

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 10:34:16

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 53
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	12.67 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	12.65 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	66.53 kWh _{PE} /m ²		
Dwelling primary energy	66.52 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	43.3 kWh/m ²		
Dwelling fabric energy efficiency	40.6 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	South	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	0.5 kWp	
Orientation	West	
Pitch	30°	
Overshading	None or very little	
Manufacturer	PV Front	
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 53	Prop Type Ref	SAP VG 21-0282
Property			

SAP Rating	93 A	DER	12.65	TER	12.67
Environmental	89 B	% DER < TER			0.16
CO ₂ Emissions (t/year)	1.28	DFEE	40.59	TFEE	43.27
Compliance Check	See BREL	% DFEE < TFEE			6.20
% DPER < TPER	0.01	DPER	66.52	TPER	66.53

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/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements	Heat Loss Perimeter	Internal Floor Area	Unheated Space Floor Area	Average Storey Height
Ground floor:	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	South	1.42	0
Rear windows brick	Windows	Brick wall	East	7.21	0

14.0 Conservatory

None

15.0 Draught Proofing

100

 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	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

0.05

W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present

No

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys

0

Number of open flues

0

Number of chimneys/flues attached to closed fire

0

Number of flues attached to solid fuel boiler

0

Number of flues attached to other heater

0

Number of blocked chimneys

0

Number of intermittent extract fans

6

Number of passive vents

0

Number of flueless gas fires

0

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
0.50	West	30°	None Or Little	No	No	1.00		PV Front

34.0 Small-scale Hydro	None
Electricity Generated	0.00
Apportioned	0.00
Connected to dwelling's electricity meter	Yes
Electricity Generation	Annual

kWh/Year

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

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout



Property Reference	SAP VG 21-0282			Issued on Date	15/11/2024
Assessment Reference	Plot 53	Prop Type Ref	SAP VG 21-0282		
Property					
SAP Rating	93 A	DER	12.65	TER	12.67
Environmental	89 B	% DER < TER			0.16
CO ₂ Emissions (t/year)	1.28	DFEE	40.59	TFEE	43.27
Compliance Check	See BREL	% DFEE < TFEE			6.20
% DPER < TPER	0.01	DPER	66.52	TPER	66.53
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

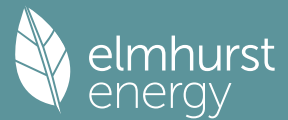
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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 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
East	7.2100	19.6403	0.7300	0.7000	0.7700	50.1460 (76)
South	1.4200	46.7521	0.7300	0.7000	0.7700	23.5095 (78)

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West	7.0000		19.6403		0.7300		0.7000		0.7700		48.6855 (80)	
Solar gains	122.3410	231.8379	367.4413	519.7934	626.8559	638.1568	608.9422	529.1639	421.5413	270.9373	151.0981	101.5886 (83)
Total gains	700.7060	825.5401	933.9136	1065.0290	1141.8608	1130.1951	1080.1213	1001.2217	909.5260	779.9151	694.1810	666.8130 (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												
	0.9984	0.9957	0.9873	0.9509	0.8487	0.6584	0.4891	0.5464	0.8139	0.9744	0.9961	0.9988 (86)
MIT	20.5138	20.5602	20.6296	20.7249	20.7941	20.8282	20.8342	20.8336	20.8118	20.7163	20.6008	20.5108 (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												
	0.9977	0.9940	0.9822	0.9309	0.7937	0.5642	0.3765	0.4285	0.7309	0.9601	0.9943	0.9983 (89)
MIT 2	19.3412	19.4034	19.4945	19.6260	19.7054	19.7486	19.7519	19.7545	19.7319	19.6205	19.4699	19.3490 (90)
Living area fraction												
	0.9977	0.9940	0.9822	0.9309	0.7937	0.5642	0.3765	0.4285	0.7309	0.9601	0.9943	0.9983 (89)
MIT	19.5379	19.5974	19.6849	19.8103	19.8880	19.9297	19.9334	19.9355	19.9130	19.8043	19.6596	19.5439 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.3879	19.4474	19.5349	19.6603	19.7380	19.7797	19.7834	19.7855	19.7630	19.6543	19.5096	19.3939 (93)

8. Space heating requirement												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9973	0.9930	0.9797	0.9241	0.7808	0.5464	0.3565	0.4072	0.7127	0.9546	0.9933	0.9980 (94)
Useful gains	698.8304	819.7347	914.9187	984.2120	891.5380	617.5397	385.1115	407.7342	648.1852	744.5088	689.5367	665.4575 (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												
	1902.8457	1828.4500	1632.8614	1326.6832	988.0712	627.8052	385.8497	409.2623	690.1446	1113.0058	1534.7203	1890.9292 (97)
Space heating kWh												
	895.7874	677.8567	534.1494	246.5793	71.8206	0.0000	0.0000	0.0000	0.0000	274.1618	608.5322	911.7509 (98a)
Space heating requirement - total per year (kWh/year)												4220.6384
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												
	895.7874	677.8567	534.1494	246.5793	71.8206	0.0000	0.0000	0.0000	0.0000	274.1618	608.5322	911.7509 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4220.6384
Space heating per m2												39.9039 (99)
(98c) / (4) =												

