

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Wed 03 Jul 2024 11:34:20

Project Information			
Assessed By	Matthew Carter	Building Type	Flat, Semi-detached
OCDEA Registration	EES/003584	Assessment Date	2024-07-03

Dwelling Details			
Assessment Type	As designed	Total Floor Area	49 m ²
Site Reference	01111	Plot Reference	00001
Address	Flat 5 Zoar Chapel South Street, Reading		

Client Details	
Name	Alex
Company	Pendor Property LTD
Address	Cedar Heights , Gerrards Cross, SL9 9TW

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	Electricity
Target carbon dioxide emission rate	13.93 kgCO ₂ /m ²
Dwelling carbon dioxide emission rate	5.62 kgCO ₂ /m ² OK

1b Target primary energy rate and dwelling primary energy

Target primary energy	73.86 kWh _{PE} /m ²
Dwelling primary energy	59.7 kWh _{PE} /m ² OK

1c Target fabric energy efficiency and dwelling fabric energy efficiency

Target fabric energy efficiency	29.9 kWh/m ²
Dwelling fabric energy efficiency	28.8 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) (0.18)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	N/A	N/A	N/A
Roofs	0.16	0.1	Roof (1) (0.1)	OK
Windows, doors, and roof windows	1.6	1.09	Opening (1.4)	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)	53.6624	0.18
Sheltered wall: Walls (2)	5.54	0.16
Party wall: Party Wall (1)	11.2	0 (!)
Exposed roof: Roof (1)	3.77	0.1 (!)

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]
Opening, Windows	2.1538	West	0.7	1 (!)
Opening, Windows	2.1538	West	0.7	1 (!)
Opening, Windows	1.89	East	0.7	1 (!)
Opening, Doo to Hall	1.8	South	N/A	1.4

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	0.006 (!)	TD5
External wall	E3: Sill	Calculated by person with suitable expertise	0.012 (!)	TD5

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E4: Jamb	Calculated by person with suitable expertise	0.023 (!)	TD5
External wall	E7: Party floor between dwellings (in blocks of flats)	Calculated by person with suitable expertise	0.021 (!)	TD5
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.075	TD5
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.045	TD5
Party wall	P3: Intermediate floor between dwellings (in blocks of flats)	SAP table default	0 (!)	
External wall	E18: Party wall between dwellings	SAP table default	0.24	
External wall	E14: Flat roof	SAP table default	0.16	

3 Air permeability (better than typically expected values are flagged with a subsequent (!))

Maximum permitted air permeability at 50Pa	8 m ³ /hm ²	
Dwelling air permeability at 50Pa	4 m ³ /hm ² , Design value	OK
Air permeability test certificate reference		

4 Space heating

Main heating system 1: Heat pump with radiators or underfloor heating - Electricity

Efficiency	312.7%
Emitter type	Underfloor
Flow temperature	35°C
System type	Heat Pump
Manufacturer	Vaillant Group UK Ltd
Model	aroTHERM 5kW
Commissioning	

Secondary heating system: N/A

Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water

Cylinder/store - type: Cylinder

Capacity	180 litres
Declared heat loss	1.4 kWh/day
Primary pipework insulated	Yes
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	90 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		
N/A		
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: Name:	Assessor ID: Date:	
b. Client Declaration		
N/A		

Summary for Input Data



Property Reference	01111	Issued on Date	03/07/2024
Assessment Reference	00001	Prop Type Ref	
Property	Zoar Chapel, Flat 5, South Street, Reading		

SAP Rating	81 B	DER	5.62	TER	13.93
Environmental	96 A	% DER < TER			59.66
CO ₂ Emissions (t/year)	0.26	DFEE	28.84	TFEE	29.93
Compliance Check	See BREL	% DFEE < TFEE			3.67
% DPER < TPER	19.18	DPER	59.70	TPER	73.86

Assessor Details	Mr. Matthew Carter	Assessor ID	7869-0001
Client			

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

Orientation	South
Property Tenture	ND
Transaction Type	6
Terrain Type	Urban
1.0 Property Type	Flat, Semi-Detached
Position of Flat	Mid-floor flat
Which Floor	2
2.0 Number of Storeys	1
3.0 Date Built	2024
3.0 Property Age Band	L
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown
6.0 Thermal Mass Parameter	Precise calculation
Thermal Mass	N/A
7.0 Electricity Tariff	Standard
Smart electricity meter fitted	No
Smart gas meter fitted	No

7.0 Measurements	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m ²	0.00 m
Ground floor:	27.43 m	49.00 m ²	2.45 m
1st Storey:	0.00 m	0.00 m ²	0.00 m
2nd Storey:	0.00 m	0.00 m ²	0.00 m
3rd Storey:	0.00 m	0.00 m ²	0.00 m
4th Storey:	0.00 m	0.00 m ²	0.00 m
5th Storey:	0.00 m	0.00 m ²	0.00 m
6th Storey:	0.00 m	0.00 m ²	0.00 m
7th Storey:	0.00 m	0.00 m ²	0.00 m

8.0 Living Area	25.90	m ²
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9.0 External Walls	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)	Shelter Res	Shelter	Openings	Area Calculation Type
	External Wall 1	Steel Frame	Steel frame wall (warm frame or hybrid construction)	0.18	14.00	59.86	53.66	0.00	None	6.20	Calculate Wall Area
	Wall to Stairs	Steel Frame	Steel frame wall (warm frame or hybrid construction)	0.18	14.00	7.34	5.54	0.60	Stairwell Access Corridor 2	1.80	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	Steel frame	0.00	20.00	11.20	0.00	None

9.2 Internal Walls	Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
	Internal Wall 1	Plasterboard on timber frame	9.00	46.15

Summary for Input Data

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Flat roof	External Flat Roof	Plasterboard, insulated flat roof	0.10	9.00	3.77	3.77	None	0.00	Enter Gross Area	0.00

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete planks floor, screed, carpeted	30.00	45.23

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Precast concrete planks floor, screed, carpeted	30.00	49.00

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Windows Doo to Hall	Manufacturer SAP table	Window Door to Corridor	Double Low-E Soft 0.05		Air Filled Air Filled	0.63 0.00	Wood	0.70 0.70	1.00 1.40

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Opening	Windows	External Wall 1	West	4.31	0
Opening	Windows	External Wall 1	East	1.89	0
Opening	Doo to Hall	Wall to Stairs	South	1.80	0

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	3.92	0.01	0.01	TD5	No
E3 Sill	Independently assessed	0.90	0.01	0.01	TD5	No
E4 Jamb	Independently assessed	6.20	0.02	0.02	TD5	No
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	27.43	0.02	0.02	TD5	No
E16 Corner (normal)	Independently assessed	7.35	0.07	0.07	TD5	No
E17 Corner (inverted – internal area greater than external area)	Independently assessed	4.90	-0.04	-0.04	TD5	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	4.57	0.00	0.32		No
E18 Party wall between dwellings	Table K1 - Default	7.35	0.24	0.24		No
E14 Flat roof	Table K1 - Default	7.00	0.16	0.16		No

Y-value W/m²K

18.0 Pressure Testing

Designed AP ₅₀	4.00	m²/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation
Mechanical Ventilation System Present No

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System

22.0 Lighting

No Fixed Lighting No				
Name	Efficacy	Power	Capacity	Count
Lighting 1	90.00	5	450	8

24.0 Main Heating 1

Database Database	
Percentage of Heat 100.00	%
Database Ref. No. 103748	
Fuel Type Electricity	
SAP Code 0	

Summary for Input Data

In Winter	312.67
In Summer	181.69
Model Name	aroTHERM 5kW
Manufacturer	Vaillant Group UK Ltd
System Type	Heat Pump
Controls SAP Code	2207
Delayed Start Stat	No
Burner Control	Modulating
HETAS approved System	No
Oil Pump Inside	No
FI Case	0.00
Flue Type	None or Unknown
Fan Assisted Flue	No
Is MHS Pumped	Pump in heated space
Heating Pump Age	2013 or later
Heat Emitter	Underfloor
Underfloor Heating	Yes - Pipes in thin screed
Flow Temperature	Enter value
Flow Temperature Value	35.00
Boiler Interlock	No
Combi boiler type	Standard Combi
Combi keep hot type	None

25.0 Main Heating 2	None
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26.0 Heat Networks	None
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	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									

28.0 Water Heating

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
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	Yes

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Vented hot water system	7.00		No	

28.3 Waste Water Heat Recovery System

Summary for Input Data

29.0 Hot Water Cylinder

Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	No	
Cylinder In Heated Space	No	
Independent Time Control	No	
Insulation Type	Measured Loss	
Cylinder Volume	180.00	L
Loss	1.40	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	

31.0 Thermal Store

None

Recommendations

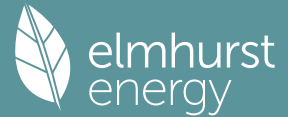
Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout



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Compliance Check	See BREL	% DFEE < TFEE				3.67	
% DPER < TPER	19.18	DPER	59.70	TPER	73.86		
Assessor Details	Mr. Matthew Carter				Assessor ID	7869-0001	
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	49.0000 (1b)	2.4500 (2b)	120.0500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.0000		120.0500 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 120.0500 (5)

2. Ventilation rate

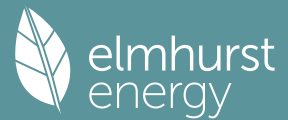
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (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) =	20.0000 / (5) = 0.1666 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3666 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3116 (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	0.3973	0.3895	0.3817	0.3428	0.3350	0.2960	0.2960	0.2882	0.3116	0.3350	0.3506	0.3661 (22b)
Effective ac	0.5789	0.5759	0.5729	0.5587	0.5561	0.5438	0.5438	0.5415	0.5485	0.5561	0.5614	0.5670 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.00)			6.2000	0.9615	5.9615		(27)
Doo to Hall			1.8000	1.4000	2.5200		(26)
External Wall 1	59.8635	6.2000	53.6635	0.1800	9.6594	14.0000	751.2890 (29a)
Wall to Stairs	7.3400	1.8000	5.5400	0.1600	0.8864	14.0000	77.5600 (29a)
Flat roof	3.7700		3.7700	0.1000	0.3770	9.0000	33.9300 (30)
Total net area of external elements Aum(A, m ²)			70.9735				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4044		(33)
Party Wall 1			11.2000	0.0000	0.0000	20.0000	224.0000 (32)
Party Floor 1			49.0000			40.0000	1960.0000 (32d)
Party Ceiling 1			45.2300			30.0000	1356.9000 (32b)
Internal Wall 1			46.1500			9.0000	415.3500 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	4819.0290 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							98.3475 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				3.9200	0.0060	0.0235	
E3 Sill				0.9000	0.0120	0.0108	
E4 Jamb				6.2000	0.0230	0.1426	
E7 Party floor between dwellings (in blocks of flats)				27.4300	0.0210	0.5760	

Full SAP Calculation Printout



E16 Corner (normal)	7.3500	0.0750	0.5512
E17 Corner (inverted - internal area greater than external area)	4.9000	-0.0450	-0.2205
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	4.5700	0.0000	0.0000
E18 Party wall between dwellings	7.3500	0.2400	1.7640
E14 Flat roof	7.0000	0.1600	1.1200
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			3.9677 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	23.3721 (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	22.9349	22.8135	22.6945	22.1355	22.0309	21.5441	21.5441	21.4539	21.7316	22.0309	22.2425	22.4637 (38)
Average = Sum(39)m / 12 =	46.3070	46.1856	46.0666	45.5076	45.4030	44.9162	44.9162	44.8260	45.1037	45.4030	45.6146	45.8358 (39)
												45.5071
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9450	0.9426	0.9401	0.9287	0.9266	0.9167	0.9167	0.9148	0.9205	0.9266	0.9309	0.9354 (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												1.6607 (42)
Hot water usage for mixer showers												
Hot water usage for baths	52.0640	51.2816	50.1414	47.9600	46.3501	44.5548	43.5344	44.6659	45.9062	47.8338	50.0621	51.8645 (42a)
Hot water usage for other uses	22.5124	22.1781	21.7073	20.8392	20.1891	19.4684	19.0790	19.5466	20.0556	20.8269	21.7129	22.4363 (42b)
Average daily hot water use (litres/day)	31.6372	30.4868	29.3364	28.1859	27.0355	25.8850	25.8850	27.0355	28.1859	29.3364	30.4868	31.6372 (42c)
												97.6350 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	106.2137	103.9465	101.1851	96.9850	93.5747	89.9082	88.4984	91.2479	94.1477	97.9970	102.2618	105.9381 (44)
Energy content (annual)	168.2165	148.0184	155.5177	132.7677	125.9695	110.5526	107.0312	112.9839	116.0936	132.9811	145.6907	165.8734 (45)
Distribution loss (46)m = 0.15 x (45)m	25.2325	22.2028	23.3276	19.9152	18.8954	16.5829	16.0547	16.9476	17.4140	19.9472	21.8536	24.8810 (46)
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4000 (48)
Temperature factor from Table 2b												0.7800 (49)
Enter (49) or (54) in (55)												1.0920 (55)
Total storage loss	33.8520	30.5760	33.8520	32.7600	33.8520	32.7600	33.8520	33.8520	32.7600	33.8520	32.7600	33.8520 (56)
If cylinder contains dedicated solar storage	33.8520	30.5760	33.8520	32.7600	33.8520	32.7600	33.8520	33.8520	32.7600	33.8520	32.7600	33.8520 (57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576 (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	256.9261	228.1432	244.2273	218.6157	214.6791	165.8246	164.1456	170.0983	171.3656	221.6907	231.5387	254.5830 (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	256.9261	228.1432	244.2273	218.6157	214.6791	165.8246	164.1456	170.0983	171.3656	221.6907	231.5387	254.5830 (64)
12Total per year (kWh/year)												2541.8378 (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	99.8181	88.8551	95.5957	86.6157	85.7710	54.7683	54.1978	56.1771	56.6107	88.1023	90.9125	99.0390 (65)

