall between dwellings	15.6600	0.0380	0.5951
P1 Party wall - Ground floor	8.8300	0.0690	0.6093
P2 Party wall - Intermediate floor within a dwelling	8.8300	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	8.8300	0.4800	4.2384
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			12.6954 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	70.0868 (37)

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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	56.0306	55.6019	55.1816	53.2077	52.8384	51.1191	51.1191	50.8008	51.7814	52.8384	53.5855	54.3666	(38)
Heat transfer coeff	126.1174	125.6887	125.2684	123.2945	122.9252	121.2060	121.2060	120.8876	121.8682	122.9252	123.6723	124.4534	(39)
Average = Sum(39)m / 12 =												123.2927	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1924	1.1883	1.1843	1.1657	1.1622	1.1459	1.1459	1.1429	1.1522	1.1622	1.1693	1.1766	(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													2.7869 (42)
Hot water usage for mixer showers	70.9471	69.8809	68.3272	65.3546	63.1608	60.7144	59.3238	60.8657	62.5559	65.1827	68.2192	70.6752	(42a)
Hot water usage for baths	30.6328	30.1778	29.5372	28.3559	27.4714	26.4907	25.9609	26.5971	27.2897	28.3392	29.5448	30.5292	(42b)
Hot water usage for other uses	43.1707	41.6009	40.0310	38.4612	36.8913	35.3215	35.3215	36.8913	38.4612	40.0310	41.6009	43.1707	(42c)
Average daily hot water use (litres/day)												133.0583	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	144.7505	141.6596	137.8954	132.1717	127.5236	122.5266	120.6062	124.3541	128.3069	133.5529	139.3648	144.3752	(44)
Energy content (annual)	229.2495	201.7213	211.9401	180.9364	171.6713	150.6607	145.8628	153.9764	158.2152	181.2300	198.5507	226.0566	(45)
Distribution loss (46)m = 0.15 x (45)m	34.3874	30.2582	31.7910	27.1405	25.7507	22.5991	21.8794	23.0965	23.7323	27.1845	29.7826	33.9085	(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	2.5528	2.3647	2.6361	2.4472	2.4735	2.3138	2.2934	2.3113	2.2561	2.4036	2.4141	2.5334	(61)
Total heat required for water heating calculated for each month	231.8023	204.0860	214.5762	183.3837	174.1448	152.9745	148.1562	156.2877	160.4713	183.6337	200.9648	228.5900	(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	231.8023	204.0860	214.5762	183.3837	174.1448	152.9745	148.1562	156.2877	160.4713	183.6337	200.9648	228.5900	(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	76.8636	67.6635	71.1291	60.7732	57.6991	50.6731	49.0727	51.7750	53.1706	60.8599	66.6216	75.7972	(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	167.2144	167.2144	167.2144	167.2144	167.2144	167.2144	167.2144	167.2144	167.2144	167.2144	167.2144	167.2144	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.0002	29.3105	23.8369	18.0461	13.4897	11.3885	12.3057	15.9954	21.4690	27.2599	31.8163	33.9174	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	396.0188	400.1283	389.7726	367.7267	339.8976	313.7422	296.2688	292.1594	302.5151	324.5610	352.3901	378.5454	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.5083	54.5083	54.5083	54.5083	54.5083	54.5083	54.5083	54.5083	54.5083	54.5083	54.5083	54.5083	(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)	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	-111.4763	(71)
Water heating gains (Table 5)	103.3114	100.6898	95.6036	84.4072	77.5525	70.3794	65.9580	69.5900	73.8480	81.8009	92.5301	101.8779	(72)
Total internal gains	645.5769	643.3750	622.4597	583.4264	544.1863	505.7566	484.7790	487.9913	508.0786	546.8683	589.9829	627.5872	(73)

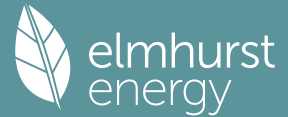
6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W				
North				1.4200	10.6334	0.7300	0.7000	0.7700	5.3471 (74)				
East				7.2100	19.6403	0.7300	0.7000	0.7700	50.1460 (76)				
West				7.0000	19.6403	0.7300	0.7000	0.7700	48.6855 (80)				
Solar gains	104.1786	203.5539	335.7596	492.2521	606.6636	622.7884	592.1794	506.2095	391.1845	241.5726	129.8276	85.7318	(83)
Total gains	749.7555	846.9290	958.2193	1075.6785	1150.8499	1128.5450	1076.9584	994.2008	899.2630	788.4409	719.8105	713.3190	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
alpha	67.0625	67.2913	67.5170	68.5980	68.8041	69.7800	69.7800	69.9638	69.4008	68.8041	68.3884	67.9592	
util living area	5.4708	5.4861	5.5011	5.5732	5.5869	5.6520	5.6520	5.6643	5.6267	5.5869	5.5592	5.5306	
	0.9977	0.9951	0.9858	0.9490	0.8453	0.6592	0.4904	0.5500	0.8192	0.9731	0.9954	0.9983	(86)
MIT	20.5247	20.5649	20.6347	20.7267	20.7950	20.8281	20.8342	20.8336	20.8110	20.7180	20.6065	20.5211	(87)
Th 2	19.9261	19.9294	19.9325	19.9476	19.9504	19.9635	19.9635	19.9659	19.9584	19.9504	19.9447	19.9387	(88)