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												
	895.7874	677.8567	534.1494	246.5793	71.8206	0.0000	0.0000	0.0000	0.0000	274.1618	608.5322	911.7509 (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)												
	1011.0468	765.0753	602.8774	278.3062	81.0617	0.0000	0.0000	0.0000	0.0000	309.4377	686.8310	1029.0643 (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												
	86.5874	86.3410	85.8192	84.5240	82.0332	79.6000	79.6000	79.6000	79.6000	84.7560	86.1809	86.6364 (217)
Fuel for water heating, kWh/month												
	267.7089	236.3722	250.0329	216.9606	212.2858	192.1791	186.1258	196.3413	201.5971	216.6615	233.1894	263.8498 (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												
	-32.1721	-50.1281	-79.9151	-96.7901	-107.9774	-101.7780	-100.0207	-92.3274	-78.4275	-60.0841	-36.6298	-27.0233 (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												
	-14.2292	-34.6035	-82.1772	-143.6042	-207.1760	-215.0381	-209.6981	-166.5271	-107.7846	-53.2235	-19.8876	-10.7876 (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												4763.7002 (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												2673.3044 (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	-2128.0103 (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	5628.1122 (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	4763.7002	0.2100	1000.3771 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2673.3044	0.2100	561.3939 (264)
Space and water heating			1561.7710 (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	-863.2737	0.1331	-114.9174
PV Unit electricity exported	-1264.7366	0.1223	-154.7023
Total			-269.6197 (269)
Total CO2, kg/year			1337.7266 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.6500 (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	4763.7002	1.1300	5382.9813 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2673.3044	1.1300	3020.8340 (278)
Space and water heating			8403.8152 (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	-863.2737	1.4919	-1287.9245
PV Unit electricity exported	-1264.7366	0.4488	-567.6457
Total			-1855.5701 (283)
Total Primary energy kWh/year			7035.9099 (286)
Dwelling Primary energy Rate (DPER)			66.5200 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	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	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) = Sum(64a)m =												
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	
East				7.2100	19.6403		0.6300	0.7000		0.7700		43.2767 (76)	
South				1.4200	46.7521		0.6300	0.7000		0.7700		20.2890 (78)	
West				7.0000	19.6403		0.6300	0.7000		0.7700		42.0162 (80)	
Solar gains	105.5820	200.0793	317.1069	448.5888	540.9852	550.7381	525.5255	456.6757	363.7959	233.8226	130.3997	87.6724 (83)	
Total gains	700.2124	810.0250	899.8167	1010.0980	1072.2823	1059.0962	1013.0572	945.0801	868.1205	759.1161	689.7677	669.1687 (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	0.9984	0.9960	0.9893	0.9602	0.8742	0.6950	0.5208	0.5773	0.8358	0.9772	0.9963	0.9988 (86)
MIT	19.7384	19.9081	20.1681	20.5282	20.8133	20.9624	20.9937	20.9892	20.8944	20.5144	20.0688	19.7189 (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	0.9978	0.9945	0.9849	0.9433	0.8238	0.5991	0.4017	0.4540	0.7561	0.9643	0.9945	0.9983 (89)
MIT 2	18.4643	18.6832	19.0158	19.4723	19.7972	19.9418	19.9596	19.9602	19.8888	19.4649	18.8993	18.4476 (90)
Living area fraction	fLA = Living area / (4) = 0.1677 (91)											
MIT	18.6779	18.8886	19.2091	19.6494	19.9676	20.1130	20.1331	20.1328	20.0574	19.6409	19.0955	18.6608 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.6779	18.8886	19.2091	19.6494	19.9676	20.1130	20.1331	20.1328	20.0574	19.6409	19.0955	18.6608 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9966	0.9923	0.9806	0.9372	0.8248	0.6140	0.4218	0.4748	0.7649	0.9591	0.9924	0.9974	(94)
Useful gains	697.8469	803.7513	882.4005	946.6356	884.4521	650.2832	427.2828	448.7458	664.0540	728.0391	684.5081	667.3982	(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	1809.7857	1755.4277	1590.0949	1325.9823	1017.1218	669.7783	429.2374	452.4423	727.2965	1112.2596	1483.7362	1798.7536	(97)
Space heating kWh	827.2825	639.5266	526.5246	273.1296	98.7062	0.0000	0.0000	0.0000	0.0000	285.8601	575.4442	841.7284	(98a)
Space heating requirement - total per year (kWh/year)												4068.2022	
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	827.2825	639.5266	526.5246	273.1296	98.7062	0.0000	0.0000	0.0000	0.0000	285.8601	575.4442	841.7284	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4068.2022	
Space heating per m2										(98c) / (4) =		38.4627	(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	827.2825	639.5266	526.5246	273.1296	98.7062	0.0000	0.0000	0.0000	0.0000	285.8601	575.4442	841.7284	(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)	895.3274	692.1283	569.8318	295.5948	106.8249	0.0000	0.0000	0.0000	0.0000	309.3724	622.7751	910.9615	(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												80.3000	(216)
(217)m	86.7585	86.5354	86.0733	84.9931	82.9567	80.3000	80.3000	80.3000	80.3000	85.0631	86.3387	86.8029	(217)
Fuel for water heating, kWh/month													

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	285.5909	253.1494	270.5391	241.6426	240.4270	224.3345	221.9545	230.5907	232.8868	244.5191	255.3403	282.4583	(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												4402.8162	(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												2983.4332	(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												5724.7286	(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	4402.8162	0.2100	924.5914 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2983.4332	0.2100	626.5210 (264)
Space and water heating			1551.1124 (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			1340.3545 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.6700 (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	4402.8162	1.1300	4975.1824 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2983.4332	1.1300	3371.2795 (278)
Space and water heating			8346.4618 (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			7036.6874 (286)
Target Primary Energy Rate (TPER)			66.5300 (287)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 53			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	93 A	DER	12.65	TER	12.67		
Environmental	89 B	% DER < TER				0.16	
CO ₂ Emissions (t/year)	1.28	DFEE	40.59	TFEE	43.27		
Compliance Check	See BREL	% DFEE < TFEE				6.20	
% DPER < TPER	0.01	DPER	66.52	TPER	66.53		
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	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)
 Point Thermal bridges (36a) = 12.6954 (36)
 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	
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	(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	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	(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)	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	(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	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 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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East	7.2100	19.6403	0.7300	0.7000	0.7700	50.1460 (76)
South	1.4200	46.7521	0.7300	0.7000	0.7700	23.5095 (78)
West	7.0000	19.6403	0.7300	0.7000	0.7700	48.6855 (80)

Solar gains	122.3410	231.8379	367.4413	519.7934	626.8559	638.1568	608.9422	529.1639	421.5413	270.9373	151.0981	101.5886 (83)
Total gains	646.8713	773.0052	884.4245	1022.9349	1104.1143	1100.0483	1053.1326	972.1433	877.9240	740.1884	647.3997	613.9860 (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	0.9989	0.9968	0.9897	0.9561	0.8563	0.6652	0.4936	0.5539	0.8238	0.9788	0.9972	0.9992 (86)
MIT	19.7336	19.9163	20.1914	20.5630	20.8418	20.9714	20.9955	20.9918	20.9068	20.5213	20.0619	19.7080 (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	0.9985	0.9955	0.9855	0.9380	0.8032	0.5717	0.3816	0.4362	0.7431	0.9667	0.9959	0.9989 (89)
MIT 2	18.8023	18.9860	19.2604	19.6266	19.8706	19.9671	19.9775	19.9782	19.9288	19.5952	19.1400	18.7835 (90)
Living area fraction	fLA = Living area / (4) =											0.1677 (91)
MIT	18.9585	19.1420	19.4165	19.7837	20.0335	20.1356	20.1483	20.1482	20.0928	19.7505	19.2947	18.9386 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.9585	19.1420	19.4165	19.7837	20.0335	20.1356	20.1483	20.1482	20.0928	19.7505	19.2947	18.9386 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9979	0.9941	0.9826	0.9340	0.8069	0.5868	0.4005	0.4561	0.7536	0.9632	0.9947	0.9984 (94)
Useful gains	645.5133	768.4764	869.0017	955.3854	890.9326	645.4921	421.7729	443.3840	661.5742	712.9518	643.9533	613.0223 (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	1797.0993	1741.8855	1576.0679	1313.3883	1003.5486	660.1264	423.1403	446.1678	717.3595	1101.9324	1474.7271	1790.2113 (97)
Space heating kWh	856.7800	654.1309	526.0572	257.7620	83.7863	0.0000	0.0000	0.0000	0.0000	289.4016	598.1572	875.8286 (98a)
Space heating requirement - total per year (kWh/year)	4141.9038											
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	856.7800	654.1309	526.0572	257.7620	83.7863	0.0000	0.0000	0.0000	0.0000	289.4016	598.1572	875.8286 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	4141.9038											
Space heating per m2	(98c) / (4) = 39.1595 (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	0.8857	0.9427	0.9154	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	992.7956	831.8626	828.0984	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1222.5361	1170.6524	1078.8610	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	165.4132	252.0596	186.5674	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	41.3533	63.0149	46.6418	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling requirement	151.0100 (107)											
Energy for space heating	39.1595 (99)											
Energy for space cooling	1.4277 (108)											
Total	40.5873 (109)											
Fabric Energy Efficiency (DFEE)	40.6 (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)
										</		