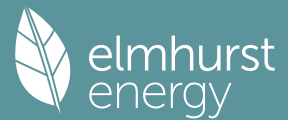
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.0290	88.6035	80.0290	82.6966	80.0290	82.6966	80.0290	80.0290	82.6966	80.0290	82.6966	80.0290 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	144.6370	146.1379	142.3557	134.3039	124.1400	114.5873	108.2055	106.7047	110.4868	118.5386	128.7025	138.2552 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035 (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)	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281 (71)
Water heating gains (Table 5)	134.1641	132.2249	128.4888	120.2995	115.2835	76.0671	72.8465	75.5068	78.6260	118.4170	126.2674	133.1169 (72)
Total internal gains	406.7405	414.8768	398.7840	385.2105	367.3630	321.2615	308.9915	310.1510	319.7199	364.8951	385.5771	399.3116 (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				1.8900	19.6403		0.6300		0.7000		0.7700		11.3444 (76)
West				4.3100	19.6403		0.6300		0.7000		0.7700		25.8700 (80)
Solar gains	37.2144	72.7992	119.8900	174.8524	214.2881	219.3620	208.8416	179.3918	139.4370	86.3824	46.4020	30.6033	(83)
Total gains	443.9549	487.6760	518.6740	560.0629	581.6511	540.6236	517.8331	489.5428	459.1569	451.2776	431.9790	429.9149	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	28.9075	28.9835	29.0584	29.4153	29.4830	29.8026	29.8026	29.8626	29.6787	29.4830	29.3463	29.2047
alpha	2.9272	2.9322	2.9372	2.9610	2.9655	2.9868	2.9868	2.9908	2.9786	2.9655	2.9564	2.9470
util living area	0.9054	0.8766	0.8314	0.7412	0.6189	0.4907	0.3681	0.4022	0.5907	0.7645	0.8688	0.9119 (86)
Living	19.6339	19.8208	20.0900	20.4331	20.6836	20.8210	20.8731	20.8654	20.7598	20.4615	20.0127	19.6074
Non living	18.5308	18.7638	19.0971	19.5171	19.8060	19.9599	20.0069	20.0029	19.8996	19.5609	19.0141	18.5041
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.3012	19.8208	20.0900	20.4331	20.6836	20.8210	20.8731	20.8654	20.7598	20.4615	20.0127	19.8022 (87)
Th 2	20.1294	20.1315	20.1335	20.1432	20.1450	20.1534	20.1534	20.1549	20.1501	20.1450	20.1413	20.1375 (88)
util rest of house	0.8944	0.8627	0.8124	0.7128	0.5784	0.4355	0.3018	0.3344	0.5357	0.7325	0.8519	0.9016 (89)
MIT 2	19.4921	18.7638	19.0971	19.5171	19.8060	19.9599	20.0069	20.0029	19.8996	19.5609	19.0141	18.7984 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.9197	19.3225	19.6219	20.0013	20.2699	20.4151	20.4647	20.4588	20.3543	20.0369	19.5419	19.3290 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.9197	19.3225	19.6219	20.0013	20.2699	20.4151	20.4647	20.4588	20.3543	20.0369	19.5419	19.3290 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8915	0.8480	0.8000	0.7078	0.5846	0.4530	0.3266	0.3593	0.5495	0.7281	0.8386	0.8905 (94)
Useful gains	395.7885	413.5718	414.9387	396.4178	340.0388	244.9254	169.1209	175.9024	252.3135	328.5822	362.2522	382.8520 (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	723.3032	666.1132	604.4822	505.1942	389.0985	261.1905	173.5881	181.9409	282.0907	428.4659	567.5331	693.4485 (97)
Space heating kWh	243.6710	169.7078	141.0204	78.3190	36.5004	0.0000	0.0000	0.0000	0.0000	74.3135	147.8022	231.0838 (98a)
Space heating requirement - total per year (kWh/year)	1122.4181											
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	243.6710	169.7078	141.0204	78.3190	36.5004	0.0000	0.0000	0.0000	0.0000	74.3135	147.8022	231.0838 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1122.4181											
Space heating per m2	(98c) / (4) = 22.9065 (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 %)	312.6685 (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	243.6710	169.7078	141.0204	78.3190	36.5004	0.0000	0.0000	0.0000	0.0000	74.3135	147.8022	231.0838 (98)
Space heating efficiency (main heating system 1)	312.6685	312.6685	312.6685	312.6685	312.6685	0.0000	0.0000	0.0000	0.0000	312.6685	312.6685	312.6685 (210)
Space heating fuel (main heating system)	77.9327	54.2772	45.1022	25.0486	11.6738	0.0000	0.0000	0.0000	0.0000	23.7675	47.2712	73.9070 (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	256.9261	228.1432	244.2273	218.6157	214.6791	165.8246	164.1456	170.0983	171.3656	221.6907	231.5387	254.5830 (64)
Efficiency of water heater (217)m	181.6919	181.6919	181.6919	181.6919	181.6919	181.6919	181.6919	181.6919	181.6919	181.6919	181.6919	181.6919 (216)
Fuel for water heating, kWh/month	141.4076	125.5660	134.4184	120.3222	118.1556	91.2669	90.3428	93.6191	94.3166	122.0146	127.4348	140.1180 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	18.3887	14.7521	13.2826	9.7314	7.5168	6.1413	6.8571	8.9131	11.5773	15.1900	17.1571	18.8998 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)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 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by 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	358.9802 (211)											
Space heating fuel - main system 2	0.0000 (213)											
Space heating fuel - secondary	0.0000 (215)											
Efficiency of water heater	181.6919											
Water heating fuel used	1398.9826 (219)											
Space cooling fuel	0.0000 (221)											
Electricity for pumps and fans:												
Total electricity for the above, kWh/year	0.0000 (231)											
Electricity for lighting (calculated in Appendix L)	148.4076 (232)											

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

PV generation	0.0000 (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	1906.3704 (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	358.9802	0.1555	55.8281 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1398.9826	0.1416	198.1565 (264)
Space and water heating			253.9846 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	148.4076	0.1443	21.4198 (268)
Total CO2, kg/year			275.4044 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.6200 (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	358.9802	1.5757	565.6571 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1398.9826	1.5238	2131.7701 (278)
Space and water heating			2697.4272 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	148.4076	1.5338	227.6325 (282)
Total Primary energy kWh/year			2925.0597 (286)
Dwelling Primary energy Rate (DPER)			59.7000 (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	49.0000 (1b)	x 2.4500 (2b)	= 120.0500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 120.0500 (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	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

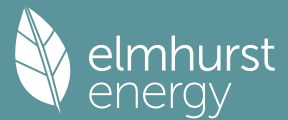
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1666 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4166	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.3541 (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	0.4515	0.4426	0.4338	0.3895	0.3807	0.3364	0.3364	0.3275	0.3541	0.3807	0.3984	0.4161 (22b)
Effective ac	0.6019	0.5980	0.5941	0.5759	0.5725	0.5566	0.5566	0.5536	0.5627	0.5725	0.5793	0.5866 (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			1.8000	1.0000	1.8000		(26)
TER Opening Type (Uw = 1.20)			6.2000	1.1450	7.0992		(27)

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External Wall 1	59.8635	6.2000	53.6635	0.1800	9.6594	(29a)
Wall to Stairs	7.3400	1.8000	5.5400	0.1800	0.9972	(29a)
Flat roof	3.7700		3.7700	0.1100	0.4147	(30)
Total net area of external elements Aum(A, m2)			70.9735			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.9706	(33)
Party Wall 1			11.2000	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 107.5781 (35)

List of Thermal Bridges						
K1 Element	Length	Psi-value	Total			
E2 Other lintels (including other steel lintels)	3.9200	0.0500	0.1960			
E3 Sill	0.9000	0.0500	0.0450			
E4 Jamb	6.2000	0.0500	0.3100			
E7 Party floor between dwellings (in blocks of flats)	27.4300	0.0700	1.9201			
E16 Corner (normal)	7.3500	0.0900	0.6615			
E17 Corner (inverted - internal area greater than external area)	4.9000	-0.0900	-0.4410			
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	4.5700	0.0000	0.0000			
E18 Party wall between dwellings	7.3500	0.0600	0.4410			
E14 Flat roof	7.0000	0.0800	0.5600			

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.6926 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 23.6632 (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	23.8460	23.6892	23.5355	22.8136	22.6786	22.0499	22.0499	21.9335	22.2921	22.6786	22.9518	23.2374 (38)
Average = Sum(39)m / 12 =	47.5091	47.3524	47.1987	46.4768	46.3418	45.7130	45.7130	45.5966	45.9552	46.3418	46.6150	46.9006 (39)
												46.4762

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9696	0.9664	0.9632	0.9485	0.9458	0.9329	0.9329	0.9305	0.9379	0.9458	0.9513	0.9572 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

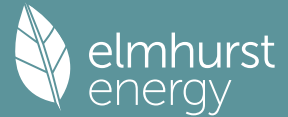
Assumed occupancy												1.6607 (42)
Hot water usage for mixer showers												
Hot water usage for baths	52.0640	51.2816	50.1414	47.9600	46.3501	44.5548	43.5344	44.6659	45.9062	47.8338	50.0621	51.8645 (42a)
Hot water usage for other uses	22.5124	22.1781	21.7073	20.8392	20.1891	19.4684	19.0790	19.5466	20.0556	20.8269	21.7129	22.4363 (42b)
Average daily hot water use (litres/day)	31.6372	30.4868	29.3364	28.1859	27.0355	25.8850	25.8850	27.0355	28.1859	29.3364	30.4868	31.6372 (42c)
												97.6350 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	106.2137	103.9465	101.1851	96.9850	93.5747	89.9082	88.4984	91.2479	94.1477	97.9970	102.2618	105.9381 (44)
Energy content (annual)	168.2165	148.0184	155.5177	132.7677	125.9695	110.5526	107.0312	112.9839	116.0936	132.9811	145.6907	165.8734 (45)
Distribution loss (46)m = 0.15 x (45)m	25.2325	22.2028	23.3276	19.9152	18.8954	16.5829	16.0547	16.9476	17.4140	19.9472	21.8536	24.8810 (46)
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8381 (55)
Total storage loss	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (56)
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (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	217.4592	192.4956	204.7603	180.4219	175.2122	158.2068	156.2738	162.2266	163.7478	182.2237	193.3449	215.1161 (62)
WWHRS	-23.8015	-21.0502	-22.0426	-18.2521	-17.0103	-14.5559	-13.6438	-14.5088	-15.0601	-17.7541	-20.1133	-23.3607 (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	193.6577	171.4454	182.7177	162.1697	158.2019	143.6509	142.6300	147.7178	148.6877	164.4696	173.2316	191.7554 (64)
12Total per year (kWh/year)												1980.3355 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Heat gains from water heating, kWh/month	95.3261	84.7979	91.1038	82.2686	81.2790	74.8821	74.9820	76.9613	76.7245	83.6103	86.5655	94.5471 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	80.0290	88.6035	80.0290	82.6966	80.0290	82.6966	80.0290	80.0290	82.6966	80.0290	82.6966	80.0290 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	144.6370	146.1379	142.3557	134.3039	124.1400	114.5873	108.2055	106.7047	110.4868	118.5386	128.7025	138.2552 (68)
Pumps, fans	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281 (71)
Total internal gains	128.1265	126.1874	122.4513	114.2620	109.2460	104.0029	100.7822	103.4426	106.5618	112.3795	120.2299	127.0794 (72)
	403.7030	411.8392	395.7464	382.1730	364.3254	349.1973	336.9273	338.0867	347.6557	361.8576	382.5395	396.2741 (73)

6. Solar gains

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[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		Specific data or Table 6c	FF	Access factor Table 6d		Gains W
East				1.8900	19.6403			0.6300	0.7000			11.3444 (76)
West				4.3100	19.6403			0.6300	0.7000			25.8700 (80)
Solar gains	37.2144	72.7992	119.8900	174.8524	214.2881	219.3620	208.8416	179.3918	139.4370	86.3824	46.4020	30.6033 (83)
Total gains	440.9173	484.6385	515.6364	557.0253	578.6136	568.5594	545.7689	517.4786	487.0927	448.2400	428.9415	426.8774 (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	30.8206	30.9226	31.0233	31.5051	31.5969	32.0315	32.0315	32.1133	31.8627	31.5969	31.4118	31.2204
alpha	3.0547	3.0615	3.0682	3.1003	3.1065	3.1354	3.1354	3.1409	3.1242	3.1065	3.0941	3.0814
util living area	0.9186	0.8918	0.8488	0.7597	0.6364	0.4813	0.3582	0.3908	0.5794	0.7832	0.8843	0.9245 (86)
MIT	19.3560	19.6007	19.9532	20.4064	20.7321	20.9190	20.9758	20.9678	20.8506	20.4412	19.8554	19.3278 (87)
Th 2	20.1088	20.1114	20.1141	20.1265	20.1288	20.1396	20.1396	20.1416	20.1354	20.1288	20.1241	20.1192 (88)
util rest of house	0.9083	0.8784	0.8300	0.7309	0.5943	0.4251	0.2918	0.3228	0.5226	0.7508	0.8680	0.9148 (89)
MIT 2	18.2043	18.5095	18.9458	19.4989	19.8726	20.0762	20.1257	20.1221	20.0102	19.5533	18.8404	18.1763 (90)
Living area fraction	fLA = Living area / (4) =											0.5286 (91)
MIT	18.8130	19.0863	19.4783	19.9786	20.3269	20.5216	20.5750	20.5691	20.4544	20.0226	19.3769	18.7849 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8130	19.0863	19.4783	19.9786	20.3269	20.5216	20.5750	20.5691	20.4544	20.0226	19.3769	18.7849 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8901	0.8604	0.8148	0.7256	0.6042	0.4506	0.3258	0.3572	0.5443	0.7465	0.8519	0.8970 (94)
Useful gains	392.4436	416.9919	420.1654	404.1870	349.6087	256.1800	177.8146	184.8380	265.1087	334.6077	365.3941	382.9281 (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	689.5020	671.7525	612.5569	514.8970	399.7859	270.6964	181.7103	190.0988	292.0197	436.6601	572.2869	684.0416 (97)
Space heating kWh	221.0114	171.1991	143.1392	79.7112	37.3318	0.0000	0.0000	0.0000	0.0000	75.9270	148.9628	224.0284 (98a)
Space heating requirement - total per year (kWh/year)												1101.3109
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	221.0114	171.1991	143.1392	79.7112	37.3318	0.0000	0.0000	0.0000	0.0000	75.9270	148.9628	224.0284 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1101.3109
Space heating per m2	(98c) / (4) =											22.4757 (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 %)												92.3000 (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	221.0114	171.1991	143.1392	79.7112	37.3318	0.0000	0.0000	0.0000	0.0000	75.9270	148.9628	224.0284 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	239.4490	185.4811	155.0804	86.3610	40.4462	0.0000	0.0000	0.0000	0.0000	82.2611	161.3898	242.7177 (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	193.6577	171.4454	182.7177	162.1697	158.2019	143.6509	142.6300	147.7178	148.6877	164.4696	173.2316	191.7554 (64)
Efficiency of water heater	84.3568	84.0566	83.5183	82.5574	81.3746	79.8000	79.8000	79.8000	79.8000	82.4389	83.7232	79.8000 (216)
(217)m	84.3568	84.0566	83.5183	82.5574	81.3746	79.8000	79.8000	79.8000	79.8000	82.4389	83.7232	84.4095 (217)
Fuel for water heating, kWh/month	229.5696	203.9643	218.7757	196.4327	194.4118	180.0137	178.7344	185.1100	186.3255	199.5047	206.9100	227.1727 (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	16.6284	13.3399	12.0111	8.7999	6.7973	5.5534	6.2007	8.0599	10.4690	13.7359	15.5147	17.0906 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-16.9067	-24.7279	-36.8671	-43.0624	-47.8618	-45.2293	-44.7162	-41.5339	-36.1202	-29.0308	-18.9160	-14.5174 (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	-7.0085	-14.9791	-30.2039	-45.9874	-61.3975	-61.8738	-61.1056	-51.4318	-37.3240	-21.5809	-9.4118	-5.5217 (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												1193.1862 (211)
Space heating fuel - main system 2												0.0000 (213)

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Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2406.9252 (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)	134.2010 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-807.3159 (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	3012.9966 (238)

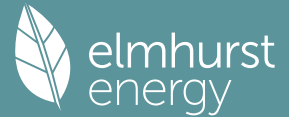
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1193.1862	0.2100	250.5691 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2406.9252	0.2100	505.4543 (264)
Space and water heating			756.0234 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	134.2010	0.1443	19.3694 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-399.4898	0.1338	-53.4489
PV Unit electricity exported	-407.8261	0.1255	-51.1874
Total			-104.6363 (269)
Total CO2, kg/year			682.6857 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.9300 (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	1193.1862	1.1300	1348.3005 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2406.9252	1.1300	2719.8255 (278)
Space and water heating			4068.1260 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	134.2010	1.5338	205.8420 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-399.4898	1.4944	-597.0100
PV Unit electricity exported	-407.8261	0.4607	-187.8861
Total			-784.8962 (283)
Total Primary energy kWh/year			3619.1726 (286)
Target Primary Energy Rate (TPER)			73.8600 (287)