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util rest of house	0.9969	0.9932	0.9800	0.9284	0.7899	0.5649	0.3776	0.4314	0.7369	0.9583	0.9933	0.9976 (89)
MIT 2	19.3551	19.4094	19.5008	19.6280	19.7062	19.7486	19.7519	19.7545	19.7313	19.6225	19.4770	19.3623 (90)
Living area fraction									FLA = Living area / (4) =			0.1677 (91)
MIT	19.5513	19.6032	19.6910	19.8123	19.8888	19.9296	19.9334	19.9354	19.9124	19.8062	19.6665	19.5567 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.4013	19.4532	19.5410	19.6623	19.7388	19.7796	19.7834	19.7854	19.7624	19.6562	19.5165	19.4067 (93)

8. Space heating requirement

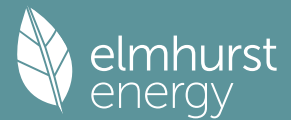
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9963	0.9921	0.9773	0.9215	0.7769	0.5471	0.3576	0.4101	0.7187	0.9527	0.9921	0.9972	(94)
Useful gains	746.9777	840.2274	936.4880	991.2024	894.0686	617.4684	385.0996	407.6762	646.3163	751.1155	714.1054	711.3010	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1904.5374	1829.1706	1633.6252	1326.9349	988.1686	627.8019	385.8489	409.2588	690.0672	1113.2410	1535.5734	1892.5217	(97)
Space heating kWh	861.2244	664.5699	518.6701	241.7274	70.0104	0.0000	0.0000	0.0000	0.0000	269.4214	591.4570	878.8282	(98a)
Space heating requirement - total per year (kWh/year)												4095.9088	
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	861.2244	664.5699	518.6701	241.7274	70.0104	0.0000	0.0000	0.0000	0.0000	269.4214	591.4570	878.8282	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4095.9088	
Space heating per m2										(98c) / (4) =		38.7247	(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 %)												88.6000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	861.2244	664.5699	518.6701	241.7274	70.0104	0.0000	0.0000	0.0000	0.0000	269.4214	591.4570	878.8282 (98)
Space heating efficiency (main heating system 1)	88.6000	88.6000	88.6000	88.6000	88.6000	0.0000	0.0000	0.0000	0.0000	88.6000	88.6000	88.6000 (210)
Space heating fuel (main heating system)	972.0366	750.0789	585.4065	272.8301	79.0185	0.0000	0.0000	0.0000	0.0000	304.0873	667.5587	991.9054 (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	231.8023	204.0860	214.5762	183.3837	174.1448	152.9745	148.1562	156.2877	160.4713	183.6337	200.9648	228.5900 (64)
Efficiency of water heater	86.5253	86.3073	85.7624	84.4796	81.9881	79.6000	79.6000	79.6000	79.6000	84.7176	86.1303	79.6000 (216)
Fuel for water heating, kWh/month	267.9012	236.4643	250.1986	217.0745	212.4025	192.1791	186.1258	196.3413	201.5971	216.7599	233.3266	264.0236 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	28.8849	23.1726	20.8643	15.2861	11.8074	9.6468	10.7711	14.0007	18.1855	23.8604	26.9503	29.6877 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-33.0601	-51.3704	-81.6378	-98.5308	-109.6129	-103.2046	-101.4318	-93.7910	-79.9001	-61.4567	-37.5969	-27.7837 (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)	-14.9249	-36.2530	-85.9866	-150.0681	-216.2967	-224.4244	-218.8576	-173.8982	-112.6673	-55.7180	-20.8495	-11.3176 (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												4622.9219 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.6000
Water heating fuel used												2674.3945 (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)												233.1179 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2200.6387 (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												5415.7956 (238)