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	Specific data or Table 6c	FF	Access factor Table 6d	Gains W	
East					7.2100	19.6403		0.6300		0.7000		0.7700	43.2767 (76)	
South					1.4200	46.7521		0.6300		0.7000		0.7700	20.2890 (78)	
West					7.0000	19.6403		0.6300		0.7000		0.7700	42.0162 (80)	
Solar gains	105.5820	200.0793	317.1069	448.5888	540.9852	550.7381	525.5255	456.6757	363.7959	233.8226	130.3997	87.6724 (83)		
Total gains	630.1122	741.2466	834.0901	951.7303	1018.2436	1012.6295	969.7158	899.6551	820.1786	703.0737	626.7013	600.0697 (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	0.9990	0.9974	0.9925	0.9688	0.8929	0.7193	0.5425	0.6033	0.8600	0.9838	0.9977	0.9993 (86)
MIT	19.6758	19.8473	20.1120	20.4850	20.7878	20.9555	20.9923	20.9866	20.8761	20.4691	20.0129	19.6570 (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	0.9987	0.9964	0.9893	0.9549	0.8467	0.6231	0.4193	0.4761	0.7851	0.9741	0.9966	0.9990 (89)
MIT 2	18.7249	18.8982	19.1634	19.5374	19.8116	19.9429	19.9597	19.9602	19.8925	19.5293	19.0746	18.7150 (90)
Living area fraction	18.8844	19.0574	19.3225	19.6963	19.9754	20.1127	20.1329	20.1324	20.0575	19.6869	19.2319	18.8730 (91)
MIT	18.8844	19.0574	19.3225	19.6963	19.9754	20.1127	20.1329	20.1324	20.0575	19.6869	19.2319	18.8730 (92)
Temperature adjustment	18.8844	19.0574	19.3225	19.6963	19.9754	20.1127	20.1329	20.1324	20.0575	19.6869	19.2319	18.8730 (93)
adjusted MIT	18.8844	19.0574	19.3225	19.6963	19.9754	20.1127	20.1329	20.1324	20.0575	19.6869	19.2319	18.8730 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9981	0.9952	0.9867	0.9507	0.8480	0.6382	0.4401	0.4977	0.7936	0.9708	0.9954	0.9986	(94)
Useful gains	628.9304	737.6856	823.0120	904.7834	863.5001	646.2167	426.7933	447.7262	650.8855	682.5162	623.8448	599.2139	(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	1835.7708	1776.6146	1604.2871	1331.7714	1018.0768	669.7476	429.2144	452.3936	727.3037	1117.9188	1500.6168	1825.1465	(97)
Space heating kWh	897.8893	698.1603	581.2687	307.4313	115.0051	0.0000	0.0000	0.0000	0.0000	323.9395	631.2758	912.0939	(98a)
Space heating requirement - total per year (kWh/year)												4467.0639	
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	897.8893	698.1603	581.2687	307.4313	115.0051	0.0000	0.0000	0.0000	0.0000	323.9395	631.2758	912.0939	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4467.0639	
Space heating per m2											(98c) / (4) =	42.2338	(99)

8c. Space cooling requirement

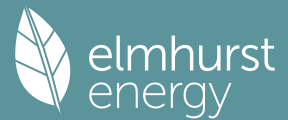
Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W												
Utilisation	0.0000	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	0.8412	0.9136	0.8801	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	960.6331	821.3196	810.6904	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1120.3583	1073.1523	994.1345	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	115.0022	187.3636	136.4824	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	28.7506	46.8409	34.1206	0.0000	0.0000	0.0000	0.0000 (107)
Energy for space heating												109.7120 (107)
Energy for space cooling												42.2338 (99)
Total												1.0373 (108)
Fabric Energy Efficiency (TFEE)												43.2710 (109)
												43.3 (109)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 53			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	93 A		DER	12.65		TER	12.67
Environmental	89 B		% DER < TER				0.16
CO ₂ Emissions (t/year)	1.28		DFEE	40.59		TFEE	43.27
Compliance Check	See BREL		% DFEE < TFEE				6.20
% DPER < TPER	0.01		DPER	66.52		TPER	66.53
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)
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												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	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)	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	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	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
East	7.2100	19.6403	0.7300	0.7000	0.7700	50.1460 (76)
South	1.4200	46.7521	0.7300	0.7000	0.7700	23.5095 (78)

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West		7.0000			19.6403			0.7300			0.7000			0.7700			48.6855 (80)		