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Property Reference	01111				Issued on Date	03/07/2024	
Assessment Reference	00001			Prop Type Ref			
Property	Zoar Chapel, Flat 5, South Street, Reading						
SAP Rating	81 B	DER	5.62	TER	13.93		
Environmental	96 A	% DER < TER				59.66	
CO ₂ Emissions (t/year)	0.26	DFEE	28.84	TFEE	29.93		
Compliance Check	See BREL	% DFEE < TFEE				3.67	
% DPER < TPER	19.18	DPER	59.70	TPER	73.86		
Assessor Details	Mr. Matthew Carter				Assessor ID	7869-0001	
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	49.0000	2.4500	120.0500
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.0000		
Dwelling volume			120.0500

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	2 * 10 = 20.0000 (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) =	20.0000 / (5) = 0.1666 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3666 (18)
Number of sides sheltered	2 (19)

Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3116 (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)
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	0.3973	0.3895	0.3817	0.3428	0.3350	0.2960	0.2960	0.2882	0.3116	0.3350	0.3506	0.3661 (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	0.5789	0.5759	0.5729	0.5587	0.5561	0.5438	0.5438	0.5415	0.5485	0.5561	0.5614	0.5670 (25)

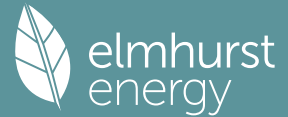
3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.00)			6.2000	0.9615	5.9615		(27)
Doo to Hall			1.8000	1.4000	2.5200		(26)
External Wall 1	59.8635	6.2000	53.6635	0.1800	9.6594	14.0000	751.2890 (29a)
Wall to Stairs	7.3400	1.8000	5.5400	0.1600	0.8864	14.0000	77.5600 (29a)
Flat roof	3.7700		3.7700	0.1000	0.3770	9.0000	33.9300 (30)
Total net area of external elements Aum(A, m ²)			70.9735				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4044		(33)
Party Wall 1			11.2000	0.0000	0.0000	20.0000	224.0000 (32)
Party Floor 1			49.0000			40.0000	1960.0000 (32d)
Party Ceiling 1			45.2300			40.0000	1809.2000 (32b)
Internal Wall 1			46.1500			9.0000	415.3500 (32c)

Heat capacity Cm = Sum (A x k)	(28)...(30) + (32) + (32a)...(32e) =	5271.3290 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		107.5781 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	3.9200	0.0060	0.0235
E2 Other lintels (including other steel lintels)	0.9000	0.0120	0.0108
E3 Sill			

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E4 Jamb	6.2000	0.0230	0.1426
E7 Party floor between dwellings (in blocks of flats)	27.4300	0.0210	0.5760
E16 Corner (normal)	7.3500	0.0750	0.5512
E17 Corner (inverted - internal area greater than external area)	4.9000	-0.0450	-0.2205
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	4.5700	0.0000	0.0000
E18 Party wall between dwellings	7.3500	0.2400	1.7640
E14 Flat roof	7.0000	0.1600	1.1200
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			3.9677 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	23.3721 (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	22.9349	22.8135	22.6945	22.1355	22.0309	21.5441	21.5441	21.4539	21.7316	22.0309	22.2425	22.4637 (38)
Average = Sum(39)m / 12 =	46.3070	46.1856	46.0666	45.5076	45.4030	44.9162	44.9162	44.8260	45.1037	45.4030	45.6146	45.8358 (39)
												45.5071
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9450	0.9426	0.9401	0.9287	0.9266	0.9167	0.9167	0.9148	0.9205	0.9266	0.9309	0.9354 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6607 (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	22.5124	22.1781	21.7073	20.8392	20.1891	19.4684	19.0790	19.5466	20.0556	20.8269	21.7129	22.4363 (42b)
Hot water usage for other uses	31.6372	30.4868	29.3364	28.1859	27.0355	25.8850	25.8850	27.0355	28.1859	29.3364	30.4868	31.6372 (42c)
Average daily hot water use (litres/day)												49.6337 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	54.1497	52.6649	51.0436	49.0251	47.2246	45.3534	44.9640	46.5820	48.2415	50.1632	52.1997	54.0736 (44)
Energy content (annual)	85.7599	74.9941	78.4522	67.1129	63.5734	55.7673	54.3801	57.6783	59.4866	68.0710	74.3680	84.6662 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	72.8959	63.7450	66.6843	57.0459	54.0374	47.4022	46.2231	49.0265	50.5636	57.8604	63.2128	71.9662 (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	72.8959	63.7450	66.6843	57.0459	54.0374	47.4022	46.2231	49.0265	50.5636	57.8604	63.2128	71.9662 (64)
12Total per year (kWh/year)												700.6633 (64)
Electric shower(s)	41.6946	37.1502	40.5666	38.7122	39.4386	37.6206	38.8746	39.4386	38.7122	40.5666	39.8038	41.6946 (64a)
Heat gains from water heating, kWh/month	28.6476	25.2238	26.8127	23.9395	23.3690	21.2557	21.2744	22.1163	22.3190	24.6067	25.7541	28.4152 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												474.2733 (64a)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	80.0290	88.6035	80.0290	82.6966	80.0290	82.6966	80.0290	80.0290	82.6966	80.0290	82.6966	80.0290 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	144.6370	146.1379	142.3557	134.3039	124.1400	114.5873	108.2055	106.7047	110.4868	118.5386	128.7025	138.2552 (68)
Pumps, fans	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281 (71)
Total internal gains	38.5049	37.5354	36.0386	33.2494	31.4099	29.5218	28.5947	29.7262	30.9986	33.0736	35.7696	38.1925 (72)
	311.0813	320.1873	306.3338	298.1604	283.4894	274.7162	264.7397	264.3703	272.0925	279.5517	295.0793	304.3872 (73)

6. Solar gains

[Jan]		Area	Solar flux	g	FF	Access	Gains
		m2	Table 6a	Specific data	Specific data	factor	W
			W/m2	or Table 6b	or Table 6c	Table 6d	
East		1.8900	19.6403	0.6300	0.7000	0.7700	11.3444 (76)
West		4.3100	19.6403	0.6300	0.7000	0.7700	25.8700 (80)
Solar gains	37.2144	72.7992	119.8900	174.8524	214.2881	219.3620	208.8416
Total gains	348.2957	392.9865	426.2237	473.0127	497.7775	494.0782	473.5813
							179.3918
							139.4370
							411.5295
							86.3824
							46.4020
							30.6033 (83)
							334.9905 (84)

7. Mean internal temperature (heating season)

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Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	31.6207	31.7038	31.7857	32.1761	32.2502	32.5998	32.5998	32.6654	32.4643	32.2502	32.1007	31.9458
alpha	3.1080	3.1136	3.1190	3.1451	3.1500	3.1733	3.1733	3.1777	3.1643	3.1500	3.1400	3.1297
util living area	0.9521	0.9302	0.8943	0.8130	0.6934	0.5331	0.4017	0.4420	0.6455	0.8456	0.9284	0.9569 (86)
MIT	19.1138	19.3843	19.7731	20.2866	20.6686	20.8962	20.9681	20.9565	20.8037	20.3004	19.6394	19.0739 (87)
Th 2	20.1294	20.1315	20.1335	20.1432	20.1450	20.1534	20.1534	20.1549	20.1501	20.1450	20.1413	20.1375 (88)
util rest of house	0.9455	0.9208	0.8797	0.7877	0.6527	0.4745	0.3299	0.3683	0.5888	0.8189	0.9171	0.9508 (89)
MIT 2	18.4055	18.6713	19.0509	19.5458	19.8934	20.0887	20.1387	20.1338	20.0184	19.5702	18.9323	18.3722 (90)
Living area fraction									fLA = Living area / (4) =			0.5286 (91)
MIT	18.7799	19.0482	19.4326	19.9373	20.3032	20.5155	20.5771	20.5687	20.4335	19.9562	19.3061	18.7431 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7799	19.0482	19.4326	19.9373	20.3032	20.5155	20.5771	20.5687	20.4335	19.9562	19.3061	18.7431 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9327	0.9066	0.8662	0.7810	0.6606	0.5002	0.3664	0.4051	0.6086	0.8123	0.9040	0.9387 (94)
Useful gains	324.8494	356.2945	369.1863	369.4315	328.8428	247.1562	173.5073	179.7467	250.4390	297.2565	308.7023	314.4484 (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	670.5191	653.4416	595.7613	502.2825	390.6091	265.7030	178.6377	186.8653	285.6624	424.7982	556.7747	666.5942 (97)
Space heating kWh	257.1783	199.6829	168.5718	95.6528	45.9541	0.0000	0.0000	0.0000	0.0000	94.8910	178.6121	261.9964 (98a)
Space heating requirement - total per year (kWh/year)												1302.5394
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	257.1783	199.6829	168.5718	95.6528	45.9541	0.0000	0.0000	0.0000	0.0000	94.8910	178.6121	261.9964 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1302.5394
Space heating per m2										(98c) / (4) =		26.5824 (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	422.2119	332.3796	340.6776	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8464	0.8976	0.8762	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	357.3723	298.3314	298.4994	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	543.7860	521.6011	488.3394	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	134.2178	166.1127	141.2409	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	33.5545	41.5282	35.3102	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												110.3928 (107)
Energy for space heating												26.5824 (99)
Energy for space cooling												2.2529 (108)
Total												28.8354 (109)
Fabric Energy Efficiency (DFEE)												28.8 (109)

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

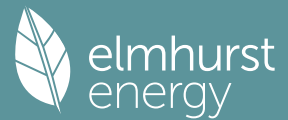
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	49.0000 (1b)	x 2.4500 (2b)	= 120.0500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 120.0500 (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	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1666 (8)
Pressure test	Yes
Pressure Test Method	Blower Door

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Measured/design AP50												5.0000 (17)
Infiltration rate												0.4166 (18)
Number of sides sheltered												2 (19)
Shelter factor												(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) = 0.3541 (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)
	0.4515	0.4426	0.4338	0.3895	0.3807	0.3364	0.3364	0.3275	0.3541	0.3807	0.3984	0.4161 (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	0.6019	0.5980	0.5941	0.5759	0.5725	0.5566	0.5566	0.5536	0.5627	0.5725	0.5793	0.5866 (25)

3. Heat losses and heat loss parameter

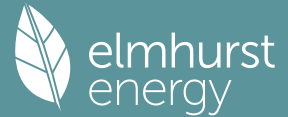
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.8000	1.0000	1.8000			(26)
TER Opening Type (Uw = 1.20)			6.2000	1.1450	7.0992			(27)
External Wall 1	59.8635	6.2000	53.6635	0.1800	9.6594			(29a)
Wall to Stairs	7.3400	1.8000	5.5400	0.1800	0.9972			(29a)
Flat roof	3.7700		3.7700	0.1100	0.4147			(30)
Total net area of external elements Aum(A, m2)			70.9735					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)... (30) + (32) =	19.9706			(33)
Party Wall 1			11.2000	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								107.5781 (35)
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		
E2 Other lintels (including other steel lintels)				3.9200	0.0500	0.1960		
E3 Sill				0.9000	0.0500	0.0450		
E4 Jamb				6.2000	0.0500	0.3100		
E7 Party floor between dwellings (in blocks of flats)				27.4300	0.0700	1.9201		
E16 Corner (normal)				7.3500	0.0900	0.6615		
E17 Corner (inverted - internal area greater than external area)				4.9000	-0.0900	-0.4410		
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				4.5700	0.0000	0.0000		
E18 Party wall between dwellings				7.3500	0.0600	0.4410		
E14 Flat roof				7.0000	0.0800	0.5600		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.6926	(36)
Point Thermal bridges							(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	23.6632	(37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6607 (42)
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths													
	22.5124	22.1781	21.7073	20.8392	20.1891	19.4684	19.0790	19.5466	20.0556	20.8269	21.7129	22.4363	22.4363 (42b)
Hot water usage for other uses													
	31.6372	30.4868	29.3364	28.1859	27.0355	25.8850	25.8850	27.0355	28.1859	29.3364	30.4868	31.6372	31.6372 (42c)
Average daily hot water use (litres/day)													49.6337 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	54.1497	52.6649	51.0436	49.0251	47.2246	45.3534	44.9640	46.5820	48.2415	50.1632	52.1997	54.0736	54.0736 (44)
Energy content (annual)	85.7599	74.9941	78.4522	67.1129	63.5734	55.7673	54.3801	57.6783	59.4866	68.0710	74.3680	84.6662	84.6662 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =			824.3098
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	0.0000 (61)
Total heat required for water heating calculated for each month													
	72.8959	63.7450	66.6843	57.0459	54.0374	47.4022	46.2231	49.0265	50.5636	57.8604	63.2128	71.9662	71.9662 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h													
	72.8959	63.7450	66.6843	57.0459	54.0374	47.4022	46.2231	49.0265	50.5636	57.8604	63.2128	71.9662	71.9662 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =			700.6633 (64)
Electric shower(s)	41.6946	37.1502	40.5666	38.7122	39.4386	37.6206	38.8746	39.4386	38.7122	40.5666	39.8038	41.6946	41.6946 (64a)
													474.2733 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													
Heat gains from water heating, kWh/month													
	28.6476	25.2238	26.8127	23.9395	23.3690	21.2557	21.2744	22.1163	22.3190	24.6067	25.7541	28.4152	28.4152 (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	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.0290	88.6035	80.0290	82.6966	80.0290	82.6966	80.0290	80.0290	82.6966	80.0290	82.6966	80.0290	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	144.6370	146.1379	142.3557	134.3039	124.1400	114.5873	108.2055	106.7047	110.4868	118.5386	128.7025	138.2552	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	(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)	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	(71)
Water heating gains (Table 5)	38.5049	37.5354	36.0386	33.2494	31.4099	29.5218	28.5947	29.7262	30.9986	33.0736	35.7696	38.1925	(72)
Total internal gains	311.0813	320.1873	306.3338	298.1604	283.4894	274.7162	264.7397	264.3703	272.0925	279.5517	295.0793	304.3872	(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				1.8900	19.6403	0.6300	0.7000			0.7700	11.3444 (76)	
West				4.3100	19.6403	0.6300	0.7000			0.7700	25.8700 (80)	
Solar gains	37.2144	72.7992	119.8900	174.8524	214.2881	219.3620	208.8416	179.3918	139.4370	86.3824	46.4020	30.6033 (83)
Total gains	348.2957	392.9865	426.2237	473.0127	497.7775	494.0782	473.5813	443.7622	411.5295	365.9341	341.4813	334.9905 (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	30.8206	30.9226	31.0233	31.5051	31.5969	32.0315	32.0315	32.1133	31.8627	31.5969	31.4118	31.2204		
alpha	3.0547	3.0615	3.0682	3.1003	3.1065	3.1354	3.1354	3.1409	3.1242	3.1065	3.0941	3.0814		
util living area	0.9530	0.9317	0.8967	0.8171	0.6995	0.5394	0.4075	0.4479	0.6516	0.8489	0.9297	0.9575	(86)	
MIT	19.0463	19.3207	19.7179	20.2500	20.6467	20.8882	20.9651	20.9528	20.7906	20.2687	19.5920	19.0136	(87)	
Th 2	20.1088	20.1114	20.1141	20.1265	20.1288	20.1396	20.1396	20.1416	20.1354	20.1288	20.1241	20.1192	(88)	
util rest of house	0.9463	0.9223	0.8823	0.7918	0.6585	0.4797	0.3338	0.3725	0.5943	0.8223	0.9185	0.9515	(89)	
MIT 2	18.3246	18.5948	18.9833	19.4986	19.8607	20.0701	20.1237	20.1188	19.9950	19.5282	18.8737	18.2999	(90)	
Living area fraction									fLA = Living area / (4) =			0.5286	(91)	
MIT	18.7061	18.9785	19.3716	19.8957	20.2761	20.5025	20.5684	20.5596	20.4155	19.9196	19.2534	18.6771	(92)	
Temperature adjustment												0.0000		
adjusted MIT	18.7061	18.9785	19.3716	19.8957	20.2761	20.5025	20.5684	20.5596	20.4155	19.9196	19.2534	18.6771	(93)	