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

Full SAP Calculation Printout



	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4622.9219	5.6000	258.8836 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2674.3945	5.6000	149.7661 (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	233.1179	26.0600	60.7505 (250)
Additional standing charges			99.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-879.3767	26.0600	-229.1656
PV Unit electricity exported	-1321.2619	5.8100	-76.7653
Total			-305.9309 (252)
Total energy cost			284.8809 (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	4622.9219	0.2100	970.8136 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2674.3945	0.2100	561.6228 (264)
Space and water heating			1532.4364 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	233.1179	0.1443	33.6461 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-879.3767	0.1332	-117.1173
PV Unit electricity exported	-1321.2619	0.1223	-161.6557
Total			-278.7731 (269)
Total CO2, kg/year			1299.2388 (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	4622.9219	1.1300	5223.9017 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2674.3945	1.1300	3022.0658 (278)
Space and water heating			8245.9675 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	233.1179	1.5338	357.5639 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-879.3767	1.4921	-1312.1603
PV Unit electricity exported	-1321.2619	0.4489	-593.1622
Total			-1905.3225 (283)
Total Primary energy kWh/year			6828.3097 (286)

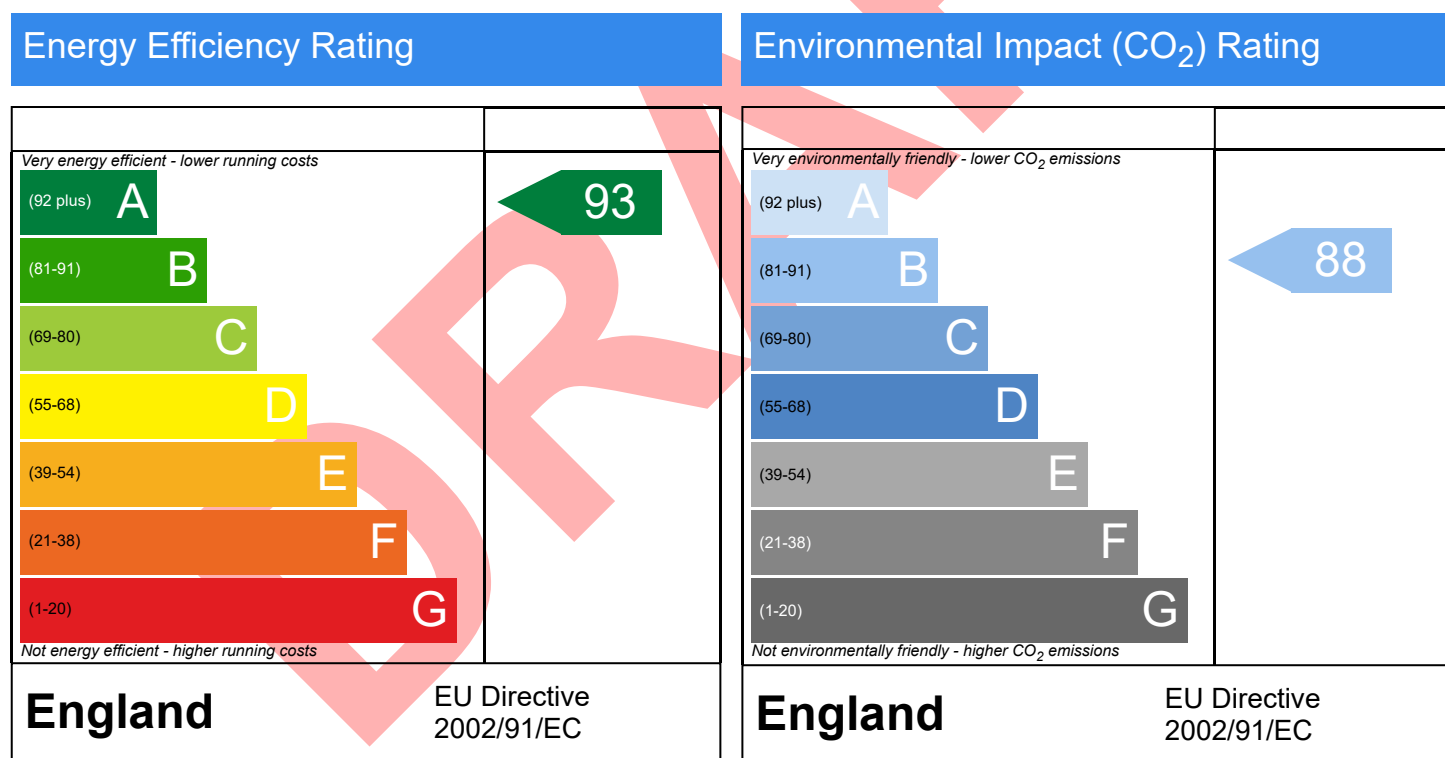
Predicted Energy Assessment



Dwelling type: House, Semi-Detached
Date of assessment: 15/11/2024
Produced by: Victoria Gartside
Total floor area: 120.53 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.