Solar gains	122.3410	231.8379	367.4413	519.7934	626.8559	638.1568	608.9422	529.1639	421.5413	270.9373	151.0981	101.5886	(83)						
Total gains	700.7060	825.5401	933.9136	1065.0290	1141.8608	1130.1951	1080.1213	1001.2217	909.5260	779.9151	694.1810	666.8130	(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	0.9984	0.9957	0.9873	0.9509	0.8487	0.6584	0.4891	0.5464	0.8139	0.9744	0.9961	0.9988	86)
MIT	20.5138	20.5602	20.6296	20.7249	20.7941	20.8282	20.8342	20.8336	20.8118	20.7163	20.6008	20.5108	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	0.9977	0.9940	0.9822	0.9309	0.7937	0.5642	0.3765	0.4285	0.7309	0.9601	0.9943	0.9983	89)
MIT 2	19.3412	19.4034	19.4945	19.6260	19.7054	19.7486	19.7519	19.7545	19.7319	19.6205	19.4699	19.3490	90)
Living area fraction	19.5379	19.5974	19.6849	19.8103	19.8880	19.9297	19.9334	19.9355	19.9130	19.8043	19.6596	19.5439	91)
MIT	19.5379	19.5974	19.6849	19.8103	19.8880	19.9297	19.9334	19.9355	19.9130	19.8043	19.6596	19.5439	92)
Temperature adjustment	19.3879	19.4474	19.5349	19.6603	19.7380	19.7797	19.7834	19.7855	19.7630	19.6543	19.5096	-0.1500	
adjusted MIT	19.3879	19.4474	19.5349	19.6603	19.7380	19.7797	19.7834	19.7855	19.7630	19.6543	19.5096	19.3939	93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9973	0.9930	0.9797	0.9241	0.7808	0.5464	0.3565	0.4072	0.7127	0.9546	0.9933	0.9980	94)
Useful gains	698.8304	819.7347	914.9187	984.2120	891.5380	617.5397	385.1115	407.7342	648.1852	744.5088	689.5367	665.4575	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	1902.8457	1828.4500	1632.8614	1326.6832	988.0712	627.8052	385.8497	409.2623	690.1446	1113.0058	1534.7203	1890.9292	97)
Space heating kWh	895.7874	677.8567	534.1494	246.5793	71.8206	0.0000	0.0000	0.0000	0.0000	274.1618	608.5322	911.7509	98a)
Space heating requirement - total per year (kWh/year)												4220.6384	
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	895.7874	677.8567	534.1494	246.5793	71.8206	0.0000	0.0000	0.0000	0.0000	274.1618	608.5322	911.7509	98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4220.6384	
Space heating per m2										(98c) / (4) =		39.9039	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	895.7874	677.8567	534.1494	246.5793	71.8206	0.0000	0.0000	0.0000	0.0000	274.1618	608.5322	911.7509	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)	1011.0468	765.0753	602.8774	278.3062	81.0617	0.0000	0.0000	0.0000	0.0000	309.4377	686.8310	1029.0643	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	86.5874	86.3410	85.8192	84.5240	82.0332	79.6000	79.6000	79.6000	79.6000	84.7560	86.1809	86.6364	216)
Fuel for water heating, kWh/month	267.7089	236.3722	250.0329	216.9606	212.2858	192.1791	186.1258	196.3413	201.5971	216.6615	233.1894	263.8498	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	-32.1721	-50.1281	-79.9151	-96.7901	-107.9774	-101.7780	-100.0207	-92.3274	-78.4275	-60.0841	-36.6298	-27.0233	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	-14.2292	-34.6035	-82.1772	-143.6042	-207.1760	-215.0381	-209.6981	-166.5271	-107.7846	-53.2235	-19.8876	-10.7876	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												4763.7002	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												2673.3044	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	-2128.0103 (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	5628.1122 (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	4763.7002	0.2100	1000.3771 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2673.3044	0.2100	561.3939 (264)
Space and water heating			1561.7710 (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	-863.2737	0.1331	-114.9174
PV Unit electricity exported	-1264.7366	0.1223	-154.7023
Total			-269.6197 (269)
Total CO2, kg/year			1337.7266 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.6500 (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	4763.7002	1.1300	5382.9813 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2673.3044	1.1300	3020.8340 (278)
Space and water heating			8403.8152 (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	-863.2737	1.4919	-1287.9245
PV Unit electricity exported	-1264.7366	0.4488	-567.6457
Total			-1855.5701 (283)
Total Primary energy kWh/year			7035.9099 (286)
Dwelling Primary energy Rate (DPER)			66.5200 (287)

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

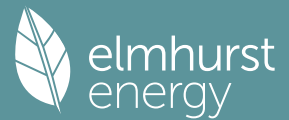
1. Overall dwelling characteristics

	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 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	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)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												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	
East				7.2100	19.6403		0.6300	0.7000		0.7700		43.2767 (76)	
South				1.4200	46.7521		0.6300	0.7000		0.7700		20.2890 (78)	
West				7.0000	19.6403		0.6300	0.7000		0.7700		42.0162 (80)	
Solar gains	105.5820	200.0793	317.1069	448.5888	540.9852	550.7381	525.5255	456.6757	363.7959	233.8226	130.3997	87.6724 (83)	
Total gains	700.2124	810.0250	899.8167	1010.0980	1072.2823	1059.0962	1013.0572	945.0801	868.1205	759.1161	689.7677	669.1687 (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	0.9984	0.9960	0.9893	0.9602	0.8742	0.6950	0.5208	0.5773	0.8358	0.9772	0.9963	0.9988 (86)
MIT	19.7384	19.9081	20.1681	20.5282	20.8133	20.9624	20.9937	20.9892	20.8944	20.5144	20.0688	19.7189 (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	0.9978	0.9945	0.9849	0.9433	0.8238	0.5991	0.4017	0.4540	0.7561	0.9643	0.9945	0.9983 (89)
MIT 2	18.4643	18.6832	19.0158	19.4723	19.7972	19.9418	19.9596	19.9602	19.8888	19.4649	18.8993	18.4476 (90)
Living area fraction	fLA = Living area / (4) = 0.1677 (91)											
MIT	18.6779	18.8886	19.2091	19.6494	19.9676	20.1130	20.1331	20.1328	20.0574	19.6409	19.0955	18.6608 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.6779	18.8886	19.2091	19.6494	19.9676	20.1130	20.1331	20.1328	20.0574	19.6409	19.0955	18.6608 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9966	0.9923	0.9806	0.9372	0.8248	0.6140	0.4218	0.4748	0.7649	0.9591	0.9924	0.9974	(94)
Useful gains	697.8469	803.7513	882.4005	946.6356	884.4521	650.2832	427.2828	448.7458	664.0540	728.0391	684.5081	667.3982	(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	1809.7857	1755.4277	1590.0949	1325.9823	1017.1218	669.7783	429.2374	452.4423	727.2965	1112.2596	1483.7362	1798.7536	(97)
Space heating kWh	827.2825	639.5266	526.5246	273.1296	98.7062	0.0000	0.0000	0.0000	0.0000	285.8601	575.4442	841.7284	(98a)
Space heating requirement - total per year (kWh/year)												4068.2022	
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	827.2825	639.5266	526.5246	273.1296	98.7062	0.0000	0.0000	0.0000	0.0000	285.8601	575.4442	841.7284	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4068.2022	
Space heating per m2											(98c) / (4) =	38.4627	(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	827.2825	639.5266	526.5246	273.1296	98.7062	0.0000	0.0000	0.0000	0.0000	285.8601	575.4442	841.7284 (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)	895.3274	692.1283	569.8318	295.5948	106.8249	0.0000	0.0000	0.0000	0.0000	309.3724	622.7751	910.9615 (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												80.3000 (216)
(217)m	86.7585	86.5354	86.0733	84.9931	82.9567	80.3000	80.3000	80.3000	80.3000	85.0631	86.3387	86.8029 (217)
Fuel for water heating, kWh/month												