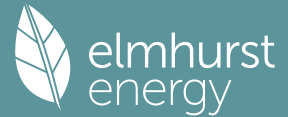
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	0.9333	0.9078	0.8683	0.7845	0.6658	0.5056	0.3712	0.4099	0.6138	0.8151	0.9051	0.9392	(94)	
Ext temp.	325.0700	356.7614	370.0705	371.0889	331.4403	249.8050	175.7790	181.9127	252.5772	298.2784	309.0786	314.6071	(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	684.4214	666.6485	607.5235	511.0469	397.4325	269.8234	181.4096	189.6642	290.2304	431.8863	566.5288	678.9861	(97)	
Space heating requirement - total per year (kWh/year)	267.3575	208.2441	176.6651	100.7698	49.0982	0.0000	0.0000	0.0000	0.0000	99.4042	185.3642	271.0980	(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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)	267.3575	208.2441	176.6651	100.7698	49.0982	0.0000	0.0000	0.0000	0.0000	99.4042	185.3642	271.0980	(98c)	
Space heating per m ²										(98c) / (4) =		27.7143	(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	429.7026	338.2765	346.5343	0.0000	0.0000	0.0000	0.0000	(100)	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8389	0.8915	0.8696	0.0000	0.0000	0.0000	0.0000	(101)	
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	360.4700	301.5697	301.3584	0.0000	0.0000	0.0000	0.0000	(102)	
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	543.7860	521.6011	488.3394	0.0000	0.0000	0.0000	0.0000	(103)	
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	131.9875	163.7034	139.1138	0.0000	0.0000	0.0000	0.0000	(104)	
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)	
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)	
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	32.9969	40.9259	34.7785	0.0000	0.0000	0.0000	0.0000	(107)	
Space cooling requirement													108.7012	(107)
Energy for space heating													27.7143	(99)
Energy for space cooling													2.2184	(108)
Total													29.9327	(109)
Fabric Energy Efficiency (TFEE)													29.9	(109)

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Property Reference	01111	Issued on Date	03/07/2024
Assessment Reference	00001	Prop Type Ref	
Property	Zoar Chapel, Flat 5, South Street, Reading		
SAP Rating	81 B	DER	5.62
Environmental	96 A	% DER < TER	59.66
CO ₂ Emissions (t/year)	0.26	DFEE	28.84
Compliance Check	See BREL	% DFEE < TFEE	3.67
% DPER < TPER	19.18	DPER	59.70
		TPER	73.86
Assessor Details	Mr. Matthew Carter	Assessor ID	7869-0001
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	49.0000 (1b)	2.4500 (2b)	120.0500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.0000		120.0500 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 120.0500 (5)

2. Ventilation rate

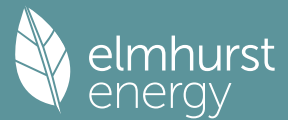
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (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) =	20.0000 / (5) = 0.1666 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3666 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3116 (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	0.3973	0.3895	0.3817	0.3428	0.3350	0.2960	0.2960	0.2882	0.3116	0.3350	0.3506	0.3661 (22b)
Effective ac	0.5789	0.5759	0.5729	0.5587	0.5561	0.5438	0.5438	0.5415	0.5485	0.5561	0.5614	0.5670 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.00)			6.2000	0.9615	5.9615		(27)
Doo to Hall			1.8000	1.4000	2.5200		(26)
External Wall 1	59.8635	6.2000	53.6635	0.1800	9.6594	14.0000	751.2890 (29a)
Wall to Stairs	7.3400	1.8000	5.5400	0.1600	0.8864	14.0000	77.5600 (29a)
Flat roof	3.7700		3.7700	0.1000	0.3770	9.0000	33.9300 (30)
Total net area of external elements Aum(A, m ²)			70.9735				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4044		(33)
Party Wall 1			11.2000	0.0000	0.0000	20.0000	224.0000 (32)
Party Floor 1			49.0000			40.0000	1960.0000 (32d)
Party Ceiling 1			45.2300			30.0000	1356.9000 (32b)
Internal Wall 1			46.1500			9.0000	415.3500 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	4819.0290 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							98.3475 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				3.9200	0.0060	0.0235	
E3 Sill				0.9000	0.0120	0.0108	
E4 Jamb				6.2000	0.0230	0.1426	
E7 Party floor between dwellings (in blocks of flats)				27.4300	0.0210	0.5760	

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E16 Corner (normal)	7.3500	0.0750	0.5512
E17 Corner (inverted - internal area greater than external area)	4.9000	-0.0450	-0.2205
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	4.5700	0.0000	0.0000
E18 Party wall between dwellings	7.3500	0.2400	1.7640
E14 Flat roof	7.0000	0.1600	1.1200
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			3.9677 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	23.3721 (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	22.9349	22.8135	22.6945	22.1355	22.0309	21.5441	21.5441	21.4539	21.7316	22.0309	22.2425	22.4637 (38)
Average = Sum(39)m / 12 =	46.3070	46.1856	46.0666	45.5076	45.4030	44.9162	44.9162	44.8260	45.1037	45.4030	45.6146	45.8358 (39)
												45.5071
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9450	0.9426	0.9401	0.9287	0.9266	0.9167	0.9167	0.9148	0.9205	0.9266	0.9309	0.9354 (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												1.6607 (42)
Hot water usage for mixer showers												
	52.0640	51.2816	50.1414	47.9600	46.3501	44.5548	43.5344	44.6659	45.9062	47.8338	50.0621	51.8645 (42a)
Hot water usage for baths												
	22.5124	22.1781	21.7073	20.8392	20.1891	19.4684	19.0790	19.5466	20.0556	20.8269	21.7129	22.4363 (42b)
Hot water usage for other uses												
	31.6372	30.4868	29.3364	28.1859	27.0355	25.8850	25.8850	27.0355	28.1859	29.3364	30.4868	31.6372 (42c)
Average daily hot water use (litres/day)												97.6350 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	106.2137	103.9465	101.1851	96.9850	93.5747	89.9082	88.4984	91.2479	94.1477	97.9970	102.2618	105.9381 (44)
Energy conte	168.2165	148.0184	155.5177	132.7677	125.9695	110.5526	107.0312	112.9839	116.0936	132.9811	145.6907	165.8734 (45)
Energy content (annual)												Total = Sum(45)m = 1621.6962
Distribution loss (46)m = 0.15 x (45)m												
	25.2325	22.2028	23.3276	19.9152	18.8954	16.5829	16.0547	16.9476	17.4140	19.9472	21.8536	24.8810 (46)
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4000 (48)
Temperature factor from Table 2b												0.7800 (49)
Enter (49) or (54) in (55)												1.0920 (55)
Total storage loss												
	33.8520	30.5760	33.8520	32.7600	33.8520	32.7600	33.8520	33.8520	32.7600	33.8520	32.7600	33.8520 (56)
If cylinder contains dedicated solar storage												
	33.8520	30.5760	33.8520	32.7600	33.8520	32.7600	33.8520	33.8520	32.7600	33.8520	32.7600	33.8520 (57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576 (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												
	256.9261	228.1432	244.2273	218.6157	214.6791	165.8246	164.1456	170.0983	171.3656	221.6907	231.5387	254.5830 (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												
	256.9261	228.1432	244.2273	218.6157	214.6791	165.8246	164.1456	170.0983	171.3656	221.6907	231.5387	254.5830 (64)
12Total per year (kWh/year)												2541.8378 (64)
Electric shower(s)												2542 (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 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
	99.8181	88.8551	95.5957	86.6157	85.7710	54.7683	54.1978	56.1771	56.6107	88.1023	90.9125	99.0390 (65)

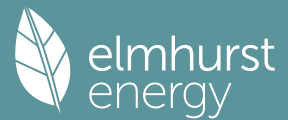
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	80.0290	88.6035	80.0290	82.6966	80.0290	82.6966	80.0290	80.0290	82.6966	80.0290	82.6966	80.0290 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	144.6370	146.1379	142.3557	134.3039	124.1400	114.5873	108.2055	106.7047	110.4868	118.5386	128.7025	138.2552 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035 (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)												
	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281 (71)
Water heating gains (Table 5)												
	134.1641	132.2249	128.4888	120.2995	115.2835	76.0671	72.8465	75.5068	78.6260	118.4170	126.2674	133.1169 (72)
Total internal gains												
	406.7405	414.8768	398.7840	385.2105	367.3630	321.2615	308.9915	310.1510	319.7199	364.8951	385.5771	399.3116 (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				1.8900	19.6403	0.6300		0.7000	0.7700	11.3444 (76)		
West				4.3100	19.6403	0.6300		0.7000	0.7700	25.8700 (80)		
Solar gains	37.2144	72.7992	119.8900	174.8524	214.2881	219.3620	208.8416	179.3918	139.4370	86.3824	46.4020	30.6033 (83)
Total gains	443.9549	487.6760	518.6740	560.0629	581.6511	540.6236	517.8331	489.5428	459.1569	451.2776	431.9790	429.9149 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	28.9075	28.9835	29.0584	29.4153	29.4830	29.8026	29.8026	29.8626	29.6787	29.4830	29.3463	29.2047
alpha	2.9272	2.9322	2.9372	2.9610	2.9655	2.9868	2.9868	2.9908	2.9786	2.9655	2.9564	2.9470
util living area	0.9054	0.8766	0.8314	0.7412	0.6189	0.4907	0.3681	0.4022	0.5907	0.7645	0.8688	0.9119 (86)
Living	19.6339	19.8208	20.0900	20.4331	20.6836	20.8210	20.8731	20.8654	20.7598	20.4615	20.0127	19.6074
Non living	18.5308	18.7638	19.0971	19.5171	19.8060	19.9599	20.0069	20.0029	19.8996	19.5609	19.0141	18.5041
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.3012	19.8208	20.0900	20.4331	20.6836	20.8210	20.8731	20.8654	20.7598	20.4615	20.0127	19.8022 (87)
Th 2	20.1294	20.1315	20.1335	20.1432	20.1450	20.1534	20.1534	20.1549	20.1501	20.1450	20.1413	20.1375 (88)
util rest of house	0.8944	0.8627	0.8124	0.7128	0.5784	0.4355	0.3018	0.3344	0.5357	0.7325	0.8519	0.9016 (89)
MIT 2	19.4921	18.7638	19.0971	19.5171	19.8060	19.9599	20.0069	20.0029	19.8996	19.5609	19.0141	18.7984 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.9197	19.3225	19.6219	20.0013	20.2699	20.4151	20.4647	20.4588	20.3543	20.0369	19.5419	19.3290 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.9197	19.3225	19.6219	20.0013	20.2699	20.4151	20.4647	20.4588	20.3543	20.0369	19.5419	19.3290 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8915	0.8480	0.8000	0.7078	0.5846	0.4530	0.3266	0.3593	0.5495	0.7281	0.8386	0.8905 (94)
Useful gains	395.7885	413.5718	414.9387	396.4178	340.0388	244.9254	169.1209	175.9024	252.3135	328.5822	362.2522	382.8520 (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	723.3032	666.1132	604.4822	505.1942	389.0985	261.1905	173.5881	181.9409	282.0907	428.4659	567.5331	693.4485 (97)
Space heating kWh	243.6710	169.7078	141.0204	78.3190	36.5004	0.0000	0.0000	0.0000	0.0000	74.3135	147.8022	231.0838 (98a)
Space heating requirement - total per year (kWh/year)	1122.4181											
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	243.6710	169.7078	141.0204	78.3190	36.5004	0.0000	0.0000	0.0000	0.0000	74.3135	147.8022	231.0838 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1122.4181											
Space heating per m2	(98c) / (4) = 22.9065 (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 %)	312.6685 (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	243.6710	169.7078	141.0204	78.3190	36.5004	0.0000	0.0000	0.0000	0.0000	74.3135	147.8022	231.0838 (98)
Space heating efficiency (main heating system 1)	312.6685	312.6685	312.6685	312.6685	312.6685	0.0000	0.0000	0.0000	0.0000	312.6685	312.6685	312.6685 (210)
Space heating fuel (main heating system)	77.9327	54.2772	45.1022	25.0486	11.6738	0.0000	0.0000	0.0000	0.0000	23.7675	47.2712	73.9070 (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	256.9261	228.1432	244.2273	218.6157	214.6791	165.8246	164.1456	170.0983	171.3656	221.6907	231.5387	254.5830 (64)
Efficiency of water heater	181.6919	181.6919	181.6919	181.6919	181.6919	181.6919	181.6919	181.6919	181.6919	181.6919	181.6919	181.6919 (216)
Fuel for water heating, kWh/month	141.4076	125.5660	134.4184	120.3222	118.1556	91.2669	90.3428	93.6191	94.3166	122.0146	127.4348	140.1180 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	18.3887	14.7521	13.2826	9.7314	7.5168	6.1413	6.8571	8.9131	11.5773	15.1900	17.1571	18.8998 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)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 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by 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	358.9802 (211)											
Space heating fuel - main system 2	0.0000 (213)											
Space heating fuel - secondary	0.0000 (215)											
Efficiency of water heater	181.6919											
Water heating fuel used	1398.9826 (219)											
Space cooling fuel	0.0000 (221)											
Electricity for pumps and fans:												
Total electricity for the above, kWh/year	0.0000 (231)											
Electricity for lighting (calculated in Appendix L)	148.4076 (232)											

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

PV generation	0.0000 (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	1906.3704 (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	358.9802	0.1555	55.8281 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1398.9826	0.1416	198.1565 (264)
Space and water heating			253.9846 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	148.4076	0.1443	21.4198 (268)
Total CO2, kg/year			275.4044 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.6200 (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	358.9802	1.5757	565.6571 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1398.9826	1.5238	2131.7701 (278)
Space and water heating			2697.4272 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	148.4076	1.5338	227.6325 (282)
Total Primary energy kWh/year			2925.0597 (286)
Dwelling Primary energy Rate (DPER)			59.7000 (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	49.0000 (1b)	x 2.4500 (2b)	= 120.0500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 120.0500 (5)

2. Ventilation rate

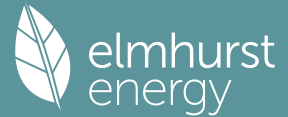
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (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) =	20.0000 / (5) = 0.1666 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4166 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3541 (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	0.4515	0.4426	0.4338	0.3895	0.3807	0.3364	0.3364	0.3275	0.3541	0.3807	0.3984	0.4161 (22b)
Effective ac	0.6019	0.5980	0.5941	0.5759	0.5725	0.5566	0.5566	0.5536	0.5627	0.5725	0.5793	0.5866 (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			1.8000	1.0000	1.8000		(26)
TER Opening Type (Uw = 1.20)			6.2000	1.1450	7.0992		(27)

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External Wall 1	59.8635	6.2000	53.6635	0.1800	9.6594	(29a)
Wall to Stairs	7.3400	1.8000	5.5400	0.1800	0.9972	(29a)
Flat roof	3.7700		3.7700	0.1100	0.4147	(30)
Total net area of external elements Aum(A, m2)			70.9735			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.9706	(33)
Party Wall 1			11.2000	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 107.5781 (35)

List of Thermal Bridges						
K1 Element	Length	Psi-value	Total			
E2 Other lintels (including other steel lintels)	3.9200	0.0500	0.1960			
E3 Sill	0.9000	0.0500	0.0450			
E4 Jamb	6.2000	0.0500	0.3100			
E7 Party floor between dwellings (in blocks of flats)	27.4300	0.0700	1.9201			
E16 Corner (normal)	7.3500	0.0900	0.6615			
E17 Corner (inverted - internal area greater than external area)	4.9000	-0.0900	-0.4410			
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	4.5700	0.0000	0.0000			
E18 Party wall between dwellings	7.3500	0.0600	0.4410			
E14 Flat roof	7.0000	0.0800	0.5600			

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.6926 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 23.6632 (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	23.8460	23.6892	23.5355	22.8136	22.6786	22.0499	22.0499	21.9335	22.2921	22.6786	22.9518	23.2374	(38)
Average = Sum(39)m / 12 =	47.5091	47.3524	47.1987	46.4768	46.3418	45.7130	45.7130	45.5966	45.9552	46.3418	46.6150	46.9006	(39)
												46.4762	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9696	0.9664	0.9632	0.9485	0.9458	0.9329	0.9329	0.9305	0.9379	0.9458	0.9513	0.9572	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

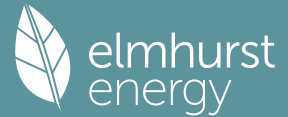
Assumed occupancy													1.6607 (42)
Hot water usage for mixer showers													
Hot water usage for baths	52.0640	51.2816	50.1414	47.9600	46.3501	44.5548	43.5344	44.6659	45.9062	47.8338	50.0621	51.8645	(42a)
Hot water usage for other uses	22.5124	22.1781	21.7073	20.8392	20.1891	19.4684	19.0790	19.5466	20.0556	20.8269	21.7129	22.4363	(42b)
Average daily hot water use (litres/day)	31.6372	30.4868	29.3364	28.1859	27.0355	25.8850	25.8850	27.0355	28.1859	29.3364	30.4868	31.6372	(42c)
												97.6350	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	106.2137	103.9465	101.1851	96.9850	93.5747	89.9082	88.4984	91.2479	94.1477	97.9970	102.2618	105.9381	(44)
Energy content (annual)	168.2165	148.0184	155.5177	132.7677	125.9695	110.5526	107.0312	112.9839	116.0936	132.9811	145.6907	165.8734	(45)
Distribution loss (46)m = 0.15 x (45)m	25.2325	22.2028	23.3276	19.9152	18.8954	16.5829	16.0547	16.9476	17.4140	19.9472	21.8536	24.8810	(46)
Water storage loss:													
Store volume													180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.5520 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8381 (55)
Total storage loss	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(56)
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(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	217.4592	192.4956	204.7603	180.4219	175.2122	158.2068	156.2738	162.2266	163.7478	182.2237	193.3449	215.1161	(62)
WWHRS	-23.8015	-21.0502	-22.0426	-18.2521	-17.0103	-14.5559	-13.6438	-14.5088	-15.0601	-17.7541	-20.1133	-23.3607	(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	193.6577	171.4454	182.7177	162.1697	158.2019	143.6509	142.6300	147.7178	148.6877	164.4696	173.2316	191.7554	(64)
12Total per year (kWh/year)													1980.3355 (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	95.3261	84.7979	91.1038	82.2686	81.2790	74.8821	74.9820	76.9613	76.7245	83.6103	86.5655	94.5471	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	80.0290	88.6035	80.0290	82.6966	80.0290	82.6966	80.0290	80.0290	82.6966	80.0290	82.6966	80.0290	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	144.6370	146.1379	142.3557	134.3039	124.1400	114.5873	108.2055	106.7047	110.4868	118.5386	128.7025	138.2552	(68)
Pumps, fans	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	(69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	(71)
Total internal gains	128.1265	126.1874	122.4513	114.2620	109.2460	104.0029	100.7822	103.4426	106.5618	112.3795	120.2299	127.0794	(72)
	403.7030	411.8392	395.7464	382.1730	364.3254	349.1973	336.9273	338.0867	347.6557	361.8576	382.5395	396.2741	(73)

6. Solar gains

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[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		Specific data or Table 6c	FF	Access factor Table 6d		Gains W
East				1.8900	19.6403			0.6300	0.7000			11.3444 (76)
West				4.3100	19.6403			0.6300	0.7000			25.8700 (80)
Solar gains	37.2144	72.7992	119.8900	174.8524	214.2881	219.3620	208.8416	179.3918	139.4370	86.3824	46.4020	30.6033 (83)
Total gains	440.9173	484.6385	515.6364	557.0253	578.6136	568.5594	545.7689	517.4786	487.0927	448.2400	428.9415	426.8774 (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	30.8206	30.9226	31.0233	31.5051	31.5969	32.0315	32.0315	32.1133	31.8627	31.5969	31.4118	31.2204
alpha	3.0547	3.0615	3.0682	3.1003	3.1065	3.1354	3.1354	3.1409	3.1242	3.1065	3.0941	3.0814
util living area	0.9186	0.8918	0.8488	0.7597	0.6364	0.4813	0.3582	0.3908	0.5794	0.7832	0.8843	0.9245 (86)
MIT	19.3560	19.6007	19.9532	20.4064	20.7321	20.9190	20.9758	20.9678	20.8506	20.4412	19.8554	19.3278 (87)
Th 2	20.1088	20.1114	20.1141	20.1265	20.1288	20.1396	20.1396	20.1416	20.1354	20.1288	20.1241	20.1192 (88)
util rest of house	0.9083	0.8784	0.8300	0.7309	0.5943	0.4251	0.2918	0.3228	0.5226	0.7508	0.8680	0.9148 (89)
MIT 2	18.2043	18.5095	18.9458	19.4989	19.8726	20.0762	20.1257	20.1221	20.0102	19.5533	18.8404	18.1763 (90)
Living area fraction	fLA = Living area / (4) =											0.5286 (91)
MIT	18.8130	19.0863	19.4783	19.9786	20.3269	20.5216	20.5750	20.5691	20.4544	20.0226	19.3769	18.7849 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8130	19.0863	19.4783	19.9786	20.3269	20.5216	20.5750	20.5691	20.4544	20.0226	19.3769	18.7849 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8901	0.8604	0.8148	0.7256	0.6042	0.4506	0.3258	0.3572	0.5443	0.7465	0.8519	0.8970 (94)
Useful gains	392.4436	416.9919	420.1654	404.1870	349.6087	256.1800	177.8146	184.8380	265.1087	334.6077	365.3941	382.9281 (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	689.5020	671.7525	612.5569	514.8970	399.7859	270.6964	181.7103	190.0988	292.0197	436.6601	572.2869	684.0416 (97)
Space heating kWh	221.0114	171.1991	143.1392	79.7112	37.3318	0.0000	0.0000	0.0000	0.0000	75.9270	148.9628	224.0284 (98a)
Space heating requirement - total per year (kWh/year)												1101.3109
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	221.0114	171.1991	143.1392	79.7112	37.3318	0.0000	0.0000	0.0000	0.0000	75.9270	148.9628	224.0284 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1101.3109
Space heating per m2	(98c) / (4) =											22.4757 (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 %)												92.3000 (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	221.0114	171.1991	143.1392	79.7112	37.3318	0.0000	0.0000	0.0000	0.0000	75.9270	148.9628	224.0284 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	239.4490	185.4811	155.0804	86.3610	40.4462	0.0000	0.0000	0.0000	0.0000	82.2611	161.3898	242.7177 (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	193.6577	171.4454	182.7177	162.1697	158.2019	143.6509	142.6300	147.7178	148.6877	164.4696	173.2316	191.7554 (64)
Water heating requirement	84.3568	84.0566	83.5183	82.5574	81.3746	79.8000	79.8000	79.8000	79.8000	82.4389	83.7232	79.8000 (216)
Efficiency of water heater	229.5696	203.9643	218.7757	196.4327	194.4118	180.0137	178.7344	185.1100	186.3255	199.5047	206.9100	84.4095 (217)
(217)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)
Fuel for water heating, kWh/month	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)
Space cooling fuel requirement	16.6284	13.3399	12.0111	8.7999	6.7973	5.5534	6.2007	8.0599	10.4690	13.7359	15.5147	17.0906 (232)
(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	16.6284	13.3399	12.0111	8.7999	6.7973	5.5534	6.2007	8.0599	10.4690	13.7359	15.5147	17.0906 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-16.9067	-24.7279	-36.8671	-43.0624	-47.8618	-45.2293	-44.7162	-41.5339	-36.1202	-29.0308	-18.9160	-14.5174 (233a)
(233a)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 wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
(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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
(235c)m	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)	-7.0085	-14.9791	-30.2039	-45.9874	-61.3975	-61.8738	-61.1056	-51.4318	-37.3240	-21.5809	-9.4118	-5.5217 (233b)
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
(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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
(235d)m	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												1193.1862 (211)
Space heating fuel - main system 1												0.0000 (213)
Space heating fuel - main system 2												

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Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2406.9252 (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)	134.2010 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-807.3159 (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	3012.9966 (238)

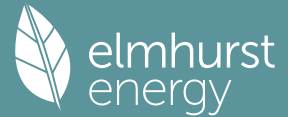
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1193.1862	0.2100	250.5691 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2406.9252	0.2100	505.4543 (264)
Space and water heating			756.0234 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	134.2010	0.1443	19.3694 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-399.4898	0.1338	-53.4489
PV Unit electricity exported	-407.8261	0.1255	-51.1874
Total			-104.6363 (269)
Total CO2, kg/year			682.6857 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.9300 (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	1193.1862	1.1300	1348.3005 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2406.9252	1.1300	2719.8255 (278)
Space and water heating			4068.1260 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	134.2010	1.5338	205.8420 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-399.4898	1.4944	-597.0100
PV Unit electricity exported	-407.8261	0.4607	-187.8861
Total			-784.8962 (283)
Total Primary energy kWh/year			3619.1726 (286)
Target Primary Energy Rate (TPER)			73.8600 (287)

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Property Reference	01111	Issued on Date	03/07/2024
Assessment Reference	00001	Prop Type Ref	
Property	Zoar Chapel, Flat 5, South Street, Reading		
SAP Rating	81 B	DER	5.62
Environmental	96 A	% DER < TER	59.66
CO ₂ Emissions (t/year)	0.26	DFEE	28.84
Compliance Check	See BREL	% DFEE < TFEE	3.67
% DPER < TPER	19.18	DPER	59.70
		TPER	73.86
Assessor Details	Mr. Matthew Carter	Assessor ID	7869-0001
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	49.0000 (1b)	2.4500 (2b)	120.0500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.0000		120.0500 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 120.0500 (5)

2. Ventilation rate

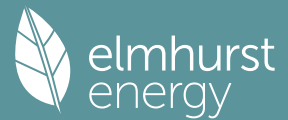
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (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) =	20.0000 / (5) = 0.1666 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3666 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3116 (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	0.3973	0.3895	0.3817	0.3428	0.3350	0.2960	0.2960	0.2882	0.3116	0.3350	0.3506	0.3661 (22b)
Effective ac	0.5789	0.5759	0.5729	0.5587	0.5561	0.5438	0.5438	0.5415	0.5485	0.5561	0.5614	0.5670 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.00)			6.2000	0.9615	5.9615		(27)
Doo to Hall			1.8000	1.4000	2.5200		(26)
External Wall 1	59.8635	6.2000	53.6635	0.1800	9.6594	14.0000	751.2890 (29a)
Wall to Stairs	7.3400	1.8000	5.5400	0.1600	0.8864	14.0000	77.5600 (29a)
Flat roof	3.7700		3.7700	0.1000	0.3770	9.0000	33.9300 (30)
Total net area of external elements Aum(A, m ²)			70.9735				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4044		(33)
Party Wall 1			11.2000	0.0000	0.0000	20.0000	224.0000 (32)
Party Floor 1			49.0000			40.0000	1960.0000 (32d)
Party Ceiling 1			45.2300			40.0000	1809.2000 (32b)
Internal Wall 1			46.1500			9.0000	415.3500 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5271.3290 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							107.5781 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				3.9200	0.0060	0.0235	
E3 Sill				0.9000	0.0120	0.0108	
E4 Jamb				6.2000	0.0230	0.1426	
E7 Party floor between dwellings (in blocks of flats)				27.4300	0.0210	0.5760	

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E16 Corner (normal)	7.3500	0.0750	0.5512
E17 Corner (inverted - internal area greater than external area)	4.9000	-0.0450	-0.2205
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	4.5700	0.0000	0.0000
E18 Party wall between dwellings	7.3500	0.2400	1.7640
E14 Flat roof	7.0000	0.1600	1.1200
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			3.9677 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	23.3721 (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	22.9349	22.8135	22.6945	22.1355	22.0309	21.5441	21.5441	21.4539	21.7316	22.0309	22.2425	22.4637 (38)
Average = Sum(39)m / 12 =	46.3070	46.1856	46.0666	45.5076	45.4030	44.9162	44.9162	44.8260	45.1037	45.4030	45.6146	45.8358 (39)
												45.5071
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9450	0.9426	0.9401	0.9287	0.9266	0.9167	0.9167	0.9148	0.9205	0.9266	0.9309	0.9354 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

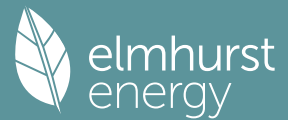
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												1.6607 (42)
Hot water usage for mixer showers												
	52.0640	51.2816	50.1414	47.9600	46.3501	44.5548	43.5344	44.6659	45.9062	47.8338	50.0621	51.8645 (42a)
Hot water usage for baths												
	22.5124	22.1781	21.7073	20.8392	20.1891	19.4684	19.0790	19.5466	20.0556	20.8269	21.7129	22.4363 (42b)
Hot water usage for other uses												
	31.6372	30.4868	29.3364	28.1859	27.0355	25.8850	25.8850	27.0355	28.1859	29.3364	30.4868	31.6372 (42c)
Average daily hot water use (litres/day)												97.6350 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	106.2137	103.9465	101.1851	96.9850	93.5747	89.9082	88.4984	91.2479	94.1477	97.9970	102.2618	105.9381 (44)
Energy content (annual)	168.2165	148.0184	155.5177	132.7677	125.9695	110.5526	107.0312	112.9839	116.0936	132.9811	145.6907	165.8734 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1621.6962
	25.2325	22.2028	23.3276	19.9152	18.8954	16.5829	16.0547	16.9476	17.4140	19.9472	21.8536	24.8810 (46)
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4000 (48)
Temperature factor from Table 2b												0.7800 (49)
Enter (49) or (54) in (55)												1.0920 (55)
Total storage loss												
	33.8520	30.5760	33.8520	32.7600	33.8520	32.7600	33.8520	33.8520	32.7600	33.8520	32.7600	33.8520 (56)
If cylinder contains dedicated solar storage												
	33.8520	30.5760	33.8520	32.7600	33.8520	32.7600	33.8520	33.8520	32.7600	33.8520	32.7600	33.8520 (57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576 (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												
	256.9261	228.1432	244.2273	218.6157	214.6791	165.8246	164.1456	170.0983	171.3656	221.6907	231.5387	254.5830 (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												
	256.9261	228.1432	244.2273	218.6157	214.6791	165.8246	164.1456	170.0983	171.3656	221.6907	231.5387	254.5830 (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												
	99.8181	88.8551	95.5957	86.6157	85.7710	54.7683	54.1978	56.1771	56.6107	88.1023	90.9125	99.0390 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	21.0086	18.6597	15.1751	11.4885	8.5878	7.2502	7.8341	10.1830	13.6676	17.3542	20.2549	21.5925 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	215.8761	218.1162	212.4712	200.4536	185.2835	171.0258	161.5008	159.2607	164.9057	176.9233	192.0934	206.3511 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249 (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)												
	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281 (71)
Water heating gains (Table 5)												
	134.1641	132.2249	128.4888	120.2995	115.2835	76.0671	72.8465	75.5068	78.6260	118.4170	126.2674	133.1169 (72)
Total internal gains												
	450.8877	448.8397	435.9740	412.0805	388.9938	334.1821	322.0203	324.7895	337.0383	392.5335	418.4546	440.8994 (73)