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	285.5909	253.1494	270.5391	241.6426	240.4270	224.3345	221.9545	230.5907	232.8868	244.5191	255.3403	282.4583	(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												4402.8162	(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												2983.4332	(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												5724.7286	(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	4402.8162	0.2100	924.5914 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2983.4332	0.2100	626.5210 (264)
Space and water heating			1551.1124 (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			1340.3545 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.6700 (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	4402.8162	1.1300	4975.1824 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2983.4332	1.1300	3371.2795 (278)
Space and water heating			8346.4618 (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			7036.6874 (286)
Target Primary Energy Rate (TPER)			66.5300 (287)

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Property Reference	SAP VG 21-0282				Issued on Date	15/11/2024	
Assessment Reference	Plot 53			Prop Type Ref	SAP VG 21-0282		
Property							
SAP Rating	93 A	DER	12.65	TER	12.67		
Environmental	89 B	% DER < TER				0.16	
CO ₂ Emissions (t/year)	1.28	DFEE	40.59	TFEE	43.27		
Compliance Check	See BREL	% DFEE < TFEE				6.20	
% DPER < TPER	0.01	DPER	66.52	TPER	66.53		
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

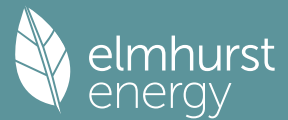
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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	0.4800	4.2384
P4 Party wall - Roof (insulation at ceiling level)			
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 content	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)
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
East	7.2100	19.6403	0.7300	0.7000	0.7700	50.1460 (76)
South	1.4200	46.7521	0.7300	0.7000	0.7700	23.5095 (78)
West	7.0000	19.6403	0.7300	0.7000	0.7700	48.6855 (80)

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Solar gains	122.3410	231.8379	367.4413	519.7934	626.8559	638.1568	608.9422	529.1639	421.5413	270.9373	151.0981	101.5886 (83)
Total gains	767.9179	875.2130	989.9009	1103.2198	1171.0422	1143.9135	1093.7212	1017.1552	929.6199	817.8056	741.0810	729.1758 (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	0.9975	0.9943	0.9835	0.9438	0.8378	0.6518	0.4833	0.5385	0.8034	0.9687	0.9947	0.9981 (86)
MIT	20.5288	20.5710	20.6412	20.7313	20.7968	20.8285	20.8343	20.8338	20.8133	20.7236	20.6111	20.5247 (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	0.9965	0.9921	0.9770	0.9217	0.7812	0.5580	0.3719	0.4219	0.7192	0.9518	0.9923	0.9973 (89)
MIT 2	19.3603	19.4172	19.5089	19.6333	19.7078	19.7488	19.7519	19.7545	19.7330	19.6291	19.4829	19.3668 (90)
Living area fraction									fLA =	Living area / (4) =		0.1677 (91)
MIT	19.5562	19.6107	19.6988	19.8175	19.8905	19.9299	19.9334	19.9355	19.9142	19.8127	19.6722	19.5610 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.4062	19.4607	19.5488	19.6675	19.7405	19.7799	19.7834	19.7855	19.7642	19.6627	19.5222	19.4110 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9958	0.9908	0.9740	0.9144	0.7681	0.5403	0.3522	0.4010	0.7009	0.9456	0.9909	0.9969 (94)
Useful gains	764.7296	867.1650	964.1815	1008.8125	899.5254	618.1119	385.1603	407.8575	651.6171	773.3336	734.3597	726.8801 (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	1905.1616	1830.1186	1634.6075	1327.5702	988.3790	627.8313	385.8529	409.2698	690.2872	1114.0339	1536.2774	1893.0631 (97)
Space heating kWh	848.4814	647.1049	498.7970	229.5055	66.1071	0.0000	0.0000	0.0000	0.0000	253.4811	577.3808	867.6402 (98a)
Space heating requirement - total per year (kWh/year)												3988.4978
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	848.4814	647.1049	498.7970	229.5055	66.1071	0.0000	0.0000	0.0000	0.0000	253.4811	577.3808	867.6402 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3988.4978
Space heating per m2										(98c) / (4) =		37.7092 (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	848.4814	647.1049	498.7970	229.5055	66.1071	0.0000	0.0000	0.0000	0.0000	253.4811	577.3808	867.6402 (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)	957.6539	730.3667	562.9763	259.0356	74.6130	0.0000	0.0000	0.0000	0.0000	286.0960	651.6713	979.2778 (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	86.5014	86.2615	85.6859	84.3635	81.8888	79.6000	79.6000	79.6000	79.6000	84.5824	86.0869	79.6000 (216)
Fuel for water heating, kWh/month	267.9752	236.5899	250.4218	217.3733	212.6600	192.1791	186.1258	196.3413	201.5971	217.1062	233.4442	264.0851 (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	-32.1721	-50.1281	-79.9151	-96.7901	-107.9774	-101.7780	-100.0207	-92.3274	-78.4275	-60.0841	-36.6298	-27.0233 (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	-14.2292	-34.6035	-82.1772	-143.6042	-207.1760	-215.0381	-209.6981	-166.5271	-107.7846	-53.2235	-19.8876	-10.7876 (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												4501.6906 (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												2675.8991 (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	-2128.0103 (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	5368.6972 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4501.6906	3.6400	163.8615 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2675.8991	3.6400	97.4027 (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	-863.2737	16.4900	-142.3538
PV Unit electricity exported	-1264.7366	5.5900	-70.6988
Total			-213.0526 (252)
Total energy cost			192.8342 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.4604 (257)
SAP value		92.5363
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	4501.6906	0.2100	945.3550 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2675.8991	0.2100	561.9388 (264)
Space and water heating			1507.2938 (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	-863.2737	0.1331	-114.9174
PV Unit electricity exported	-1264.7366	0.1223	-154.7023
Total			-269.6197 (269)
Total CO2, kg/year			1283.2495 (272)
CO2 emissions per m2			12.1300 (273)
EI value			88.5949
EI rating			89 (274)
EI band			B

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	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)

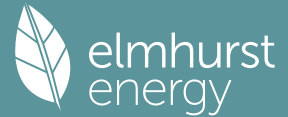
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	56.0306	55.6019	55.1816	53.2077	52.8384	51.1191	51.1191	50.8008	51.7814	52.8384	53.5855	54.3666 (38)
Average = Sum(39)m / 12 =	126.1174	125.6887	125.2684	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 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												2210.0711
	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)

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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
East				7.2100	19.6403		0.7300		0.7000		0.7700		50.1460 (76)
South				1.4200	46.7521		0.7300		0.7000		0.7700		23.5095 (78)
West				7.0000	19.6403		0.7300		0.7000		0.7700		48.6855 (80)
Solar gains	122.3410	231.8379	367.4413	519.7934	626.8559	638.1568	608.9422	529.1639	421.5413	270.9373	151.0981	101.5886	(83)
Total gains	767.9179	875.2130	989.9009	1103.2198	1171.0422	1143.9135	1093.7212	1017.1552	929.6199	817.8056	741.0810	729.1758	(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	0.9975	0.9943	0.9835	0.9438	0.8378	0.6518	0.4833	0.5385	0.8034	0.9687	0.9947	0.9981 (86)
MIT	20.5288	20.5710	20.6412	20.7313	20.7968	20.8285	20.8343	20.8338	20.8133	20.7236	20.6111	20.5247 (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	0.9965	0.9921	0.9770	0.9217	0.7812	0.5580	0.3719	0.4219	0.7192	0.9518	0.9923	0.9973 (89)
MIT 2	19.3603	19.4172	19.5089	19.6333	19.7078	19.7488	19.7519	19.7545	19.7330	19.6291	19.4829	19.3668 (90)
Living area fraction	fLA = Living area / (4) =											0.1677 (91)
MIT	19.5562	19.6107	19.6988	19.8175	19.8905	19.9299	19.9334	19.9355	19.9142	19.8127	19.6722	19.5610 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.4062	19.4607	19.5488	19.6675	19.7405	19.7799	19.7834	19.7855	19.7642	19.6627	19.5222	19.4110 (93)

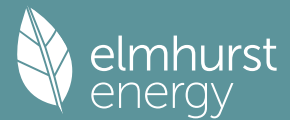
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9958	0.9908	0.9740	0.9144	0.7681	0.5403	0.3522	0.4010	0.7009	0.9456	0.9909	0.9969	(94)
Ext temp.	764.7296	867.1650	964.1815	1008.8125	899.5254	618.1119	385.1603	407.8575	651.6171	773.3336	734.3597	726.8801	(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	1905.1616	1830.1186	1634.6075	1327.5702	988.3790	627.8313	385.8529	409.2698	690.2872	1114.0339	1536.2774	1893.0631	(97)
Space heating requirement - total per year (kWh/year)	848.4814	647.1049	498.7970	229.5055	66.1071	0.0000	0.0000	0.0000	0.0000	253.4811	577.3808	867.6402	(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)	848.4814	647.1049	498.7970	229.5055	66.1071	0.0000	0.0000	0.0000	0.0000	253.4811	577.3808	867.6402	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3988.4978	
Space heating per m2												(98c) / (4) =	37.7092 (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)	848.4814	647.1049	498.7970	229.5055	66.1071	0.0000	0.0000	0.0000	0.0000	253.4811	577.3808	867.6402 (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)	957.6539	730.3667	562.9763	259.0356	74.6130	0.0000	0.0000	0.0000	0.0000	286.0960	651.6713	979.2778 (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	86.5014	86.2615	85.6859	84.3635	81.8888	79.6000	79.6000	79.6000	79.6000	84.5824	86.0869	79.6000 (216)
Fuel for water heating, kWh/month	267.9752	236.5899	250.4218	217.3733	212.6600	192.1791	186.1258	196.3413	201.5971	217.1062	233.4442	86.5592 (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	-32.1721	-50.1281	-79.9151	-96.7901	-107.9774	-101.7780	-100.0207	-92.3274	-78.4275	-60.0841	-36.6298	-27.0233 (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	-14.2292	-34.6035	-82.1772	-143.6042	-207.1760	-215.0381	-209.6981	-166.5271	-107.7846	-53.2235	-19.8876	-10.7876 (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												4501.6906 (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												2675.8991 (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												-2128.0103 (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												5368.6972 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4501.6906	5.6000	252.0947 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2675.8991	5.6000	149.8503 (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	-863.2737	26.0600	-224.9691
PV Unit electricity exported	-1264.7366	5.8100	-73.4812
Total			-298.4503 (252)
Total energy cost			285.6568 (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	4501.6906	0.2100	945.3550 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2675.8991	0.2100	561.9388 (264)
Space and water heating			1507.2938 (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	-863.2737	0.1331	-114.9174
PV Unit electricity exported	-1264.7366	0.1223	-154.7023
Total			-269.6197 (269)
Total CO2, kg/year			1283.2495 (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	4501.6906	1.1300	5086.9103 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2675.8991	1.1300	3023.7660 (278)
Space and water heating			8110.6763 (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	-863.2737	1.4919	-1287.9245
PV Unit electricity exported	-1264.7366	0.4488	-567.6457
Total			-1855.5701 (283)
Total Primary energy kWh/year			6742.7709 (286)

SAP 10 EPC IMPROVEMENTS

Plot 53

Current energy efficiency rating: A 93
Current environmental impact rating: B 89

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

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

Measures omitted - SAP change or cost saving too small:
N Solar water heating + 0.6 -£ 22 -144 kg (11.2%)

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

Potential energy efficiency rating: A 93
Potential environmental impact rating: B 89

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

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

	Current	Potential	Saving
Electricity	£83	£83	£0
Mains gas	£501	£501	£0
Space heating	£374	£374	£0
Water heating	£150	£150	£0
Lighting	£61	£61	£0
Generated (PV)	-£298	-£298	£0
Total cost of fuels	£286	£286	£0
Total cost of uses	£287	£287	£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	64 kWh/m²	64 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) 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)

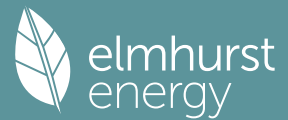
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	56.0306	55.6019	55.1816	53.2077	52.8384	51.1191	51.1191	50.8008	51.7814	52.8384	53.5855	54.3666	(38)
Heat transfer coeff	126.1174	125.6887	125.2684	123.2945	122.9252	121.2060	121.2060	120.8876	121.8682	122.9252	123.6723	124.4534	(39)
Average = Sum(39)m / 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	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
East					7.2100	19.6403	0.7300	0.7000			0.7700			50.1460 (76)
South					1.4200	46.7521	0.7300	0.7000			0.7700			23.5095 (78)
West					7.0000	19.6403	0.7300	0.7000			0.7700			48.6855 (80)
Solar gains	122.3410	231.8379	367.4413	519.7934	626.8559	638.1568	608.9422	529.1639	421.5413	270.9373	151.0981			101.5886 (83)
Total gains	767.9179	875.2130	989.9009	1103.2198	1171.0422	1143.9135	1093.7212	1017.1552	929.6199	817.8056	741.0810			729.1758 (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	0.9975	0.9943	0.9835	0.9438	0.8378	0.6518	0.4833	0.5385	0.8034	0.9687	0.9947	0.9981	(86)
MIT	20.5288	20.5710	20.6412	20.7313	20.7968	20.8285	20.8343	20.8338	20.8133	20.7236	20.6111	20.5247	(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	0.9965	0.9921	0.9770	0.9217	0.7812	0.5580	0.3719	0.4219	0.7192	0.9518	0.9923	0.9973	(89)
MIT 2	19.3603	19.4172	19.5089	19.6333	19.7078	19.7488	19.7519	19.7545	19.7330	19.6291	19.4829	19.3668	(90)
Living area fraction	fLA = Living area / (4) =												
MIT	19.5562	19.6107	19.6988	19.8175	19.8905	19.9299	19.9334	19.9355	19.9142	19.8127	19.6722	19.5610	(92)
Temperature adjustment													-0.1500
adjusted MIT	19.4062	19.4607	19.5488	19.6675	19.7405	19.7799	19.7834	19.7855	19.7642	19.6627	19.5222	19.4110	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9958	0.9908	0.9740	0.9144	0.7681	0.5403	0.3522	0.4010	0.7009	0.9456	0.9909	0.9969	(94)
Useful gains	764.7296	867.1650	964.1815	1008.8125	899.5254	618.1119	385.1603	407.8575	651.6171	773.3336	734.3597	726.8801	(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	1905.1616	1830.1186	1634.6075	1327.5702	988.3790	627.8313	385.8529	409.2698	690.2872	1114.0339	1536.2774	1893.0631	(97)
Space heating kWh	848.4814	647.1049	498.7970	229.5055	66.1071	0.0000	0.0000	0.0000	0.0000	253.4811	577.3808	867.6402	(98a)
Space heating requirement - total per year (kWh/year)													3988.4978
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	848.4814	647.1049	498.7970	229.5055	66.1071	0.0000	0.0000	0.0000	0.0000	253.4811	577.3808	867.6402	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)													3988.4978
Space heating per m2													(98c) / (4) = 37.7092 (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	
	848.4814	647.1049	498.7970	229.5055	66.1071	0.0000	0.0000	0.0000	0.0000	253.4811	577.3808	867.6402	(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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957.6539	730.3667	562.9763	259.0356	74.6130	0.0000	0.0000	0.0000	0.0000	286.0960	651.6713	979.2778	(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	86.5014	86.2615	85.6859	84.3635	81.8888	79.6000	79.6000	79.6000	79.6000	84.5824	86.0869	(216)
Fuel for water heating, kWh/month												
267.9752	236.5899	250.4218	217.3733	212.6600	192.1791	186.1258	196.3413	201.5971	217.1062	233.4442	264.0851	(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	7.3041	7.0685	7.3041	7.0685	(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	-32.1721	-50.1281	-79.9151	-96.7901	-107.9774	-101.7780	-100.0207	-92.3274	-78.4275	-60.0841	-36.6298	(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	-14.2292	-34.6035	-82.1772	-143.6042	-207.1760	-215.0381	-209.6981	-166.5271	-107.7846	-53.2235	-19.8876	(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											4501.6906	(211)
Space heating fuel - main system 2											0.0000	(213)
Space heating fuel - secondary											0.0000	(215)
Efficiency of water heater											79.6000	(216)
Water heating fuel used											2675.8991	(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											-2128.0103	(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											5368.6972	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4501.6906	3.6400	163.8615 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2675.8991	3.6400	97.4027 (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	-863.2737	16.4900	-142.3538
PV Unit electricity exported	-1264.7366	5.5900	-70.6988
Total			-213.0526 (252)
Total energy cost			192.8342 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.4604 (257)
SAP value		92.5363
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	4501.6906	0.2100	945.3550 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2675.8991	0.2100	561.9388 (264)
Space and water heating			1507.2938 (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	-863.2737	0.1331	-114.9174
PV Unit electricity exported	-1264.7366	0.1223	-154.7023
Total			-269.6197 (269)
Total CO2, kg/year			1283.2495 (272)
CO2 emissions per m2			12.1300 (273)

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EI value
EI rating
EI band

88.5949
89 (274)
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

	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

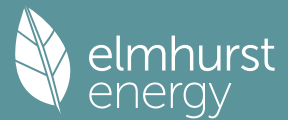
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid front door			2.1400	1.1000	2.3540		(26)
Windows (Uw = 1.30)			15.6300	1.2357	19.3146		(27)
Ground floor			25.4100	0.1300	3.3033	0.0000	0.0000 (28a)
Exposed floor			14.7600	0.2000	2.9520	20.0000	295.2000 (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)
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	

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

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
East			7.2100		19.6403		0.7300		0.7000		0.7700		50.1460 (76)
South			1.4200		46.7521		0.7300		0.7000		0.7700		23.5095 (78)
West			7.0000		19.6403		0.7300		0.7000		0.7700		48.6855 (80)
Solar gains	122.3410	231.8379	367.4413	519.7934	626.8559	638.1568	608.9422	529.1639	421.5413	270.9373	151.0981		101.5886 (83)
Total gains	767.9179	875.2130	989.9009	1103.2198	1171.0422	1143.9135	1093.7212	1017.1552	929.6199	817.8056	741.0810		729.1758 (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	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	0.9975	0.9943	0.9835	0.9438	0.8378	0.6518	0.4833	0.5385	0.8034	0.9687	0.9947	0.9981	(86)
MIT	20.5288	20.5710	20.6412	20.7313	20.7968	20.8285	20.8343	20.8338	20.8133	20.7236	20.6111	20.5247	(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	0.9965	0.9921	0.9770	0.9217	0.7812	0.5580	0.3719	0.4219	0.7192	0.9518	0.9923	0.9973 (89)
MIT 2	19.3603	19.4172	19.5089	19.6333	19.7078	19.7488	19.7519	19.7545	19.7330	19.6291	19.4829	19.3668 (90)
Living area fraction									FLA = Living area / (4) =			0.1677 (91)
MIT	19.5562	19.6107	19.6988	19.8175	19.8905	19.9299	19.9334	19.9355	19.9142	19.8127	19.6722	19.5610 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.4062	19.4607	19.5488	19.6675	19.7405	19.7799	19.7834	19.7855	19.7642	19.6627	19.5222	19.4110 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9958	0.9908	0.9740	0.9144	0.7681	0.5403	0.3522	0.4010	0.7009	0.9456	0.9909	0.9969	(94)
Useful gains	764.7296	867.1650	964.1815	1008.8125	899.5254	618.1119	385.1603	407.8575	651.6171	773.3336	734.3597	726.8801	(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	1905.1616	1830.1186	1634.6075	1327.5702	988.3790	627.8313	385.8529	409.2698	690.2872	1114.0339	1536.2774	1893.0631	(97)
Space heating kWh	848.4814	647.1049	498.7970	229.5055	66.1071	0.0000	0.0000	0.0000	0.0000	253.4811	577.3808	867.6402	(98a)
Space heating requirement - total per year (kWh/year)												3988.4978	
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	848.4814	647.1049	498.7970	229.5055	66.1071	0.0000	0.0000	0.0000	0.0000	253.4811	577.3808	867.6402	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3988.4978	
Space heating per m2										(98c) / (4) =		37.7092	(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	848.4814	647.1049	498.7970	229.5055	66.1071	0.0000	0.0000	0.0000	0.0000	253.4811	577.3808	867.6402	(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)	957.6539	730.3667	562.9763	259.0356	74.6130	0.0000	0.0000	0.0000	0.0000	286.0960	651.6713	979.2778	(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												79.6000	(216)
(217)m	86.5014	86.2615	85.6859	84.3635	81.8888	79.6000	79.6000	79.6000	79.6000	84.5824	86.0869	86.5592	(217)
Fuel for water heating, kWh/month	267.9752	236.5899	250.4218	217.3733	212.6600	192.1791	186.1258	196.3413	201.5971	217.1062	233.4442	264.0851	(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	-32.1721	-50.1281	-79.9151	-96.7901	-107.9774	-101.7780	-100.0207	-92.3274	-78.4275	-60.0841	-36.6298	-27.0233	(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	-14.2292	-34.6035	-82.1772	-143.6042	-207.1760	-215.0381	-209.6981	-166.5271	-107.7846	-53.2235	-19.8876	-10.7876	(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												4501.6906	(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												2675.8991	(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)

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	4501.6906	5.6000	252.0947 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2675.8991	5.6000	149.8503 (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	-863.2737	26.0600	-224.9691
PV Unit electricity exported	-1264.7366	5.8100	-73.4812
Total			-298.4503 (252)
Total energy cost			285.6568 (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	4501.6906	0.2100	945.3550 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2675.8991	0.2100	561.9388 (264)
Space and water heating			1507.2938 (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	-863.2737	0.1331	-114.9174
PV Unit electricity exported	-1264.7366	0.1223	-154.7023
Total			-269.6197 (269)
Total CO2, kg/year			1283.2495 (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	4501.6906	1.1300	5086.9103 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2675.8991	1.1300	3023.7660 (278)
Space and water heating			8110.6763 (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	-863.2737	1.4919	-1287.9245
PV Unit electricity exported	-1264.7366	0.4488	-567.6457
Total			-1855.5701 (283)
Total Primary energy kWh/year			6742.7709 (286)

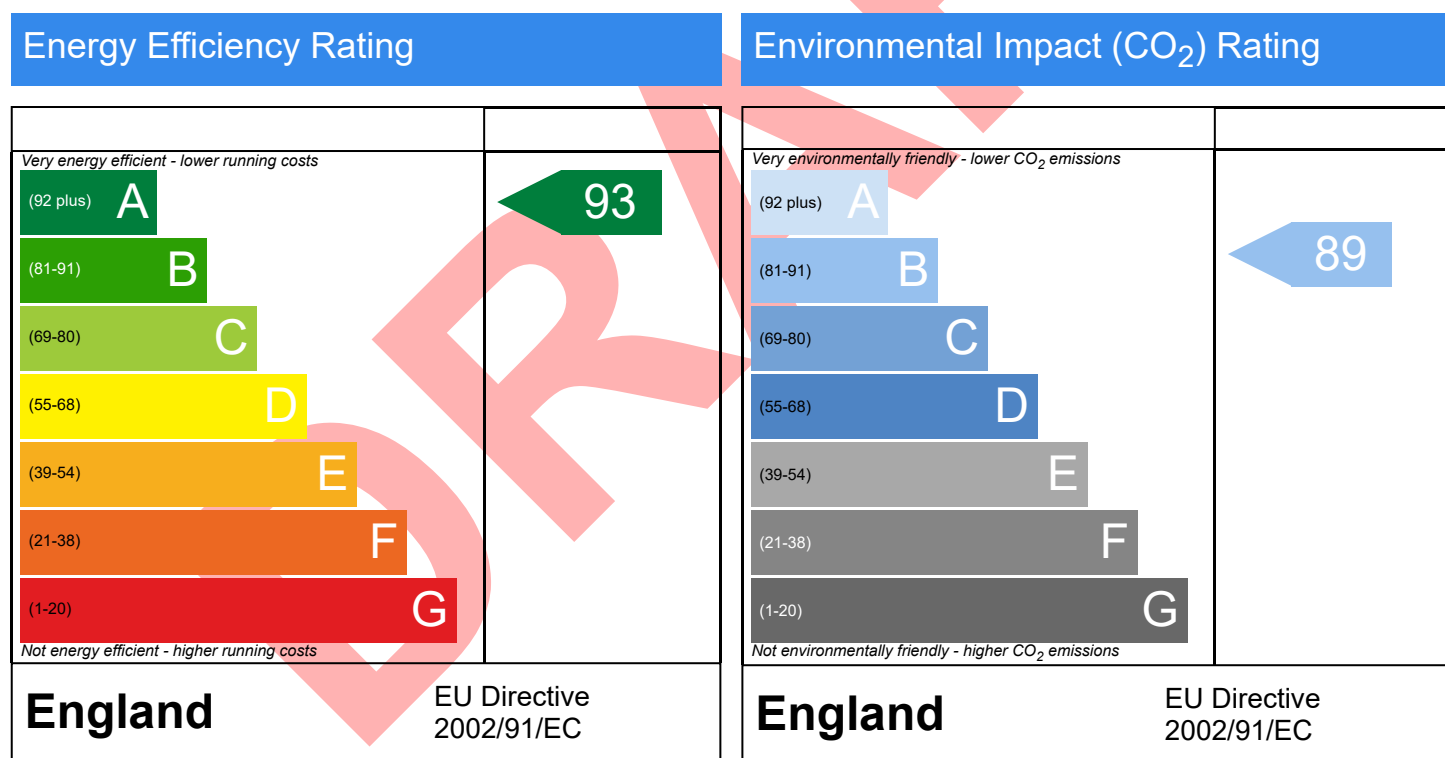
Predicted Energy Assessment



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.