6. Solar gains												
[Jan]												
	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
East	1.8900	19.6403	0.6300	0.7000	0.7700	11.3444 (76)						
West	4.3100	19.6403	0.6300	0.7000	0.7700	25.8700 (80)						
Solar gains	37.2144	72.7992	119.8900	174.8524	214.2881	219.3620	208.8416	179.3918	139.4370	86.3824	46.4020	30.6033 (83)
Total gains	488.1021	521.6390	555.8640	586.9329	603.2819	553.5441	530.8619	504.1813	476.4752	478.9159	464.8566	471.5027 (84)

7. Mean internal temperature (heating season)

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Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	31.6207	31.7038	31.7857	32.1761	32.2502	32.5998	32.5998	32.6654	32.4643	32.2502	32.1007	31.9458	
alpha	3.1080	3.1136	3.1190	3.1451	3.1500	3.1733	3.1733	3.1777	3.1643	3.1500	3.1400	3.1297	
util living area	0.8961	0.8710	0.8217	0.7340	0.6116	0.4859	0.3620	0.3945	0.5823	0.7536	0.8608	0.9038 (86)	
Living	19.8252	19.9742	20.2239	20.5163	20.7306	20.8433	20.8854	20.8797	20.7937	20.5437	20.1492	19.7966	
Non living	18.7628	18.9481	19.2552	19.6117	19.8562	19.9820	20.0188	20.0164	19.9336	19.6531	19.1763	18.7339	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.3990	19.9742	20.2239	20.5163	20.7306	20.8433	20.8854	20.8797	20.7937	20.5437	20.1492	19.9649 (87)	
Th 2	20.1294	20.1315	20.1335	20.1432	20.1450	20.1534	20.1534	20.1549	20.1501	20.1450	20.1413	20.1375 (88)	
util rest of house	0.8837	0.8561	0.8013	0.7044	0.5700	0.4302	0.2960	0.3270	0.5262	0.7199	0.8425	0.8923 (89)	
MIT 2	19.5846	18.9481	19.2552	19.6117	19.8562	19.9820	20.0188	20.0164	19.9336	19.6531	19.1763	18.9868 (90)	
Living area fraction									fLA = Living area / (4) =				0.5286 (91)
MIT	20.0150	19.4904	19.7672	20.0898	20.3183	20.4373	20.4768	20.4727	20.3882	20.1239	19.6906	19.5038 (92)	
Temperature adjustment												0.0000	
adjusted MIT	20.0150	19.4904	19.7672	20.0898	20.3183	20.4373	20.4768	20.4727	20.3882	20.1239	19.6906	19.5038 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8820	0.8437	0.7919	0.7024	0.5787	0.4493	0.3215	0.3528	0.5425	0.7190	0.8318	0.8827 (94)
Useful gains	430.4855	440.1087	440.1656	412.2854	349.1473	248.7097	170.6953	177.8790	258.4910	344.3238	386.6636	416.1941 (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	727.7165	673.8672	611.1754	509.2230	391.2986	262.1889	174.1324	182.5620	283.6221	432.4130	574.3138	701.4634 (97)
Space heating kWh	221.1399	157.0857	127.2313	69.7951	31.3606	0.0000	0.0000	0.0000	0.0000	65.5384	135.1081	212.2403 (98a)
Space heating requirement - total per year (kWh/year)												1019.4994
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	221.1399	157.0857	127.2313	69.7951	31.3606	0.0000	0.0000	0.0000	0.0000	65.5384	135.1081	212.2403 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1019.4994
Space heating per m2										(98c) / (4) =		20.8061 (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 %)													312.6685 (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	221.1399	157.0857	127.2313	69.7951	31.3606	0.0000	0.0000	0.0000	0.0000	65.5384	135.1081	212.2403 (98)	
Space heating efficiency (main heating system 1)	312.6685	312.6685	312.6685	312.6685	312.6685	0.0000	0.0000	0.0000	0.0000	312.6685	312.6685	312.6685 (210)	
Space heating fuel (main heating system)	70.7266	50.2404	40.6921	22.3224	10.0300	0.0000	0.0000	0.0000	0.0000	20.9610	43.2113	67.8803 (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	256.9261	228.1432	244.2273	218.6157	214.6791	165.8246	164.1456	170.0983	171.3656	221.6907	231.5387	254.5830 (64)	
Efficiency of water heater	181.6919	181.6919	181.6919	181.6919	181.6919	181.6919	181.6919	181.6919	181.6919	181.6919	181.6919	181.6919 (216)	
Fuel for water heating, kWh/month	141.4076	125.5660	134.4184	120.3222	118.1556	91.2669	90.3428	93.6191	94.3166	122.0146	127.4348	140.1180 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)	
Lighting	18.3887	14.7521	13.2826	9.7314	7.5168	6.1413	6.8571	8.9131	11.5773	15.1900	17.1571	18.8998 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)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 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)	
Electricity generated by 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													326.0640 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													181.6919
Water heating fuel used													1398.9826 (219)
Space cooling fuel													0.0000 (221)

Electricity for pumps and fans:													
Total electricity for the above, kWh/year													0.0000 (231)
Electricity for lighting (calculated in Appendix L)													148.4076 (232)

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

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PV generation	0.0000 (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	1873.4542 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	326.0640	16.4900	53.7680 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1398.9826	16.4900	230.6922 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	148.4076	16.4900	24.4724 (250)
Additional standing charges			0.0000 (251)
Total energy cost			308.9326 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] = 1.1831$ (257)
SAP value	80.8212
SAP rating (Section 12)	81 (258)
SAP band	B

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	326.0640	0.1556	50.7489 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1398.9826	0.1416	198.1565 (264)
Space and water heating			248.9055 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	148.4076	0.1443	21.4198 (268)
Total CO2, kg/year			270.3253 (272)
CO2 emissions per m2			5.5200 (273)
EI value			96.1464
EI rating			96 (274)
EI band			A

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	49.0000 (1b)	2.4500 (2b)	120.0500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	120.0500 (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	2 * 10 = 20.0000 (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) =	20.0000 / (5) =	0.1666 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.3666	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.3116 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)

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Adj infilt rate	0.3272	0.3116	0.3116	0.2882	0.2882	0.2571	0.2649	0.2493	0.2571	0.2727	0.2727	0.2960 (22b)
Effective ac	0.5535	0.5485	0.5485	0.5415	0.5415	0.5330	0.5351	0.5311	0.5330	0.5372	0.5372	0.5438 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Windows (Uw = 1.00)			6.2000	0.9615	5.9615			(27)
Doo to Hall			1.8000	1.4000	2.5200			(26)
External Wall 1	59.8635	6.2000	53.6635	0.1800	9.6594	14.0000	751.2890	(29a)
Wall to Stairs	7.3400	1.8000	5.5400	0.1600	0.8864	14.0000	77.5600	(29a)
Flat roof	3.7700		3.7700	0.1000	0.3770	9.0000	33.9300	(30)
Total net area of external elements Aum(A, m2)			70.9735					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.4044			(33)
Party Wall 1			11.2000	0.0000	0.0000	20.0000	224.0000	(32)
Party Floor 1			49.0000			40.0000	1960.0000	(32d)
Party Ceiling 1			45.2300			40.0000	1809.2000	(32b)
Internal Wall 1			46.1500			9.0000	415.3500	(32c)

Heat capacity Cm = Sum(A x K)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
(28)...(30) + (32) + (32a)...(32e) = 5271.3290 (34)
107.5781 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	3.9200	0.0060	0.0235
E3 Sill	0.9000	0.0120	0.0108
E4 Jamb	6.2000	0.0230	0.1426
E7 Party floor between dwellings (in blocks of flats)	27.4300	0.0210	0.5760
E16 Corner (normal)	7.3500	0.0750	0.5512
E17 Corner (inverted - internal area greater than external area)	4.9000	-0.0450	-0.2205
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	4.5700	0.0000	0.0000
E18 Party wall between dwellings	7.3500	0.2400	1.7640
E14 Flat roof	7.0000	0.1600	1.1200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Point Thermal bridges
Total fabric heat loss
(33) + (36) + (36a) = 23.3721 (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	21.9288	21.7316	21.7316	21.4539	21.4539	21.1173	21.1979	21.0392	21.1173	21.2808	21.2808	21.5441	(38)
Heat transfer coeff	45.3008	45.1037	45.1037	44.8260	44.8260	44.4894	44.5700	44.4113	44.4894	44.6529	44.6529	44.9162	(39)
Average = Sum(39)m / 12 =												44.7785	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9245	0.9205	0.9205	0.9148	0.9148	0.9079	0.9096	0.9064	0.9079	0.9113	0.9113	0.9167	(40)
HLP (average)												0.9138	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6607 (42)
Hot water usage for mixer showers												
52.0640	51.2816	50.1414	47.9600	46.3501	44.5548	43.5344	44.6659	45.9062	47.8338	50.0621	51.8645	(42a)
Hot water usage for baths												
22.5124	22.1781	21.7073	20.8392	20.1891	19.4684	19.0790	19.5466	20.0556	20.8269	21.7129	22.4363	(42b)
Hot water usage for other uses												
31.6372	30.4868	29.3364	28.1859	27.0355	25.8850	25.8850	27.0355	28.1859	29.3364	30.4868	31.6372	(42c)
Average daily hot water use (litres/day)												97.6350 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.2137	103.9465	101.1851	96.9850	93.5747	89.9082	88.4984	91.2479	94.1477	97.9970	102.2618	105.9381	(44)
Energy conte	168.2165	148.0184	155.5177	132.7677	125.9695	110.5526	107.0312	112.9839	116.0936	132.9811	145.6907	165.8734	(45)
Energy content (annual)										Total = Sum(45)m =		1621.6962	
Distribution loss (46)m = 0.15 x (45)m													
	25.2325	22.2028	23.3276	19.9152	18.8954	16.5829	16.0547	16.9476	17.4140	19.9472	21.8536	24.8810	(46)

Water storage loss:
Store volume
180.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day):
Temperature factor from Table 2b
0.7800 (49)
Enter (49) or (54) in (55)
1.0920 (55)

Total storage loss
33.8520 30.5760 33.8520 32.7600 33.8520 32.7600 33.8520 33.8520 32.7600 33.8520 32.7600 33.8520 33.8520 (56)

If cylinder contains dedicated solar storage
33.8520 30.5760 33.8520 32.7600 33.8520 32.7600 33.8520 33.8520 32.7600 33.8520 32.7600 33.8520 33.8520 (57)

Primary loss 54.8576 49.5488 54.8576 53.0880 54.8576 22.5120 23.2624 23.2624 22.5120 54.8576 53.0880 54.8576 (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
256.9261 228.1432 244.2273 218.6157 214.6791 165.8246 164.1456 170.0983 171.3656 221.6907 231.5387 254.5830 (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
256.9261 228.1432 244.2273 218.6157 214.6791 165.8246 164.1456 170.0983 171.3656 221.6907 231.5387 254.5830 (64)

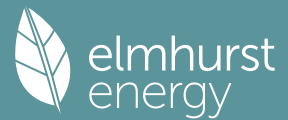
Electric shower(s)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)

Heat gains from water heating, kWh/month
99.8181 88.8551 95.5957 86.6157 85.7710 54.7683 54.1978 56.1771 56.6107 88.1023 90.9125 99.0390 (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	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	21.0086	18.6597	15.1751	11.4885	8.5878	7.2502	7.8341	10.1830	13.6676	17.3542	20.2549	21.5925 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												

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Cooking gains	215.8761	218.1162	212.4712	200.4536	185.2835	171.0258	161.5008	159.2607	164.9057	176.9233	192.0934	206.3511 (68)
Pumps, fans	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281 (71)
Total internal gains	134.1641	132.2249	128.4888	120.2995	115.2835	76.0671	72.8465	75.5068	78.6260	118.4170	126.2674	133.1169 (72)
	450.8877	448.8397	435.9740	412.0805	388.9938	334.1821	322.0203	324.7895	337.0383	392.5335	418.4546	440.8994 (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				1.8900	22.3313	0.6300	0.7000			0.7700	12.8988 (76)	
West				4.3100	22.3313	0.6300	0.7000			0.7700	29.4146 (80)	
Solar gains	42.3134	74.4565	120.9043	181.2008	215.9084	236.3513	222.6525	195.8814	152.2514	94.2818	54.0502	34.4588 (83)
Total gains	493.2011	523.2963	556.8783	593.2814	604.9022	570.5334	544.6727	520.6708	489.2896	486.8153	472.5048	475.3583 (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	32.3230	32.4643	32.4643	32.6654	32.6654	32.9125	32.8530	32.9704	32.9125	32.7920	32.7920	32.5998
alpha	3.1549	3.1643	3.1643	3.1777	3.1777	3.1942	3.1902	3.1980	3.1942	3.1861	3.1861	3.1733
util living area	0.8796	0.8546	0.7952	0.6901	0.5412	0.3779	0.2513	0.2698	0.4927	0.7020	0.8328	0.8875 (86)
Living	19.9783	20.1036	20.3518	20.6178	20.8021	20.8816	20.8994	20.8986	20.8487	20.6507	20.2974	19.9575
Non living	18.9665	19.1225	19.4235	19.7392	19.9411	20.0228	20.0341	20.0366	19.9961	19.7860	19.3699	18.9467
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.4774	20.1036	20.3518	20.6178	20.8021	20.8816	20.8994	20.8986	20.8487	20.6507	20.2974	20.1034 (87)
Th 2	20.1467	20.1501	20.1501	20.1549	20.1549	20.1608	20.1594	20.1621	20.1608	20.1579	20.1579	20.1534 (88)
util rest of house	0.8653	0.8379	0.7719	0.6565	0.4945	0.3184	0.1842	0.2005	0.4309	0.6625	0.8110	0.8740 (89)
MIT 2	19.6762	19.1225	19.4235	19.7392	19.9411	20.0228	20.0341	20.0366	19.9961	19.7860	19.3699	19.1642 (90)
Living area fraction	20.0997	19.6411	19.9141	20.2036	20.3962	20.4767	20.4915	20.4922	20.4468	20.2431	19.8602	19.6606 (92)
MIT	20.0997	19.6411	19.9141	20.2036	20.3962	20.4767	20.4915	20.4922	20.4468	20.2431	19.8602	19.6606 (93)
Temperature adjustment												0.0000
adjusted MIT	20.0997	19.6411	19.9141	20.2036	20.3962	20.4767	20.4915	20.4922	20.4468	20.2431	19.8602	19.6606 (93)

8. Space heating requirement

Utilisation	0.8644	0.8268	0.7650	0.6585	0.5082	0.3411	0.2109	0.2280	0.4525	0.6667	0.8026	0.8651 (94)
Useful gains	426.3380	432.6402	425.9884	390.6950	307.4167	194.6160	114.8551	118.7300	221.4065	324.5533	379.2224	411.2505 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	679.4981	633.3045	564.4341	461.8684	331.5422	199.1668	115.5023	119.5653	233.4254	385.9376	529.5908	654.0061 (97)
Space heating kWh	188.3511	134.8464	103.0036	51.2449	17.9494	0.0000	0.0000	0.0000	0.0000	45.6699	108.2653	180.6102 (98a)
Space heating requirement - total per year (kWh/year)												829.9407
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	188.3511	134.8464	103.0036	51.2449	17.9494	0.0000	0.0000	0.0000	0.0000	45.6699	108.2653	180.6102 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												829.9407
Space heating per m ²										(98c) / (4) =		16.9376 (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 %)	311.8541 (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	188.3511	134.8464	103.0036	51.2449	17.9494	0.0000	0.0000	0.0000	0.0000	45.6699	108.2653	180.6102 (98)
Space heating efficiency (main heating system 1)	311.8541	311.8541	311.8541	311.8541	311.8541	0.0000	0.0000	0.0000	0.0000	311.8541	311.8541	311.8541 (210)
Space heating fuel (main heating system)	60.3972	43.2402	33.0294	16.4323	5.7557	0.0000	0.0000	0.0000	0.0000	14.6446	34.7166	57.9150 (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	256.9261	228.1432	244.2273	218.6157	214.6791	165.8246	164.1456	170.0983	171.3656	221.6907	231.5387	254.5830 (64)
Efficiency of water heater (217)m	181.1641	181.1641	181.1641	181.1641	181.1641	181.1641	181.1641	181.1641	181.1641	181.1641	181.1641	181.1641 (216)
Fuel for water heating, kWh/month	141.8195	125.9318	134.8100	120.6727	118.4998	91.5328	90.6060	93.8919	94.5914	122.3701	127.8061	140.5262 (219)
Space cooling fuel requirement												

Full SAP Calculation Printout



(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	18.3887	14.7521	13.2826	9.7314	7.5168	6.1413	6.8571	8.9131	11.5773	15.1900	17.1571	18.8998	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)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	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by 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												266.1311	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												181.1641	
Water heating fuel used												1403.0583	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												148.4076	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(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												1817.5970	(238)

10a. Fuel costs - using BEDF prices (550)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	266.1311	26.0600	69.3538	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1403.0583	26.0600	365.6370	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	148.4076	26.0600	38.6750	(250)
Additional standing charges			0.0000	(251)
Total energy cost			473.6658	(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	266.1311	0.1563	41.6003	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1403.0583	0.1416	198.7338	(264)
Space and water heating			240.3341	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	148.4076	0.1443	21.4198	(268)
Total CO2, kg/year			261.7539	(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	266.1311	1.5787	420.1380	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1403.0583	1.5238	2137.9807	(278)
Space and water heating			2558.1186	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	148.4076	1.5338	227.6325	(282)
Total Primary energy kWh/year			2785.7511	(286)

SAP 10 EPC IMPROVEMENTS

00001

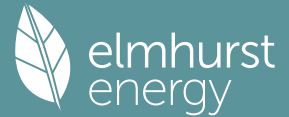
Current energy efficiency rating: B 81
Current environmental impact rating: A 96

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

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

Typical annual savings Energy Environmental
efficiency impact

Full SAP Calculation Printout



Recommended measures
(none)

Total Savings £0 0.00 kg/m²

Potential energy efficiency rating: B 81
Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 550 TEST (28 Jun 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

Electricity	Current £474	Potential £474	Saving £0
Space heating	£69	£69	£0
Water heating	£366	£366	£0
Lighting	£39	£39	£0
Total cost of fuels	£474	£474	£0
Total cost of uses	£474	£474	£0
Delivered energy	37 kWh/m ²	37 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m ²	5 kg/m ²	5 kg/m ²	0 kg/m ²
Primary energy	57 kWh/m ²	57 kWh/m ²	0 kWh/m ²

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	49.0000 (1b)	x 2.4500 (2b)	= 120.0500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 120.0500 (5)

2. Ventilation rate

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (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)	20.0000 / (5) =	0.1666 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	(17)
Infiltration rate	0.3666	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3116 (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	0.3973	0.3895	0.3817	0.3428	0.3350	0.2960	0.2960	0.2882	0.3116	0.3350	0.3506	0.3661 (22b)
Effective ac	0.5789	0.5759	0.5729	0.5587	0.5561	0.5438	0.5438	0.5415	0.5485	0.5561	0.5614	0.5670 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.00)			6.2000	0.9615	5.9615		(27)
Doo to Hall			1.8000	1.4000	2.5200		(26)
External Wall 1	59.8635	6.2000	53.6635	0.1800	9.6594	14.0000	751.2890 (29a)
Wall to Stairs	7.3400	1.8000	5.5400	0.1600	0.8864	14.0000	77.5600 (29a)
Flat roof	3.7700		3.7700	0.1000	0.3770	9.0000	33.9300 (30)
Total net area of external elements Aum(A, m ²)			70.9735				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.4044		(33)
Party Wall 1			11.2000	0.0000	0.0000	20.0000	224.0000 (32)
Party Floor 1			49.0000			40.0000	1960.0000 (32d)
Party Ceiling 1			45.2300			40.0000	1809.2000 (32b)
Internal Wall 1			46.1500			9.0000	415.3500 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	5271.3290 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							107.5781 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				3.9200	0.0060	0.0235	
E3 Sill				0.9000	0.0120	0.0108	

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
	22.9349	22.8135	22.6945	22.1355	22.0309	21.5441	21.5441	21.4539	21.7316	22.0309	22.2425	22.4637 (38)
Heat transfer coeff												
	46.3070	46.1856	46.0666	45.5076	45.4030	44.9162	44.9162	44.8260	45.1037	45.4030	45.6146	45.8358 (39)
Average = Sum(39)m / 12 =												45.5071
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9450	0.9426	0.9401	0.9287	0.9266	0.9167	0.9167	0.9148	0.9205	0.9266	0.9309	0.9354 (40)
HLP (average)												0.9287
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

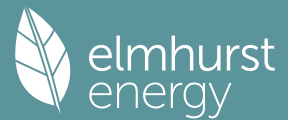
Assumed occupancy													1.6607 (42)
Hot water usage for mixer showers													
52.0640	51.2816	50.1414	47.9600	46.3501	44.5548	43.5344	44.6659	45.9062	47.8338	50.0621	51.8645	(42a)	
Hot water usage for baths													
22.5124	22.1781	21.7073	20.8392	20.1891	19.4684	19.0790	19.5466	20.0556	20.8269	21.7129	22.4363	(42b)	
Hot water usage for other uses													
31.6372	30.4868	29.3364	28.1859	27.0355	25.8850	25.8850	27.0355	28.1859	29.3364	30.4868	31.6372	(42c)	
Average daily hot water use (litres/day)												97.6350 (43)	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
106.2137	103.9465	101.1851	96.9850	93.5747	89.9082	88.4984	91.2479	94.1477	97.9970	102.2618	105.9381	(44)	
Energy content (annual)	168.2165	148.0184	155.5177	132.7677	125.9695	110.5526	107.0312	112.9839	116.0936	132.9811	145.6907	165.8734 (45)	
Distribution loss (46)m = 0.15 x (45)m												1621.6962	
25.2325	22.2028	23.3276	19.9152	18.8954	16.5829	16.0547	16.9476	17.4140	19.9472	21.8536	24.8810	(46)	
Water storage loss:													
Store volume												180.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.4000 (48)	
Temperature factor from Table 2b												0.7800 (49)	
Enter (49) or (54) in (55)												1.0920 (55)	
Total storage loss													
33.8520	30.5760	33.8520	32.7600	33.8520	32.7600	33.8520	33.8520	32.7600	33.8520	32.7600	33.8520	(56)	
If cylinder contains dedicated solar storage													
33.8520	30.5760	33.8520	32.7600	33.8520	32.7600	33.8520	33.8520	32.7600	33.8520	32.7600	33.8520	(57)	
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576 (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	(61)	
Total heat required for water heating calculated for each month													
256.9261	228.1432	244.2273	218.6157	214.6791	165.8246	164.1456	170.0983	171.3656	221.6907	231.5387	254.5830	(62)	
WWHRS	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	(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	(63c)	
FGHRS	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													
256.9261	228.1432	244.2273	218.6157	214.6791	165.8246	164.1456	170.0983	171.3656	221.6907	231.5387	254.5830	(64)	
Electric shower(s)												2541.8378 (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	(64a)	
Heat gains from water heating, kWh/month													
99.8181	88.8551	95.5957	86.6157	85.7710	54.7683	54.1978	56.1771	56.6107	88.1023	90.9125	99.0390	(65)	

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.0086	18.6597	15.1751	11.4885	8.5878	7.2502	7.8341	10.1830	13.6676	17.3542	20.2549	21.5925 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	215.8761	218.1162	212.4712	200.4536	185.2835	171.0258	161.5008	159.2607	164.9057	176.9233	192.0934	206.3511 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249 (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)	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281 (71)
Water heating gains (Table 5)	134.1641	132.2249	128.4888	120.2995	115.2835	76.0671	72.8465	75.5068	78.6260	118.4170	126.2674	133.1169 (72)
Total internal gains	450.8877	448.8397	435.9740	412.0805	388.9938	334.1821	322.0203	324.7895	337.0383	392.5335	418.4546	440.8994 (73)

[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					1.8900	19.6403	0.6300	0.7000	0.7700			11.3444 (76)
West					4.3100	19.6403	0.6300	0.7000	0.7700			25.8700 (80)

Solar gains	37.2144	72.7992	119.8900	174.8524	214.2881	219.3620	208.8416	179.3918	139.4370	86.3824	46.4020	30.6033 (83)
Total gains	488.1021	521.6390	555.8640	586.9329	603.2819	553.5441	530.8619	504.1813	476.4752	478.9159	464.8566	471.5027 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	31.6207	31.7038	31.7857	32.1761	32.2502	32.5998	32.5998	32.6654	32.4643	32.2502	32.1007	31.9458
alpha	3.1080	3.1136	3.1190	3.1451	3.1500	3.1733	3.1733	3.1777	3.1643	3.1500	3.1400	3.1297
util living area	0.8961	0.8710	0.8217	0.7340	0.6116	0.4859	0.3620	0.3945	0.5823	0.7536	0.8608	0.9038 (86)
Living	19.8252	19.9742	20.2239	20.5163	20.7306	20.8433	20.8854	20.8797	20.7937	20.5437	20.1492	19.7966
Non living	18.7628	18.9481	19.2552	19.6117	19.8562	19.9820	20.0188	20.0164	19.9336	19.6531	19.1763	18.7339
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.3990	19.9742	20.2239	20.5163	20.7306	20.8433	20.8854	20.8797	20.7937	20.5437	20.1492	19.9649 (87)
Th 2	20.1294	20.1315	20.1335	20.1432	20.1450	20.1534	20.1534	20.1549	20.1501	20.1450	20.1413	20.1375 (88)
util rest of house	0.8837	0.8561	0.8013	0.7044	0.5700	0.4302	0.2960	0.3270	0.5262	0.7199	0.8425	0.8923 (89)
MIT 2	19.5846	18.9481	19.2552	19.6117	19.8562	19.9820	20.0188	20.0164	19.9336	19.6531	19.1763	18.9868 (90)
Living area fraction									FLA = Living area / (4) =			0.5286 (91)
MIT	20.0150	19.4904	19.7672	20.0898	20.3183	20.4373	20.4768	20.4727	20.3882	20.1239	19.6906	19.5038 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0150	19.4904	19.7672	20.0898	20.3183	20.4373	20.4768	20.4727	20.3882	20.1239	19.6906	19.5038 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8820	0.8437	0.7919	0.7024	0.5787	0.4493	0.3215	0.3528	0.5425	0.7190	0.8318	0.8827 (94)
Useful gains	430.4855	440.1087	440.1656	412.2854	349.1473	248.7097	170.6953	177.8790	258.4910	344.3238	386.6636	416.1941 (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	727.7165	673.8672	611.1754	509.2230	391.2986	262.1889	174.1324	182.5620	283.6221	432.4130	574.3138	701.4634 (97)
Space heating kWh	221.1399	157.0857	127.2313	69.7951	31.3606	0.0000	0.0000	0.0000	0.0000	65.5384	135.1081	212.2403 (98a)
Space heating requirement - total per year (kWh/year)												1019.4994
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	221.1399	157.0857	127.2313	69.7951	31.3606	0.0000	0.0000	0.0000	0.0000	65.5384	135.1081	212.2403 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1019.4994
Space heating per m2										(98c) / (4) =		20.8061 (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 %)												312.6685 (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	221.1399	157.0857	127.2313	69.7951	31.3606	0.0000	0.0000	0.0000	0.0000	65.5384	135.1081	212.2403 (98)
Space heating efficiency (main heating system 1)	312.6685	312.6685	312.6685	312.6685	312.6685	0.0000	0.0000	0.0000	0.0000	312.6685	312.6685	312.6685 (210)
Space heating fuel (main heating system)	70.7266	50.2404	40.6921	22.3224	10.0300	0.0000	0.0000	0.0000	0.0000	20.9610	43.2113	67.8803 (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	256.9261	228.1432	244.2273	218.6157	214.6791	165.8246	164.1456	170.0983	171.3656	221.6907	231.5387	254.5830 (64)
Efficiency of water heater	181.6919	181.6919	181.6919	181.6919	181.6919	181.6919	181.6919	181.6919	181.6919	181.6919	181.6919	181.6919 (216)
Fuel for water heating, kWh/month	141.4076	125.5660	134.4184	120.3222	118.1556	91.2669	90.3428	93.6191	94.3166	122.0146	127.4348	140.1180 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	18.3887	14.7521	13.2826	9.7314	7.5168	6.1413	6.8571	8.9131	11.5773	15.1900	17.1571	18.8998 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)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 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by 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												326.0640 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												181.6919
Water heating fuel used												1398.9826 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												148.4076 (232)

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

PV generation	0.0000	(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	1873.4542	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	326.0640	16.4900	53.7680 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1398.9826	16.4900	230.6922 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	148.4076	16.4900	24.4724 (250)
Additional standing charges			0.0000 (251)
Total energy cost			308.9326 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	1.1831 (257)
SAP value	80.8212
SAP rating (Section 12)	81 (258)
SAP band	B

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	326.0640	0.1556	50.7489 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1398.9826	0.1416	198.1565 (264)
Space and water heating			248.9055 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	148.4076	0.1443	21.4198 (268)
Total CO2, kg/year			270.3253 (272)
CO2 emissions per m2			5.5200 (273)
EI value			96.1464
EI rating			96 (274)
EI band			A

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	49.0000 (1b)	2.4500 (2b)	120.0500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	120.0500 (5)

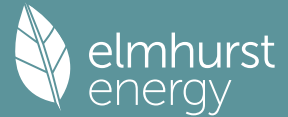
2. Ventilation rate

	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	2 * 10 = 20.0000 (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) =	20.0000 / (5) =	0.1666 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			4.0000 (17)
Infiltration rate			0.3666 (18)
Number of sides sheltered			2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.3116 (21)

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

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Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate												
Effective ac	0.3272	0.3116	0.3116	0.2882	0.2882	0.2571	0.2649	0.2493	0.2571	0.2727	0.2727	0.2960 (22b)
	0.5535	0.5485	0.5485	0.5415	0.5415	0.5330	0.5351	0.5311	0.5330	0.5372	0.5372	0.5438 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Windows (Uw = 1.00)			6.2000	0.9615	5.9615			(27)
Doo to Hall			1.8000	1.4000	2.5200			(26)
External Wall 1	59.8635	6.2000	53.6635	0.1800	9.6594	14.0000	751.2890	(29a)
Wall to Stairs	7.3400	1.8000	5.5400	0.1600	0.8864	14.0000	77.5600	(29a)
Flat roof	3.7700		3.7700	0.1000	0.3770	9.0000	33.9300	(30)
Total net area of external elements Aum(A, m2)			70.9735					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	19.4044				(33)
Party Wall 1			11.2000	0.0000	0.0000	20.0000	224.0000	(32)
Party Floor 1			49.0000			40.0000	1960.0000	(32d)
Party Ceiling 1			45.2300			40.0000	1809.2000	(32b)
Internal Wall 1			46.1500			9.0000	415.3500	(32c)

Heat capacity Cm = Sum(A x k)

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

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	3.9200	0.0060	0.0235	
E3 Sill	0.9000	0.0120	0.0108	
E4 Jamb	6.2000	0.0230	0.1426	
E7 Party floor between dwellings (in blocks of flats)	27.4300	0.0210	0.5760	
E16 Corner (normal)	7.3500	0.0750	0.5512	
E17 Corner (inverted - internal area greater than external area)	4.9000	-0.0450	-0.2205	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	4.5700	0.0000	0.0000	
E18 Party wall between dwellings	7.3500	0.2400	1.7640	
E14 Flat roof	7.0000	0.1600	1.1200	

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

Point Thermal bridges

Total fabric heat loss

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	21.9288	21.7316	21.7316	21.4539	21.4539	21.1173	21.1979	21.0392	21.1173	21.2808	21.2808	21.5441	(38)
Heat transfer coeff	45.3008	45.1037	45.1037	44.8260	44.8260	44.4894	44.5700	44.4113	44.4894	44.6529	44.6529	44.9162	(39)
Average = Sum(39)m / 12 =													44.7785

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9245	0.9205	0.9205	0.9148	0.9148	0.9079	0.9096	0.9064	0.9079	0.9113	0.9113	0.9167	(40)
HLP (average)													0.9138
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6607 (42)
Hot water usage for mixer showers	52.0640	51.2816	50.1414	47.9600	46.3501	44.5548	43.5344	44.6659	45.9062	47.8338	50.0621	51.8645	(42a)
Hot water usage for baths	22.5124	22.1781	21.7073	20.8392	20.1891	19.4684	19.0790	19.5466	20.0556	20.8269	21.7129	22.4363	(42b)
Hot water usage for other uses	31.6372	30.4868	29.3364	28.1859	27.0355	25.8850	25.8850	27.0355	28.1859	29.3364	30.4868	31.6372	(42c)
Average daily hot water use (litres/day)													97.6350 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.2137	103.9465	101.1851	96.9850	93.5747	89.9082	88.4984	91.2479	94.1477	97.9970	102.2618	105.9381	(44)
Energy conte	168.2165	148.0184	155.5177	132.7677	125.9695	110.5526	107.0312	112.9839	116.0936	132.9811	145.6907	165.8734	(45)
Energy content (annual)													1621.6962
Distribution loss (46)m = 0.15 x (45)m	25.2325	22.2028	23.3276	19.9152	18.8954	16.5829	16.0547	16.9476	17.4140	19.9472	21.8536	24.8810	(46)

Water storage loss:

Store volume

a) If manufacturer declared loss factor is known (kWh/day):

Temperature factor from Table 2b

Enter (49) or (54) in (55)

Total storage loss

33.8520 30.5760 33.8520 32.7600 33.8520 32.7600 33.8520 33.8520 32.7600 33.8520 32.7600 33.8520 33.8520 (56)

If cylinder contains dedicated solar storage

33.8520 30.5760 33.8520 32.7600 33.8520 32.7600 33.8520 33.8520 32.7600 33.8520 32.7600 33.8520 33.8520 (57)

Primary loss 54.8576 49.5488 54.8576 53.0880 54.8576 22.5120 23.2624 23.2624 22.5120 54.8576 53.0880 54.8576 (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

256.9261 228.1432 244.2273 218.6157 214.6791 165.8246 164.1456 170.0983 171.3656 221.6907 231.5387 254.5830 (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 256.9261 228.1432 244.2273 218.6157 214.6791 165.8246 164.1456 170.0983 171.3656 221.6907 231.5387 254.5830 (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)

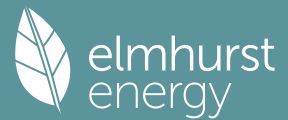
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month 99.8181 88.8551 95.5957 86.6157 85.7710 54.7683 54.1978 56.1771 56.6107 88.1023 90.9125 99.0390 (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	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													

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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	21.0086	18.6597	15.1751	11.4885	8.5878	7.2502	7.8341	10.1830	13.6676	17.3542	20.2549	21.5925 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	215.8761	218.1162	212.4712	200.4536	185.2835	171.0258	161.5008	159.2607	164.9057	176.9233	192.0934	206.3511 (68)
Pumps, fans	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281 (71)
Total internal gains	134.1641	132.2249	128.4888	120.2995	115.2835	76.0671	72.8465	75.5068	78.6260	118.4170	126.2674	133.1169 (72)
	450.8877	448.8397	435.9740	412.0805	388.9938	334.1821	322.0203	324.7895	337.0383	392.5335	418.4546	440.8994 (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					1.8900	22.3313	0.6300	0.7000			0.7700	12.8988 (76)
West					4.3100	22.3313	0.6300	0.7000			0.7700	29.4146 (80)
Solar gains	42.3134	74.4565	120.9043	181.2008	215.9084	236.3513	222.6525	195.8814	152.2514	94.2818	54.0502	34.4588 (83)
Total gains	493.2011	523.2963	556.8783	593.2814	604.9022	570.5334	544.6727	520.6708	489.2896	486.8153	472.5048	475.3583 (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	32.3230	32.4643	32.4643	32.6654	32.6654	32.9125	32.8530	32.9704	32.9125	32.7920	32.7920	32.5998
alpha	3.1549	3.1643	3.1643	3.1777	3.1777	3.1942	3.1902	3.1980	3.1942	3.1861	3.1861	3.1733
util living area	0.8796	0.8546	0.7952	0.6901	0.5412	0.3779	0.2513	0.2698	0.4927	0.7020	0.8328	0.8875 (86)
Living	19.9783	20.1036	20.3518	20.6178	20.8021	20.8816	20.8994	20.8986	20.8487	20.6507	20.2974	19.9575
Non living	18.9665	19.1225	19.4235	19.7392	19.9411	20.0228	20.0341	20.0366	19.9961	19.7860	19.3699	18.9467
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.4774	20.1036	20.3518	20.6178	20.8021	20.8816	20.8994	20.8986	20.8487	20.6507	20.2974	20.1034 (87)
Th 2	20.1467	20.1501	20.1501	20.1549	20.1549	20.1608	20.1594	20.1621	20.1608	20.1579	20.1579	20.1534 (88)
util rest of house	0.8653	0.8379	0.7719	0.6565	0.4945	0.3184	0.1842	0.2005	0.4309	0.6625	0.8110	0.8740 (89)
MIT 2	19.6762	19.1225	19.4235	19.7392	19.9411	20.0228	20.0341	20.0366	19.9961	19.7860	19.3699	19.1642 (90)
Living area fraction	20.0997	19.6411	19.9141	20.2036	20.3962	20.4767	20.4915	20.4922	20.4468	20.2431	19.8602	19.6606 (92)
MIT	20.0997	19.6411	19.9141	20.2036	20.3962	20.4767	20.4915	20.4922	20.4468	20.2431	19.8602	19.6606 (93)
Temperature adjustment												0.0000
adjusted MIT	20.0997	19.6411	19.9141	20.2036	20.3962	20.4767	20.4915	20.4922	20.4468	20.2431	19.8602	19.6606 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.8644	0.8268	0.7650	0.6585	0.5082	0.3411	0.2109	0.2280	0.4525	0.6667	0.8026	0.8651 (94)
Ext temp.	426.3380	432.6402	425.9884	390.6950	307.4167	194.6160	114.8551	118.7300	221.4065	324.5533	379.2224	411.2505 (95)
Heat loss rate W	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Space heating kWh	679.4981	633.3045	564.4341	461.8684	331.5422	199.1668	115.5023	119.5653	233.4254	385.9376	529.5908	654.0061 (97)
Space heating requirement - total per year (kWh/year)	188.3511	134.8464	103.0036	51.2449	17.9494	0.0000	0.0000	0.0000	0.0000	45.6699	108.2653	180.6102 (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)	188.3511	134.8464	103.0036	51.2449	17.9494	0.0000	0.0000	0.0000	0.0000	45.6699	108.2653	180.6102 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (99)
Space heating per m2	(98c) / (4) = 16.9376 (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 %)	311.8541 (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
Space heating efficiency (main heating system 1)	188.3511	134.8464	103.0036	51.2449	17.9494	0.0000	0.0000	0.0000	0.0000	45.6699	108.2653	180.6102 (98)
Space heating fuel (main heating system)	311.8541	311.8541	311.8541	311.8541	311.8541	0.0000	0.0000	0.0000	0.0000	311.8541	311.8541	311.8541 (210)
Space heating efficiency (main heating system 2)	60.3972	43.2402	33.0294	16.4323	5.7557	0.0000	0.0000	0.0000	0.0000	14.6446	34.7166	57.9150 (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)
Water heating requirement	256.9261	228.1432	244.2273	218.6157	214.6791	165.8246	164.1456	170.0983	171.3656	221.6907	231.5387	254.5830 (64)
Efficiency of water heater (217)m	181.1641	181.1641	181.1641	181.1641	181.1641	181.1641	181.1641	181.1641	181.1641	181.1641	181.1641	181.1641 (216)
Fuel for water heating, kWh/month	181.1641	181.1641	181.1641	181.1641	181.1641	181.1641	181.1641	181.1641	181.1641	181.1641	181.1641	181.1641 (217)

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	141.8195	125.9318	134.8100	120.6727	118.4998	91.5328	90.6060	93.8919	94.5914	122.3701	127.8061	140.5262	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	18.3887	14.7521	13.2826	9.7314	7.5168	6.1413	6.8571	8.9131	11.5773	15.1900	17.1571	18.8998	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)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	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by 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												266.1311	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												181.1641	
Water heating fuel used												1403.0583	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												148.4076	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(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												1817.5970	(238)

10a. Fuel costs - using BEDF prices (550)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	266.1311	26.0600	69.3538	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1403.0583	26.0600	365.6370	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	148.4076	26.0600	38.6750	(250)
Additional standing charges			0.0000	(251)
Total energy cost			473.6658	(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	266.1311	0.1563	41.6003	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1403.0583	0.1416	198.7338	(264)
Space and water heating			240.3341	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	148.4076	0.1443	21.4198	(268)
Total CO2, kg/year			261.7539	(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	266.1311	1.5787	420.1380	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1403.0583	1.5238	2137.9807	(278)
Space and water heating			2558.1186	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	148.4076	1.5338	227.6325	(282)
Total Primary energy kWh/year			2785.7511	(286)

Predicted Energy Assessment



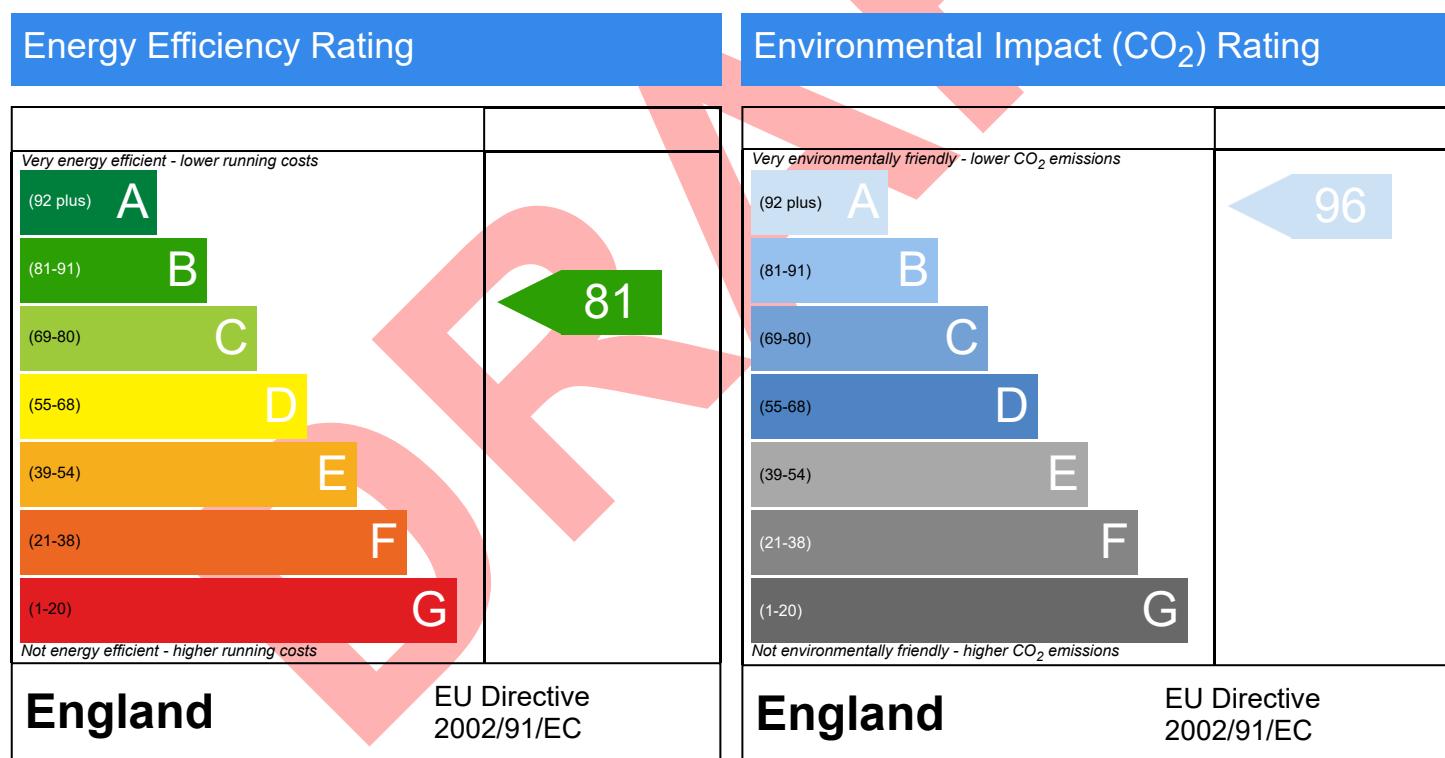
Zoar Chapel, Flat 5, South Street, Reading

Dwelling type:
Date of assessment:
Produced by:
Total floor area:
DRRN:

Flat, Semi-Detached
03/07/2024
Matthew Carter
49 m²

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.

Thermal Bridging

Property Reference	01111	Issued on Date	03/07/2024
Assessment Reference	00001	Prop Type Ref	Semi-Detached Flat
Property	Zoar Chapel, Flat 5, South Street, Reading		

SAP Rating	81 B	DER	5.62	TER	13.93
Environmental	96 A	% DER < TER			59.66
CO ₂ Emissions (t/year)	0.26	DFEE	28.84	TFEE	29.93
Compliance Check	See BREL	% DFEE < TFEE			3.67
% DPER < TPER	19.18	DPER	59.70	TPER	73.86

Assessor Details	Mr. Matthew Carter	Assessor ID	7869-0001
Client			

	Junction details	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.006	3.92	0.02	TD5
External wall	E3 Sill	Independently assessed	0.012	0.90	0.01	TD5
External wall	E4 Jamb	Independently assessed	0.023	6.20	0.14	TD5
External wall	E7 Party floor between dwellings (in blocks of flats)	Independently assessed	0.021	27.43	0.58	TD5
External wall	E16 Corner (normal)	Independently assessed	0.075	7.35	0.55	TD5
External wall	E17 Corner (inverted – internal area greater than external area)	Independently assessed	-0.045	4.90	-0.22	TD5
Party wall	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	0.000	4.57	1.46	
External wall	E18 Party wall between dwellings	Table K1 - Default	0.240	7.35	1.76	
External wall	E14 Flat roof	Table K1 - Default	0.160	7.00	1.12	

Total: 69.62 W/mK:
Y-Value: 0.06 W/m²K: