

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 11:34:21

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	01112	Plot Reference	00001
Address	Flat 6 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	13.94 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	5.53 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	73.74 kWh _{PE} /m ²		
Dwelling primary energy	58.69 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	30.7 kWh/m ²		
Dwelling fabric energy efficiency	28.4 kWh/m ²		OK

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.18	Walls (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	N/A	N/A	N/A
Windows, doors, and roof windows	1.6	1.07	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)	50.7624	0.18	
Sheltered wall: Walls (2)	5.54	0.16	
Party wall: Party Wall (1)	11.2	0 (!)	

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	1.89	East	0.7	1 (!)
Opening, Windows	1.89	East	0.7	1 (!)
Opening, Windows	2.1538	West	0.7	1 (!)
Opening, Windows	2.1538	West	0.7	1 (!)
Opening, Doo to Hall	1.8	North	N/A	1.4
Opening, Windows	0.505	South	0.7	1 (!)
Opening, Windows	0.505	South	0.7	1 (!)

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

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E3: Sill	Calculated by person with suitable expertise	0.012 (!)	TD5
External wall	E4: Jamb	Calculated by person with suitable expertise	0.023 (!)	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
External wall	E18: Party wall between dwellings	SAP table default	0.24	
External wall	E7: Party floor between dwellings (in blocks of flats)	Calculated by person with suitable expertise	0.022 (!)	TD5

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	313.5%
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
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	01112	Issued on Date	03/07/2024
Assessment Reference	00001	Prop Type Ref	
Property	Zoar Chapel , Flat 6, South Street , Reading		

SAP Rating	81 B	DER	5.53	TER	13.94
Environmental	96 A	% DER < TER			60.33
CO ₂ Emissions (t/year)	0.26	DFEE	28.43	TFEE	30.72
Compliance Check	See BREL	% DFEE < TFEE			7.46
% DPER < TPER	20.41	DPER	58.69	TPER	73.74

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	50.76	0.00	None	9.10	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

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete planks floor, screed, carpeted	30.00	49.00

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	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.00
Doo to Hall	SAP table	Door to Corridor			Air Filled	0.00		0.70	1.40

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Opening	Windows	External Wall 1	East	3.78	0
Opening	Windows	External Wall 1	West	4.31	0
Opening	Doo to Hall	Wall to Stairs	North	1.80	0
Opening	Windows	External Wall 1	South	1.01	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	6.00	0.01	0.01 TD5	No
E3 Sill	Independently assessed	3.00	0.01	0.01 TD5	No
E4 Jamb	Independently assessed	6.62	0.02	0.02 TD5	No
E16 Corner (normal)	Independently assessed	4.90	0.07	0.07 TD5	No
E17 Corner (inverted – internal area greater than external area)	Independently assessed	2.45	-0.04	-0.04 TD5	No
E18 Party wall between dwellings	Table K1 - Default	7.35	0.24	0.24	No
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	27.00	0.02	0.02 TD5	No

Y-value W/m²K

18.0 Pressure Testing

Designed AP₅₀ m³/(h.m²) @ 50 Pa

Property Tested?

Test Method

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
In Winter 313.50
In Summer 182.23
Model Name aroTHERM 5kW
Manufacturer Vaillant Group UK Ltd
System Type Heat Pump

Summary for Input Data

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

26.0 Heat Networks

	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

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

Summary for Input Data



Cylinder Volume	180.00	L
Loss	1.40	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	

31.0 Thermal Store

Recommendations

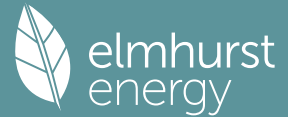
Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout



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% DPER < TPER	20.41	DPER	58.69
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	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)
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)			9.1000	0.9615	8.7500		(27)
Doo to Hall			1.8000	1.4000	2.5200		(26)
External Wall 1	59.8635	9.1000	50.7635	0.1800	9.1374	14.0000	710.6890 (29a)
Wall to Stairs	7.3400	1.8000	5.5400	0.1600	0.8864	14.0000	77.5600 (29a)
Total net area of external elements Aum(A, m ²)			67.2035				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.2938		(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			49.0000			30.0000	1470.0000 (32b)
Internal Wall 1			46.1500			9.0000	415.3500 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	4857.5990 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							99.1347 (35)
List of Thermal Bridges							
K1 Element					Length	Psi-value	Total
E2 Other lintels (including other steel lintels)					6.0000	0.0060	0.0360
E3 Sill					3.0000	0.0120	0.0360
E4 Jamb					6.6200	0.0230	0.1523
E16 Corner (normal)					4.9000	0.0750	0.3675
E17 Corner (inverted - internal area greater than external area)					2.4500	-0.0450	-0.1103

Full SAP Calculation Printout



E18 Party wall between dwellings	7.3500	0.2400	1.7640	
E7 Party floor between dwellings (in blocks of flats)	27.0000	0.0220	0.5940	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				2.8395 (36)
Point Thermal bridges				0.0000
Total fabric heat loss		(33) + (36) + (36a) =		24.1333 (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 =	47.0683	46.9469	46.8278	46.2689	46.1643	45.6774	45.6774	45.5873	45.8650	46.1643	46.3759	46.5970 (39)
												46.2684
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9606	0.9581	0.9557	0.9443	0.9421	0.9322	0.9322	0.9304	0.9360	0.9421	0.9464	0.9510 (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 content (annual)	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)
Distribution loss (46)m = 0.15 x (45)m	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)
Water storage loss:												
Store volume	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)
a) If manufacturer declared loss factor is known (kWh/day):												180.0000 (47)
Temperature factor from Table 2b												1.4000 (48)
Enter (49) or (54) in (55)												0.7800 (49)
Total storage loss												1.0920 (55)
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 (56)
Primary 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 (57)
Combi 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)
Total heat required for water heating calculated for each month	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)
WWHRS	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)
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 (63a)
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 (63b)
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 (63c)
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)
Heat gains from water heating, kWh/month	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)

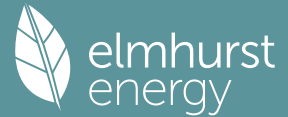
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	74.1557	82.1010	74.1557	76.6276	74.1557	76.6276	74.1557	74.1557	76.6276	74.1557	76.6276	74.1557 (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	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)
	400.8673	408.3743	392.9108	379.1415	361.4898	315.1926	303.1183	304.2778	313.6509	359.0219	379.5081	393.4384 (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			3.7800	19.6403		0.6300		0.7000		0.7700	22.6888 (76)	
South			1.0100	46.7521		0.6300		0.7000		0.7700	14.4309 (78)	
West			4.3100	19.6403		0.6300		0.7000		0.7700	25.8700 (80)	
Solar gains	62.9897	118.6254	186.5427	262.1801	315.0686	320.3548	305.8445	266.4551	213.3917	138.2067	77.6526	52.4020 (83)
Total gains	463.8570	526.9997	579.4535	641.3216	676.5584	635.5473	608.9628	570.7329	527.0427	497.2287	457.1607	445.8404 (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	28.6676	28.7417	28.8148	29.1629	29.2289	29.5405	29.5405	29.5989	29.4197	29.2289	29.0956	28.9575	
alpha	2.9112	2.9161	2.9210	2.9442	2.9486	2.9694	2.9694	2.9733	2.9613	2.9486	2.9397	2.9305	
util living area	0.8989	0.8602	0.8007	0.6938	0.5618	0.4340	0.3217	0.3554	0.5394	0.7335	0.8572	0.9071 (86)	
Living	19.6547	19.8775	20.1712	20.5073	20.7295	20.8406	20.8794	20.8733	20.7872	20.5056	20.0421	19.6196	
Non living	18.5460	18.8218	19.1819	19.5882	19.8398	19.9633	19.9974	19.9948	19.9118	19.5980	19.0385	18.5087	
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	20.3118	19.8775	20.1712	20.5073	20.7295	20.8406	20.8794	20.8733	20.7872	20.5056	20.0421	19.8127 (87)	
Th 2	20.1163	20.1184	20.1204	20.1300	20.1318	20.1402	20.1402	20.1418	20.1370	20.1318	20.1282	20.1244 (88)	
util rest of house	0.8872	0.8449	0.7795	0.6635	0.5214	0.3822	0.2617	0.2930	0.4851	0.6995	0.8392	0.8963 (89)	
MIT 2	19.4903	18.8218	19.1819	19.5882	19.8398	19.9633	19.9974	19.9948	19.9118	19.5980	19.0385	18.7998 (90)	
Living area fraction									fLA = Living area / (4) =				0.5286 (91)
MIT	19.9245	19.3799	19.7048	20.0740	20.3101	20.4270	20.4636	20.4592	20.3745	20.0777	19.5690	19.3352 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.9245	19.3799	19.7048	20.0740	20.3101	20.4270	20.4636	20.4592	20.3745	20.0777	19.5690	19.3352 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8844	0.8305	0.7686	0.6614	0.5299	0.3998	0.2846	0.3164	0.5006	0.6972	0.8262	0.8851 (94)
Useful gains	410.2406	437.6516	445.3894	424.1911	358.5411	254.1138	173.2876	180.6033	263.8285	346.6736	377.6915	394.6226 (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	735.4190	679.7836	618.3545	517.0094	397.4773	266.1643	176.4796	185.0463	287.7801	437.5323	578.2600	705.2558 (97)
Space heating kWh	241.9328	162.7127	128.6860	66.8292	28.9685	0.0000	0.0000	0.0000	0.0000	67.5989	144.4093	231.1111 (98a)
Space heating requirement - total per year (kWh/year)												1072.2484
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	241.9328	162.7127	128.6860	66.8292	28.9685	0.0000	0.0000	0.0000	0.0000	67.5989	144.4093	231.1111 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1072.2484
Space heating per m2										(98c) / (4) =		21.8826 (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 %)												313.4964 (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	241.9328	162.7127	128.6860	66.8292	28.9685	0.0000	0.0000	0.0000	0.0000	67.5989	144.4093	231.1111 (98)
Space heating efficiency (main heating system 1)	313.4964	313.4964	313.4964	313.4964	313.4964	0.0000	0.0000	0.0000	0.0000	313.4964	313.4964	313.4964 (210)
Space heating fuel (main heating system)	77.1724	51.9026	41.0486	21.3174	9.2404	0.0000	0.0000	0.0000	0.0000	21.5629	46.0641	73.7205 (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	182.2287	182.2287	182.2287	182.2287	182.2287	182.2287	182.2287	182.2287	182.2287	182.2287	182.2287	182.2287 (216)
Fuel for water heating, kWh/month	140.9910	125.1960	134.0224	119.9677	117.8075	90.9981	90.0767	93.3433	94.0387	121.6552	127.0594	139.7052 (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	17.0392	13.6695	12.3079	9.0173	6.9652	5.6906	6.3539	8.2590	10.7276	14.0752	15.8980	17.5128 (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												342.0290 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												182.2287
Water heating fuel used												1394.8611 (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)												137.5161 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)

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Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	1874.4062 (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	342.0290	0.1559	53.3368 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1394.8611	0.1416	197.5728 (264)
Space and water heating			250.9095 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	137.5161	0.1443	19.8478 (268)
Total CO2, kg/year			270.7573 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.5300 (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	342.0290	1.5773	539.4776 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1394.8611	1.5238	2125.4898 (278)
Space and water heating			2664.9674 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	137.5161	1.5338	210.9269 (282)
Total Primary energy kWh/year			2875.8942 (286)
Dwelling Primary energy Rate (DPER)			58.6900 (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

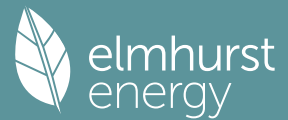
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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)			9.1000	1.1450	10.4198		(27)
External Wall 1	59.8635	9.1000	50.7635	0.1800	9.1374		(29a)
Wall to Stairs	7.3400	1.8000	5.5400	0.1800	0.9972		(29a)

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Total net area of external elements Aum(A, m2) 67.2035 (31)
Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) = 22.3545 (33)
Party Wall 1 11.2000 0.0000 0.0000 (32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 109.1347 (35)

List of Thermal Bridges
K1 Element Length Psi-value Total
E2 Other lintels (including other steel lintels) 6.0000 0.0500 0.3000
E3 Sill 3.0000 0.0500 0.1500
E4 Jamb 6.6200 0.0500 0.3310
E16 Corner (normal) 4.9000 0.0900 0.4410
E17 Corner (inverted - internal area greater than external area) 2.4500 -0.0900 -0.2205
E18 Party wall between dwellings 7.3500 0.0600 0.4410
E7 Party floor between dwellings (in blocks of flats) 27.0000 0.0700 1.8900

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.3325 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.6870 (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 = 49.5330 49.3762 49.2225 48.5006 48.3656 47.7369 47.7369 47.6204 47.9790 48.3656 48.6388 48.9244 (39)
48.5000

HLP Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
HLP (average) 1.0109 1.0077 1.0045 0.9898 0.9871 0.9742 0.9742 0.9718 0.9792 0.9871 0.9926 0.9985 (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
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 Total = Sum(45)m = 1621.6962

Water storage loss: 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)

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)
Total per year (kWh/year) = Sum(64)m = 1980.3355 (64)
1980 (64)

12Total per year (kWh/year)
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)

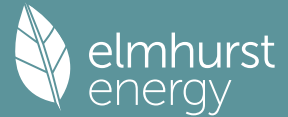
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts 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 74.1557 82.1010 74.1557 76.6276 74.1557 76.6276 74.1557 74.1557 76.6276 74.1557 76.6276 74.1557 (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 3.0000 3.0000 3.0000 3.0000 3.0000 0.0000 0.0000 0.0000 0.0000 3.0000 3.0000 3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5) -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) 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)
Total internal gains 397.8297 405.3367 389.8732 376.1040 358.4522 343.1283 331.0540 332.2135 341.5867 355.9844 376.4705 390.4008 (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 3.7800 19.6403 0.6300 0.7000 0.7700 22.6888 (76)

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South	1.0100	46.7521	0.6300	0.7000	0.7700	14.4309 (78)
West	4.3100	19.6403	0.6300	0.7000	0.7700	25.8700 (80)

Solar gains	62.9897	118.6254	186.5427	262.1801	315.0686	320.3548	305.8445	266.4551	213.3917	138.2067	77.6526	52.4020 (83)
Total gains	460.8194	523.9621	576.4160	638.2841	673.5208	663.4831	636.8986	598.6687	554.9784	494.1911	454.1232	442.8029 (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	29.9890	30.0842	30.1782	30.6273	30.7128	31.1173	31.1173	31.1934	30.9603	30.7128	30.5403	30.3620
alpha	2.9993	3.0056	3.0119	3.0418	3.0475	3.0745	3.0745	3.0796	3.0640	3.0475	3.0360	3.0241
util living area	0.9152	0.8800	0.8244	0.7201	0.5873	0.4366	0.3224	0.3552	0.5402	0.7595	0.8773	0.9225 (86)
MIT	19.3240	19.6184	20.0118	20.4703	20.7739	20.9336	20.9803	20.9732	20.8694	20.4680	19.8449	19.2836 (87)
Th 2	20.0743	20.0769	20.0796	20.0918	20.0941	20.1049	20.1049	20.1069	20.1007	20.0941	20.0895	20.0846 (88)
util rest of house	0.9042	0.8652	0.8033	0.6887	0.5440	0.3819	0.2595	0.2900	0.4829	0.7246	0.8598	0.9124 (89)
MIT 2	18.1399	18.5050	18.9877	19.5403	19.8824	20.0543	20.0939	20.0912	19.9938	19.5535	18.8013	18.0968 (90)
Living area fraction									fLA = Living area / (4) =			0.5286 (91)
MIT	18.7658	19.0935	19.5290	20.0319	20.3537	20.5190	20.5625	20.5574	20.4566	20.0369	19.3529	18.7241 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7658	19.0935	19.5290	20.0319	20.3537	20.5190	20.5625	20.5574	20.4566	20.0369	19.3529	18.7241 (93)

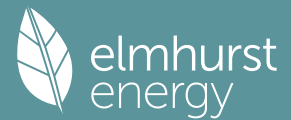
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8854	0.8470	0.7893	0.6865	0.5568	0.4076	0.2920	0.3233	0.5062	0.7222	0.8435	0.8940 (94)
Useful gains	408.0254	443.7835	454.9374	438.1781	375.0214	270.4244	185.9503	193.5409	280.9300	356.9250	383.0356	395.8876 (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	716.5329	700.8205	641.3206	539.9023	418.5389	282.5568	189.1554	197.9778	304.9840	456.4201	595.9667	710.5841 (97)
Space heating kWh	229.5296	172.7289	138.6691	73.2415	32.3770	0.0000	0.0000	0.0000	0.0000	74.0243	153.3104	234.1342 (98a)
Space heating requirement - total per year (kWh/year)												1108.0150
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	229.5296	172.7289	138.6691	73.2415	32.3770	0.0000	0.0000	0.0000	0.0000	74.0243	153.3104	234.1342 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1108.0150
Space heating per m2										(98c) / (4) =		22.6126 (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	229.5296	172.7289	138.6691	73.2415	32.3770	0.0000	0.0000	0.0000	0.0000	74.0243	153.3104	234.1342 (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)	248.6778	187.1386	150.2373	79.3515	35.0780	0.0000	0.0000	0.0000	0.0000	80.1997	166.1001	253.6665 (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 (217)m	84.4419	84.0765	83.4492	82.3982	81.1981	79.8000	79.8000	79.8000	79.8000	82.3919	83.7869	79.8000 (216)
Fuel for water heating, kWh/month	229.3384	203.9159	218.9567	196.8122	194.8345	180.0137	178.7344	185.1100	186.3255	199.6188	206.7525	226.9062 (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	15.4081	12.3609	11.1297	8.1541	6.2984	5.1459	5.7456	7.4684	9.7007	12.7279	14.3761	15.8363 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-16.8883	-24.6954	-36.8155	-43.0034	-47.8017	-45.1754	-44.6561	-41.4661	-36.0536	-28.9813	-18.8907	-14.5018 (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	-7.0269	-15.0117	-30.2555	-46.0464	-61.4576	-61.9276	-61.1657	-51.4996	-37.3907	-21.6304	-9.4371	-5.5372 (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												1200.4496 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.8000
Water heating fuel used												2407.3187 (219)
Space cooling fuel												0.0000 (221)

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Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	124.3522 (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	3010.8046 (238)

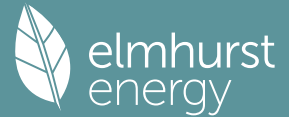
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1200.4496	0.2100	252.0944 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2407.3187	0.2100	505.5369 (264)
Space and water heating			757.6313 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	124.3522	0.1443	17.9479 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-398.9293	0.1338	-53.3745
PV Unit electricity exported	-408.3866	0.1255	-51.2621
Total			-104.6366 (269)
Total CO2, kg/year			682.8719 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.9400 (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	1200.4496	1.1300	1356.5080 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2407.3187	1.1300	2720.2702 (278)
Space and water heating			4076.7782 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	124.3522	1.5338	190.7355 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-398.9293	1.4944	-596.1744
PV Unit electricity exported	-408.3866	0.4607	-188.1604
Total			-784.3348 (283)
Total Primary energy kWh/year			3613.2797 (286)
Target Primary Energy Rate (TPER)			73.7400 (287)

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Property Reference	01112				Issued on Date	03/07/2024	
Assessment Reference	00001			Prop Type Ref			
Property	Zoar Chapel , Flat 6, South Street , Reading						
SAP Rating	81 B	DER	5.53	TER	13.94		
Environmental	96 A	% DER < TER				60.33	
CO ₂ Emissions (t/year)	0.26	DFEE	28.43	TFEE	30.72		
Compliance Check	See BREL	% DFEE < TFEE				7.46	
% DPER < TPER	20.41	DPER	58.69	TPER	73.74		
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 (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

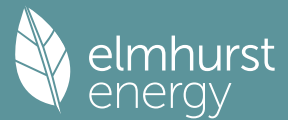
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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)
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)			9.1000	0.9615	8.7500		(27)
Doo to Hall			1.8000	1.4000	2.5200		(26)
External Wall 1	59.8635	9.1000	50.7635	0.1800	9.1374	14.0000	710.6890 (29a)
Wall to Stairs	7.3400	1.8000	5.5400	0.1600	0.8864	14.0000	77.5600 (29a)
Total net area of external elements Aum(A, m ²)			67.2035				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	21.2938			(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			49.0000			40.0000	1960.0000 (32b)
Internal Wall 1			46.1500			9.0000	415.3500 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	5347.5990 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							109.1347 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				6.0000	0.0060	0.0360	
E3 Sill				3.0000	0.0120	0.0360	
E4 Jamb				6.6200	0.0230	0.1523	

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E16 Corner (normal)	4.9000	0.0750	0.3675
E17 Corner (inverted - internal area greater than external area)	2.4500	-0.0450	-0.1103
E18 Party wall between dwellings	7.3500	0.2400	1.7640
E7 Party floor between dwellings (in blocks of flats)	27.0000	0.0220	0.5940
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			2.8395 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	24.1333 (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 =	47.0683	46.9469	46.8278	46.2689	46.1643	45.6774	45.6774	45.5873	45.8650	46.1643	46.3759	46.5970 (39)
												46.2684
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9606	0.9581	0.9557	0.9443	0.9421	0.9322	0.9322	0.9304	0.9360	0.9421	0.9464	0.9510 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	0.9443
												31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6607 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths												22.5124 (42b)
Hot water usage for other uses												31.6372 (42c)
Average daily hot water use (litres/day)												49.6337 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	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 conte	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)
Energy content (annual)												824.3098
Distribution loss (46)m = 0.15 x (45)m												0.0000 (46)
Water storage loss:												
Total storage loss:												0.0000 (56)
If cylinder contains dedicated solar storage												0.0000 (57)
Primary loss												0.0000 (59)
Combi loss												0.0000 (61)
Total heat required for water heating calculated for each month												
WWHRS	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)
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 (63a)
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 (63b)
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 (63c)
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)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												474.2733 (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)

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	74.1557	82.1010	74.1557	76.6276	74.1557	76.6276	74.1557	74.1557	76.6276	74.1557	76.6276	74.1557 (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)
	305.2081	313.6848	300.4606	292.0914	277.6162	268.6472	258.8665	258.4971	266.0235	273.6785	289.0103	298.5139 (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				3.7800	19.6403		0.6300		0.7000		0.7700		22.6888 (76)
South				1.0100	46.7521		0.6300		0.7000		0.7700		14.4309 (78)
West				4.3100	19.6403		0.6300		0.7000		0.7700		25.8700 (80)
Solar gains	62.9897	118.6254	186.5427	262.1801	315.0686	320.3548	305.8445	266.4551	213.3917	138.2067	77.6526	52.4020	(83)
Total gains	368.1978	432.3102	487.0033	554.2715	592.6848	589.0020	564.7110	524.9522	479.4152	411.8852	366.6629	350.9160	(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)	

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	31.5594	31.6410	31.7214	32.1046	32.1773	32.5203	32.5203	32.5846	32.3873	32.1773	32.0306	31.8785
alpha	3.1040	3.1094	3.1148	3.1403	3.1452	3.1680	3.1680	3.1723	3.1592	3.1452	3.1354	3.1252
util living area	0.9472	0.9162	0.8652	0.7623	0.6262	0.4676	0.3471	0.3861	0.5866	0.8134	0.9186	0.9533 (86)
MIT	19.1604	19.4854	19.9144	20.4189	20.7535	20.9281	20.9789	20.9702	20.8506	20.3857	19.6987	19.1079 (87)
Th 2	20.1163	20.1184	20.1204	20.1300	20.1318	20.1402	20.1402	20.1418	20.1370	20.1318	20.1282	20.1244 (88)
util rest of house	0.9398	0.9052	0.8478	0.7334	0.5839	0.4123	0.2824	0.3187	0.5296	0.7832	0.9060	0.9468 (89)
MIT 2	18.4404	18.7579	19.1726	19.6516	19.9491	20.0967	20.1308	20.1278	20.0394	19.6346	18.9783	18.3948 (90)
Living area fraction	18.8210	19.1424	19.5647	20.0572	20.3743	20.5362	20.5791	20.5731	20.4682	20.0316	19.3591	18.7717 (92)
MIT	18.8210	19.1424	19.5647	20.0572	20.3743	20.5362	20.5791	20.5731	20.4682	20.0316	19.3591	18.7717 (93)
Temperature adjustment												0.0000
adjusted MIT	18.8210	19.1424	19.5647	20.0572	20.3743	20.5362	20.5791	20.5731	20.4682	20.0316	19.3591	18.7717 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9266	0.8907	0.8354	0.7309	0.5961	0.4382	0.3158	0.3530	0.5522	0.7794	0.8928	0.9343 (94)
Useful gains	341.1628	385.0639	406.8339	405.0953	353.3225	258.1043	178.3273	185.3215	264.7448	321.0179	327.3412	327.8525 (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	683.4775	668.6353	611.7913	516.2300	400.4421	271.1497	181.7544	190.2394	292.0757	435.4042	568.5247	678.9985 (97)
Space heating kWh	254.6821	190.5600	152.4883	80.0170	35.0570	0.0000	0.0000	0.0000	0.0000	85.1034	173.6521	261.2526 (98a)
Space heating requirement - total per year (kWh/year)												1232.8126
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	254.6821	190.5600	152.4883	80.0170	35.0570	0.0000	0.0000	0.0000	0.0000	85.1034	173.6521	261.2526 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1232.8126
Space heating per m2										(98c) / (4) =		25.1594 (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	429.3678	338.0130	346.4633	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8931	0.9315	0.9143	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	383.4476	314.8474	316.7567	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	661.3155	634.4259	589.3799	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	200.0649	237.7664	202.8316	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	50.0162	59.4416	50.7079	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												160.1657 (107)
Energy for space heating												25.1594 (99)
Energy for space cooling												3.2687 (108)
Total												28.4281 (109)
Fabric Energy Efficiency (DFEE)												28.4 (109)

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

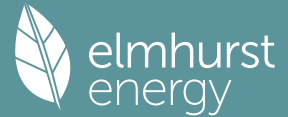
1. Overall dwelling characteristics

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

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Number of sides sheltered

2 (19)

Shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.8500 \quad (20)$$

Infiltration rate adjusted to include shelter factor

$$(21) = (18) \times (20) = 0.3541 \quad (21)$$

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	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)			9.1000	1.1450	10.4198			(27)
External Wall 1	59.8635	9.1000	50.7635	0.1800	9.1374			(29a)
Wall to Stairs	7.3400	1.8000	5.5400	0.1800	0.9972			(29a)
Total net area of external elements Aum(A, m2)					67.2035			(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	22.3545		(33)
Party Wall 1			11.2000	0.0000	0.0000			(32)

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

109.1347 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	6.0000	0.0500	0.3000	
E3 Sill	3.0000	0.0500	0.1500	
E4 Jamb	6.6200	0.0500	0.3310	
E16 Corner (normal)	4.9000	0.0900	0.4410	
E17 Corner (inverted - internal area greater than external area)	2.4500	-0.0900	-0.2205	
E18 Party wall between dwellings	7.3500	0.0600	0.4410	
E7 Party floor between dwellings (in blocks of flats)	27.0000	0.0700	1.8900	

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

3.3325 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

$$(33) + (36) + (36a) = 25.6870 \quad (37)$$

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	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)
Heat transfer coeff	49.5330	49.3762	49.2225	48.5006	48.3656	47.7369	47.7369	47.6204	47.9790	48.3656	48.6388	48.9244	(39)
Average = Sum(39)m / 12 =													48.5000

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0109	1.0077	1.0045	0.9898	0.9871	0.9742	0.9742	0.9718	0.9792	0.9871	0.9926	0.9985	(40)
HLP (average)													0.9898
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

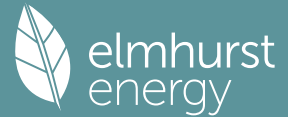
4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6607 (42)
Hot water usage for mixer showers	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	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 conte	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)
Energy content (annual)													824.3098
Distribution loss (46)m = 0.15 x (45)m													
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Total heat required for water heating calculated for each month													
WWHRS	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)
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	(63a)
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	(63b)
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	(63c)
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)
Total 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)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													474.2733 (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)

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													
	74.1557	82.1010	74.1557	76.6276	74.1557	76.6276	74.1557	74.1557	76.6276	74.1557	76.6276	74.1557	(67)

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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	305.2081	313.6848	300.4606	292.0914	277.6162	268.6472	258.8665	258.4971	266.0235	273.6785	289.0103	298.5139 (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					3.7800	19.6403	0.6300	0.7000			0.7700	22.6888 (76)	
South					1.0100	46.7521	0.6300	0.7000			0.7700	14.4309 (78)	
West					4.3100	19.6403	0.6300	0.7000			0.7700	25.8700 (80)	
Solar gains	62.9897	118.6254	186.5427	262.1801	315.0686	320.3548	305.8445	266.4551	213.3917	138.2067	77.6526	52.4020 (83)	
Total gains	368.1978	432.3102	487.0033	554.2715	592.6848	589.0020	564.7110	524.9522	479.4152	411.8852	366.6629	350.9160 (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	29.9890	30.0842	30.1782	30.6273	30.7128	31.1173	31.1173	31.1934	30.9603	30.7128	30.5403	30.3620
alpha	2.9993	3.0056	3.0119	3.0418	3.0475	3.0745	3.0745	3.0796	3.0640	3.0475	3.0360	3.0241
util living area	0.9490	0.9199	0.8719	0.7736	0.6416	0.4831	0.3606	0.4003	0.6022	0.8224	0.9220	0.9548 (86)
MIT	19.0250	19.3559	19.8023	20.3419	20.7101	20.9121	20.9731	20.9627	20.8230	20.3153	19.5939	18.9788 (87)
Th 2	20.0743	20.0769	20.0796	20.0918	20.0941	20.1049	20.1049	20.1069	20.1007	20.0941	20.0895	20.0846 (88)
util rest of house	0.9418	0.9090	0.8546	0.7447	0.5981	0.4247	0.2913	0.3284	0.5430	0.7922	0.9095	0.9484 (89)
MIT 2	18.2778	18.6019	19.0346	19.5503	19.8794	20.0519	20.0931	20.0895	19.9855	19.5403	18.8485	18.2399 (90)
Living area fraction	FLA = Living area / (4) =											
MIT	18.6727	19.0005	19.4404	19.9687	20.3185	20.5066	20.5582	20.5511	20.4282	19.9499	19.2425	18.6304 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.6727	19.0005	19.4404	19.9687	20.3185	20.5066	20.5582	20.5511	20.4282	19.9499	19.2425	18.6304 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9280	0.8937	0.8409	0.7404	0.6093	0.4514	0.3268	0.3647	0.5654	0.7869	0.8956	0.9354 (94)
Ext temp.	341.6964	386.3720	409.5322	410.4014	361.1227	265.9007	184.5622	191.4717	271.0689	324.1156	328.3694	328.2447 (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	711.9241	696.2277	636.9577	536.8387	416.8388	281.9631	188.9541	197.6755	303.6193	452.2150	590.5956	706.0008 (97)
Space heating kWh	275.4494	208.2231	169.2046	91.0348	41.4528	0.0000	0.0000	0.0000	0.0000	95.3059	188.8029	281.0506 (98a)
Space heating requirement - total per year (kWh/year)	1350.5241											
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	275.4494	208.2231	169.2046	91.0348	41.4528	0.0000	0.0000	0.0000	0.0000	95.3059	188.8029	281.0506 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1350.5241											
Space heating per m2	(98c) / (4) = 27.5617 (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	448.7265	353.2527	361.9153	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8771	0.9193	0.9004	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	393.5905	324.7575	325.8753	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	661.3155	634.4259	589.3799	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	192.7620	230.3933	196.0474	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	48.1905	57.5983	49.0119	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	154.8007 (107)											
Energy for space heating	27.5617 (99)											
Energy for space cooling	3.1592 (108)											
Total	30.7209 (109)											
Fabric Energy Efficiency (TFEE)	30.7 (109)											

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Property Reference	01112	Issued on Date	03/07/2024
Assessment Reference	00001	Prop Type Ref	
Property	Zoar Chapel , Flat 6, South Street , Reading		
SAP Rating	81 B	DER	5.53
Environmental	96 A	% DER < TER	60.33
CO ₂ Emissions (t/year)	0.26	DFEE	28.43
Compliance Check	See BREL	% DFEE < TFEE	7.46
% DPER < TPER	20.41	DPER	58.69
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)			9.1000	0.9615	8.7500		(27)
Doo to Hall			1.8000	1.4000	2.5200		(26)
External Wall 1	59.8635	9.1000	50.7635	0.1800	9.1374	14.0000	710.6890 (29a)
Wall to Stairs	7.3400	1.8000	5.5400	0.1600	0.8864	14.0000	77.5600 (29a)
Total net area of external elements Aum(A, m ²)			67.2035				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	21.2938			(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			49.0000			30.0000	1470.0000 (32b)
Internal Wall 1			46.1500			9.0000	415.3500 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =	4857.5990 (34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							99.1347 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				6.0000	0.0060	0.0360	
E3 Sill				3.0000	0.0120	0.0360	
E4 Jamb				6.6200	0.0230	0.1523	
E16 Corner (normal)				4.9000	0.0750	0.3675	
E17 Corner (inverted - internal area greater than external area)				2.4500	-0.0450	-0.1103	

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E18 Party wall between dwellings	7.3500	0.2400	1.7640	
E7 Party floor between dwellings (in blocks of flats)	27.0000	0.0220	0.5940	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				2.8395 (36)
Point Thermal bridges				0.0000
Total fabric heat loss		(33) + (36) + (36a) =		24.1333 (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 =	47.0683	46.9469	46.8278	46.2689	46.1643	45.6774	45.6774	45.5873	45.8650	46.1643	46.3759	46.5970 (39)
												46.2684
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9606	0.9581	0.9557	0.9443	0.9421	0.9322	0.9322	0.9304	0.9360	0.9421	0.9464	0.9510 (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 content (annual)	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)
Distribution loss (46)m = 0.15 x (45)m	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)
Water storage loss:												
Store volume	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)
a) If manufacturer declared loss factor is known (kWh/day):												180.0000 (47)
Temperature factor from Table 2b												1.4000 (48)
Enter (49) or (54) in (55)												0.7800 (49)
Total storage loss												1.0920 (55)
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 (56)
Primary 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 (57)
Combi 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)
Total heat required for water heating calculated for each month	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)
WWHRS	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)
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 (63a)
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 (63b)
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 (63c)
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	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)

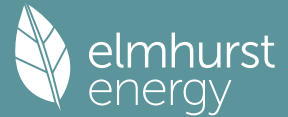
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	74.1557	82.1010	74.1557	76.6276	74.1557	76.6276	74.1557	74.1557	76.6276	74.1557	76.6276	74.1557 (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	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)
	400.8673	408.3743	392.9108	379.1415	361.4898	315.1926	303.1183	304.2778	313.6509	359.0219	379.5081	393.4384 (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			3.7800	19.6403		0.6300		0.7000		0.7700	22.6888 (76)	
South			1.0100	46.7521		0.6300		0.7000		0.7700	14.4309 (78)	
West			4.3100	19.6403		0.6300		0.7000		0.7700	25.8700 (80)	
Solar gains	62.9897	118.6254	186.5427	262.1801	315.0686	320.3548	305.8445	266.4551	213.3917	138.2067	77.6526	52.4020 (83)
Total gains	463.8570	526.9997	579.4535	641.3216	676.5584	635.5473	608.9628	570.7329	527.0427	497.2287	457.1607	445.8404 (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	28.6676	28.7417	28.8148	29.1629	29.2289	29.5405	29.5405	29.5989	29.4197	29.2289	29.0956	28.9575
alpha	2.9112	2.9161	2.9210	2.9442	2.9486	2.9694	2.9694	2.9733	2.9613	2.9486	2.9397	2.9305
util living area												
	0.8989	0.8602	0.8007	0.6938	0.5618	0.4340	0.3217	0.3554	0.5394	0.7335	0.8572	0.9071 (86)
Living	19.6547	19.8775	20.1712	20.5073	20.7295	20.8406	20.8794	20.8733	20.7872	20.5056	20.0421	19.6196
Non living	18.5460	18.8218	19.1819	19.5882	19.8398	19.9633	19.9974	19.9948	19.9118	19.5980	19.0385	18.5087
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	20.3118	19.8775	20.1712	20.5073	20.7295	20.8406	20.8794	20.8733	20.7872	20.5056	20.0421	19.8127 (87)
Th 2	20.1163	20.1184	20.1204	20.1300	20.1318	20.1402	20.1402	20.1418	20.1370	20.1318	20.1282	20.1244 (88)
util rest of house												
	0.8872	0.8449	0.7795	0.6635	0.5214	0.3822	0.2617	0.2930	0.4851	0.6995	0.8392	0.8963 (89)
MIT 2	19.4903	18.8218	19.1819	19.5882	19.8398	19.9633	19.9974	19.9948	19.9118	19.5980	19.0385	18.7998 (90)
Living area fraction												
										fLA = Living area / (4) =		0.5286 (91)
MIT	19.9245	19.3799	19.7048	20.0740	20.3101	20.4270	20.4636	20.4592	20.3745	20.0777	19.5690	19.3352 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9245	19.3799	19.7048	20.0740	20.3101	20.4270	20.4636	20.4592	20.3745	20.0777	19.5690	19.3352 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8844	0.8305	0.7686	0.6614	0.5299	0.3998	0.2846	0.3164	0.5006	0.6972	0.8262	0.8851 (94)
Useful gains	410.2406	437.6516	445.3894	424.1911	358.5411	254.1138	173.2876	180.6033	263.8285	346.6736	377.6915	394.6226 (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	735.4190	679.7836	618.3545	517.0094	397.4773	266.1643	176.4796	185.0463	287.7801	437.5323	578.2600	705.2558 (97)
Space heating kWh	241.9328	162.7127	128.6860	66.8292	28.9685	0.0000	0.0000	0.0000	0.0000	67.5989	144.4093	231.1111 (98a)
Space heating requirement - total per year (kWh/year)												1072.2484
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	241.9328	162.7127	128.6860	66.8292	28.9685	0.0000	0.0000	0.0000	0.0000	67.5989	144.4093	231.1111 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1072.2484
Space heating per m2										(98c) / (4) =		21.8826 (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 %)												313.4964 (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	241.9328	162.7127	128.6860	66.8292	28.9685	0.0000	0.0000	0.0000	0.0000	67.5989	144.4093	231.1111 (98)
Space heating efficiency (main heating system 1)	313.4964	313.4964	313.4964	313.4964	313.4964	0.0000	0.0000	0.0000	0.0000	313.4964	313.4964	313.4964 (210)
Space heating fuel (main heating system)	77.1724	51.9026	41.0486	21.3174	9.2404	0.0000	0.0000	0.0000	0.0000	21.5629	46.0641	73.7205 (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	182.2287	182.2287	182.2287	182.2287	182.2287	182.2287	182.2287	182.2287	182.2287	182.2287	182.2287	182.2287 (216)
Fuel for water heating, kWh/month	140.9910	125.1960	134.0224	119.9677	117.8075	90.9981	90.0767	93.3433	94.0387	121.6552	127.0594	139.7052 (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	17.0392	13.6695	12.3079	9.0173	6.9652	5.6906	6.3539	8.2590	10.7276	14.0752	15.8980	17.5128 (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												342.0290 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												182.2287
Water heating fuel used												1394.8611 (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)												137.5161 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)

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Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	1874.4062 (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	342.0290	0.1559	53.3368 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1394.8611	0.1416	197.5728 (264)
Space and water heating			250.9095 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	137.5161	0.1443	19.8478 (268)
Total CO2, kg/year			270.7573 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.5300 (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	342.0290	1.5773	539.4776 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1394.8611	1.5238	2125.4898 (278)
Space and water heating			2664.9674 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	137.5161	1.5338	210.9269 (282)
Total Primary energy kWh/year			2875.8942 (286)
Dwelling Primary energy Rate (DPER)			58.6900 (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

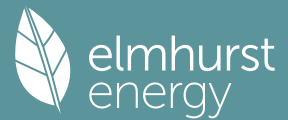
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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)			9.1000	1.1450	10.4198		(27)
External Wall 1	59.8635	9.1000	50.7635	0.1800	9.1374		(29a)
Wall to Stairs	7.3400	1.8000	5.5400	0.1800	0.9972		(29a)

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Total net area of external elements Aum(A, m2) 67.2035 (31)
Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) = 22.3545 (33)
Party Wall 1 11.2000 0.0000 0.0000 (32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 109.1347 (35)

List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.0000	0.0500	0.3000
E3 Sill	3.0000	0.0500	0.1500
E4 Jamb	6.6200	0.0500	0.3310
E16 Corner (normal)	4.9000	0.0900	0.4410
E17 Corner (inverted - internal area greater than external area)	2.4500	-0.0900	-0.2205
E18 Party wall between dwellings	7.3500	0.0600	0.4410
E7 Party floor between dwellings (in blocks of flats)	27.0000	0.0700	1.8900
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			3.3325 (36)
Point Thermal bridges			0.0000 (36a) =
Total fabric heat loss			25.6870 (37) (33) + (36) + (36a) =

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
(38)m Jan 23.8460 Feb 23.6892 Mar 23.5355 Apr 22.8136 May 22.6786 Jun 22.0499 Jul 22.0499 Aug 21.9335 Sep 22.2921 Oct 22.6786 Nov 22.9518 Dec 23.2374 (38)
Heat transfer coeff 49.5330 49.3762 49.2225 48.5006 48.3656 47.7369 47.7369 47.6204 47.9790 48.3656 48.6388 48.9244 (39)
Average = Sum(39)m / 12 = 48.5000

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0109	1.0077	1.0045	0.9898	0.9871	0.9742	0.9742	0.9718	0.9792	0.9871	0.9926	0.9985 (40)
HLP (average)												0.9898
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 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)

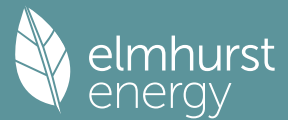
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	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	74.1557	82.1010	74.1557	76.6276	74.1557	76.6276	74.1557	74.1557	76.6276	74.1557	76.6276	74.1557 (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	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-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)	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)
Total internal gains	397.8297	405.3367	389.8732	376.1040	358.4522	343.1283	331.0540	332.2135	341.5867	355.9844	376.4705	390.4008 (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	3.7800	19.6403	0.6300	0.7000	0.7700	22.6888 (76)

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South				1.0100		46.7521		0.6300		0.7000		0.7700		14.4309 (78)
West				4.3100		19.6403		0.6300		0.7000		0.7700		25.8700 (80)

Solar gains	62.9897	118.6254	186.5427	262.1801	315.0686	320.3548	305.8445	266.4551	213.3917	138.2067	77.6526	52.4020 (83)		
Total gains	460.8194	523.9621	576.4160	638.2841	673.5208	663.4831	636.8986	598.6687	554.9784	494.1911	454.1232	442.8029 (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	29.9890	30.0842	30.1782	30.6273	30.7128	31.1173	31.1173	31.1934	30.9603	30.7128	30.5403	30.3620		
alpha	2.9993	3.0056	3.0119	3.0418	3.0475	3.0745	3.0745	3.0796	3.0640	3.0475	3.0360	3.0241		
util living area	0.9152	0.8800	0.8244	0.7201	0.5873	0.4366	0.3224	0.3552	0.5402	0.7595	0.8773	0.9225 (86)		
MIT	19.3240	19.6184	20.0118	20.4703	20.7739	20.9336	20.9803	20.9732	20.8694	20.4680	19.8449	19.2836 (87)		
Th 2	20.0743	20.0769	20.0796	20.0918	20.0941	20.1049	20.1049	20.1069	20.1007	20.0941	20.0895	20.0846 (88)		
util rest of house	0.9042	0.8652	0.8033	0.6887	0.5440	0.3819	0.2595	0.2900	0.4829	0.7246	0.8598	0.9124 (89)		
MIT 2	18.1399	18.5050	18.9877	19.5403	19.8824	20.0543	20.0939	20.0912	19.9938	19.5535	18.8013	18.0968 (90)		
Living area fraction									fLA = Living area / (4) =			0.5286 (91)		
MIT	18.7658	19.0935	19.5290	20.0319	20.3537	20.5190	20.5625	20.5574	20.4566	20.0369	19.3529	18.7241 (92)		
Temperature adjustment												0.0000		
adjusted MIT	18.7658	19.0935	19.5290	20.0319	20.3537	20.5190	20.5625	20.5574	20.4566	20.0369	19.3529	18.7241 (93)		

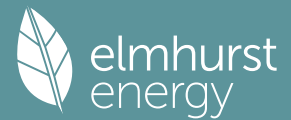
8. Space heating requirement														

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	0.8854	0.8470	0.7893	0.6865	0.5568	0.4076	0.2920	0.3233	0.5062	0.7222	0.8435	0.8940 (94)		
Useful gains	408.0254	443.7835	454.9374	438.1781	375.0214	270.4244	185.9503	193.5409	280.9300	356.9250	383.0356	395.8876 (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	716.5329	700.8205	641.3206	539.9023	418.5389	282.5568	189.1554	197.9778	304.9840	456.4201	595.9667	710.5841 (97)		
Space heating kWh	229.5296	172.7289	138.6691	73.2415	32.3770	0.0000	0.0000	0.0000	0.0000	74.0243	153.3104	234.1342 (98a)		
Space heating requirement - total per year (kWh/year)												1108.0150		
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	229.5296	172.7289	138.6691	73.2415	32.3770	0.0000	0.0000	0.0000	0.0000	74.0243	153.3104	234.1342 (98c)		
Space heating requirement after solar contribution - total per year (kWh/year)												1108.0150		
Space heating per m2										(98c) / (4) =		22.6126 (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	229.5296	172.7289	138.6691	73.2415	32.3770	0.0000	0.0000	0.0000	0.0000	74.0243	153.3104	234.1342 (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)	248.6778	187.1386	150.2373	79.3515	35.0780	0.0000	0.0000	0.0000	0.0000	80.1997	166.1001	253.6665 (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 (217)m	84.4419	84.0765	83.4492	82.3982	81.1981	79.8000	79.8000	79.8000	79.8000	82.3919	83.7869	79.8000 (216)		
Fuel for water heating, kWh/month	229.3384	203.9159	218.9567	196.8122	194.8345	180.0137	178.7344	185.1100	186.3255	199.6188	206.7525	226.9062 (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	15.4081	12.3609	11.1297	8.1541	6.2984	5.1459	5.7456	7.4684	9.7007	12.7279	14.3761	15.8363 (232)		
Electricity generated by PVs (Appendix M) (negative quantity)														
(233a)m	-16.8883	-24.6954	-36.8155	-43.0034	-47.8017	-45.1754	-44.6561	-41.4661	-36.0536	-28.9813	-18.8907	-14.5018 (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	-7.0269	-15.0117	-30.2555	-46.0464	-61.4576	-61.9276	-61.1657	-51.4996	-37.3907	-21.6304	-9.4371	-5.5372 (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												1200.4496 (211)		
Space heating fuel - main system 2												0.0000 (213)		
Space heating fuel - secondary												0.0000 (215)		
Efficiency of water heater												79.8000		
Water heating fuel used												2407.3187 (219)		
Space cooling fuel												0.0000 (221)		

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Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	124.3522 (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	3010.8046 (238)

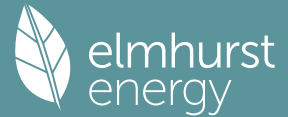
----- 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP -----

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1200.4496	0.2100	252.0944 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2407.3187	0.2100	505.5369 (264)
Space and water heating			757.6313 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	124.3522	0.1443	17.9479 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-398.9293	0.1338	-53.3745
PV Unit electricity exported	-408.3866	0.1255	-51.2621
Total			-104.6366 (269)
Total CO2, kg/year			682.8719 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.9400 (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	1200.4496	1.1300	1356.5080 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2407.3187	1.1300	2720.2702 (278)
Space and water heating			4076.7782 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	124.3522	1.5338	190.7355 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-398.9293	1.4944	-596.1744
PV Unit electricity exported	-408.3866	0.4607	-188.1604
Total			-784.3348 (283)
Total Primary energy kWh/year			3613.2797 (286)
Target Primary Energy Rate (TPER)			73.7400 (287)

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Property Reference	01112				Issued on Date	03/07/2024	
Assessment Reference	00001			Prop Type Ref			
Property	Zoar Chapel , Flat 6, South Street , Reading						
SAP Rating	81 B	DER	5.53	TER	13.94		
Environmental	96 A	% DER < TER				60.33	
CO ₂ Emissions (t/year)	0.26	DFEE	28.43	TFEE	30.72		
Compliance Check	See BREL	% DFEE < TFEE				7.46	
% DPER < TPER	20.41	DPER	58.69	TPER	73.74		
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

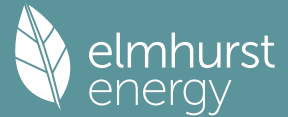
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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)			9.1000	0.9615	8.7500		(27)
Doo to Hall			1.8000	1.4000	2.5200		(26)
External Wall 1	59.8635	9.1000	50.7635	0.1800	9.1374	14.0000	710.6890 (29a)
Wall to Stairs	7.3400	1.8000	5.5400	0.1600	0.8864	14.0000	77.5600 (29a)
Total net area of external elements Aum(A, m ²)			67.2035				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	21.2938			(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			49.0000			40.0000	1960.0000 (32b)
Internal Wall 1			46.1500			9.0000	415.3500 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =	5347.5990 (34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							109.1347 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				6.0000	0.0060	0.0360	
E3 Sill				3.0000	0.0120	0.0360	
E4 Jamb				6.6200	0.0230	0.1523	
E16 Corner (normal)				4.9000	0.0750	0.3675	
E17 Corner (inverted - internal area greater than external area)				2.4500	-0.0450	-0.1103	

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E18 Party wall between dwellings						7.3500	0.2400	1.7640						
E7 Party floor between dwellings (in blocks of flats)						27.0000	0.0220	0.5940						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)									2.8395 (36)					
Point Thermal bridges									(36a) = 0.0000					
Total fabric heat loss						(33) + (36) + (36a) =			24.1333 (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		
	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	47.0683	46.9469	46.8278	46.2689	46.1643	45.6774	45.6774	45.5873	45.8650	46.1643	46.3759	46.5970	(39)	
Average = Sum(39)m / 12 =											46.2684			
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	0.9606	0.9581	0.9557	0.9443	0.9421	0.9322	0.9322	0.9304	0.9360	0.9421	0.9464	0.9510	(40)	
HLP (average)											0.9443			
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 content	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)	
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	19.4668	17.2903	14.0614	10.6454	7.9575	6.7181	7.2591	9.4357	12.6646	16.0806	18.7684	20.0079 (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	449.3459	447.4703	434.8604	411.2374	388.3636	333.6500	321.4454	324.0422	336.0352	391.2599	416.9681	439.3148 (73)

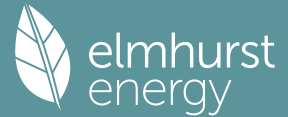
6. Solar gains

[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				3.7800	19.6403		0.6300		0.7000		0.7700		22.6888 (76)
South				1.0100	46.7521		0.6300		0.7000		0.7700		14.4309 (78)
West				4.3100	19.6403		0.6300		0.7000		0.7700		25.8700 (80)
Solar gains	62.9897	118.6254	186.5427	262.1801	315.0686	320.3548	305.8445	266.4551	213.3917	138.2067	77.6526		52.4020 (83)
Total gains	512.3356	566.0957	621.4031	673.4175	703.4322	654.0048	627.2899	590.4973	549.4269	529.4666	494.6208		491.7168 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)
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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	31.5594	31.6410	31.7214	32.1046	32.1773	32.5203	32.5203	32.5846	32.3873	32.1773	32.0306	31.8785
alpha	3.1040	3.1094	3.1148	3.1403	3.1452	3.1680	3.1680	3.1723	3.1592	3.1452	3.1354	3.1252
util living area	0.8885	0.8530	0.7894	0.6845	0.5525	0.4270	0.3144	0.3464	0.5285	0.7204	0.8476	0.8981 (86)
Living	19.8573	20.0392	20.3057	20.5883	20.7732	20.8613	20.8910	20.8867	20.8196	20.5890	20.1874	19.8215
Non living	18.7910	19.0153	19.3395	19.6793	19.8859	19.9838	20.0090	20.0077	19.9438	19.6904	19.2104	18.7534
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	20.4154	20.0392	20.3057	20.5883	20.7732	20.8613	20.8910	20.8867	20.8196	20.5890	20.1874	19.9863 (87)
Th 2	20.1163	20.1184	20.1204	20.1300	20.1318	20.1402	20.1402	20.1418	20.1370	20.1318	20.1282	20.1244 (88)
util rest of house	0.8753	0.8365	0.7667	0.6530	0.5113	0.3750	0.2552	0.2849	0.4735	0.6846	0.8280	0.8859 (89)
MIT 2	19.5880	19.0153	19.3395	19.6793	19.8859	19.9838	20.0090	20.0077	19.9438	19.6904	19.2104	19.0005 (90)
Living area fraction									FLA = Living area / (4) =			
MIT	20.0253	19.5565	19.8502	20.1598	20.3549	20.4476	20.4752	20.4723	20.4067	20.1654	19.7268	19.5216 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0253	19.5565	19.8502	20.1598	20.3549	20.4476	20.4752	20.4723	20.4067	20.1654	19.7268	19.5216 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8739	0.8248	0.7592	0.6541	0.5222	0.3939	0.2785	0.3089	0.4912	0.6861	0.8179	0.8764 (94)
Useful gains	447.7198	466.9056	471.8001	440.4917	367.3208	257.6160	174.6896	182.3799	269.8648	363.2535	404.5552	430.9435 (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	740.1649	688.0781	625.1614	520.9760	399.5468	267.1040	177.0097	185.6463	289.2571	441.5782	585.5788	713.9400 (97)
Space heating kWh	217.5792	148.6279	114.1008	57.9487	23.9762	0.0000	0.0000	0.0000	0.0000	58.2735	130.3370	210.5494 (98a)
Space heating requirement - total per year (kWh/year)												961.3927
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	217.5792	148.6279	114.1008	57.9487	23.9762	0.0000	0.0000	0.0000	0.0000	58.2735	130.3370	210.5494 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												961.3927
Space heating per m2										(98c) / (4) =		19.6203 (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 %)												313.4964 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	217.5792	148.6279	114.1008	57.9487	23.9762	0.0000	0.0000	0.0000	0.0000	58.2735	130.3370	210.5494 (98)
Space heating efficiency (main heating system 1)	313.4964	313.4964	313.4964	313.4964	313.4964	0.0000	0.0000	0.0000	0.0000	313.4964	313.4964	313.4964 (210)
Space heating fuel (main heating system)	69.4041	47.4098	36.3962	18.4847	7.6480	0.0000	0.0000	0.0000	0.0000	18.5883	41.5753	67.1617 (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	182.2287	182.2287	182.2287	182.2287	182.2287	182.2287	182.2287	182.2287	182.2287	182.2287	182.2287	182.2287 (216)
Fuel for water heating, kWh/month	140.9910	125.1960	134.0224	119.9677	117.8075	90.9981	90.0767	93.3433	94.0387	121.6552	127.0594	139.7052 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	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	17.0392	13.6695	12.3079	9.0173	6.9652	5.6906	6.3539	8.2590	10.7276	14.0752	15.8980	17.5128 (232)
Electricity generated by PVs (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 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												306.6679 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												182.2287
Water heating fuel used												1394.8611 (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)												137.5161 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)

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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	1839.0451 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	306.6679	16.4900	50.5695 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1394.8611	16.4900	230.0126 (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	137.5161	16.4900	22.6764 (250)
Additional standing charges			0.0000 (251)
Total energy cost			303.2585 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	1.1614 (257)
SAP value	81.1735
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	306.6679	0.1561	47.8731 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1394.8611	0.1416	197.5728 (264)
Space and water heating			245.4459 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	137.5161	0.1443	19.8478 (268)
Total CO2, kg/year			265.2937 (272)
CO2 emissions per m2			5.4100 (273)
EI value			96.2182
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

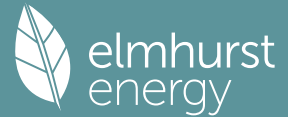
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	49.0000 (1b)	x 2.4500 (2b)	= 120.0500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	120.0500 (5)

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	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)
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)

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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)			9.1000	0.9615	8.7500			(27)
Doo to Hall			1.8000	1.4000	2.5200			(26)
External Wall 1	59.8635	9.1000	50.7635	0.1800	9.1374	14.0000	710.6890	(29a)
Wall to Stairs	7.3400	1.8000	5.5400	0.1600	0.8864	14.0000	77.5600	(29a)
Total net area of external elements Aum (A, m2)			67.2035					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.2938			(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			49.0000			40.0000	1960.0000	(32b)
Internal Wall 1			46.1500			9.0000	415.3500	(32c)

Heat capacity Cm = Sum(A x k)

(28)...(30) + (32) + (32a)...(32e) = 5347.5990 (34)

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

109.1347 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.0000	0.0060	0.0360
E3 Sill	3.0000	0.0120	0.0360
E4 Jamb	6.6200	0.0230	0.1523
E16 Corner (normal)	4.9000	0.0750	0.3675
E17 Corner (inverted - internal area greater than external area)	2.4500	-0.0450	-0.1103
E18 Party wall between dwellings	7.3500	0.2400	1.7640
E7 Party floor between dwellings (in blocks of flats)	27.0000	0.0220	0.5940

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

2.8395 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 24.1333 (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	46.0621	45.8650	45.8650	45.5873	45.5873	45.2507	45.3312	45.1725	45.2507	45.4142	45.4142	45.6774	(39)
Average = Sum(39)m / 12 =												45.5398	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9400	0.9360	0.9360	0.9304	0.9304	0.9235	0.9251	0.9219	0.9235	0.9268	0.9268	0.9322	(40)
HLP (average)												0.9294	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

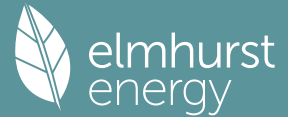
4. Water heating energy requirements (kWh/year)

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):													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)
													Total per year (kWh/year) = Sum(64)m = 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)
													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	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	19.4668	17.2903	14.0614	10.6454	7.9575	6.7181	7.2591	9.4357	12.6646	16.0806	18.7684	20.0079	(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)													

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	-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	449.3459	447.4703	434.8604	411.2374	388.3636	333.6500	321.4454	324.0422	336.0352	391.2599	416.9681	439.3148 (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	3.7800		22.3313		0.6300		0.7000		0.7700		25.7975 (76)	
South	1.0100		50.9848		0.6300		0.7000		0.7700		15.7374 (78)	
West	4.3100		22.3313		0.6300		0.7000		0.7700		29.4146 (80)	
Solar gains	70.9496	120.2843	186.8183	270.3999	316.4423	344.3018	325.1601	289.7653	231.5866	149.6333	89.6215	58.4423 (83)
Total gains	520.2955	567.7546	621.6786	681.6373	704.8059	677.9518	646.6054	613.8074	567.6218	540.8932	506.5896	497.7571 (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	32.2487	32.3873	32.3873	32.5846	32.5846	32.8270	32.7687	32.8838	32.8270	32.7088	32.7088	32.5203
alpha	3.1499	3.1592	3.1592	3.1723	3.1723	3.1885	3.1846	3.1923	3.1885	3.1806	3.1806	3.1680
util living area	0.8699	0.8351	0.7608	0.6379	0.4845	0.3269	0.2160	0.2337	0.4403	0.6645	0.8155	0.8801 (86)
Living	20.0133	20.1638	20.4229	20.6760	20.8289	20.8889	20.9007	20.9002	20.8634	20.6880	20.3373	19.9846
Non living	18.9977	19.1830	19.4936	19.7891	19.9530	20.0145	20.0213	20.0240	19.9946	19.8126	19.4050	18.9685
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	20.4952	20.1638	20.4229	20.6760	20.8289	20.8889	20.9007	20.9002	20.8634	20.6880	20.3373	20.1266 (87)
Th 2	20.1336	20.1370	20.1370	20.1418	20.1418	20.1476	20.1462	20.1489	20.1476	20.1448	20.1448	20.1402 (88)
util rest of house	0.8545	0.8167	0.7354	0.6031	0.4396	0.2735	0.1571	0.1723	0.3819	0.6235	0.7921	0.8657 (89)
MIT 2	19.6807	19.1830	19.4936	19.7891	19.9530	20.0145	20.0213	20.0240	19.9946	19.8126	19.4050	19.1797 (90)
Living area fraction	20.1113	19.7014	19.9848	20.2579	20.4160	20.4767	20.4862	20.4871	20.4539	20.2753	19.8978	19.6802 (92)
MIT	20.1113	19.7014	19.9848	20.2579	20.4160	20.4767	20.4862	20.4871	20.4539	20.2753	19.8978	19.6802 (93)
Temperature adjustment												0.0000
adjusted MIT	20.1113	19.7014	19.9848	20.2579	20.4160	20.4767	20.4862	20.4871	20.4539	20.2753	19.8978	19.6802 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8541	0.8065	0.7307	0.6080	0.4542	0.2943	0.1807	0.1969	0.4032	0.6300	0.7847	0.8571 (94)
Useful gains	444.3975	457.9083	454.2384	414.4290	320.1324	199.5356	116.8160	120.8324	228.8933	340.7869	397.5341	426.6364 (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	691.4500	646.7601	577.2018	472.1891	338.0752	202.5727	117.2337	121.3845	237.7403	393.9801	540.3299	665.9863 (97)
Space heating kWh	183.8071	126.9084	91.4848	41.5873	13.3495	0.0000	0.0000	0.0000	0.0000	39.5758	102.8129	178.0763 (98a)
Space heating requirement - total per year (kWh/year)												777.6020
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	183.8071	126.9084	91.4848	41.5873	13.3495	0.0000	0.0000	0.0000	0.0000	39.5758	102.8129	178.0763 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												777.6020
Space heating per m2										(98c) / (4) =		15.8694 (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 %)												312.7045 (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	183.8071	126.9084	91.4848	41.5873	13.3495	0.0000	0.0000	0.0000	0.0000	39.5758	102.8129	178.0763 (98)
Space heating efficiency (main heating system 1)	312.7045	312.7045	312.7045	312.7045	312.7045	0.0000	0.0000	0.0000	0.0000	312.7045	312.7045	312.7045 (210)
Space heating fuel (main heating system)	58.7798	40.5841	29.2560	13.2992	4.2690	0.0000	0.0000	0.0000	0.0000	12.6560	32.8786	56.9472 (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	181.7152	181.7152	181.7152	181.7152	181.7152	181.7152	181.7152	181.7152	181.7152	181.7152	181.7152	181.7152 (216)
Fuel for water heating, kWh/month	141.3894	125.5498	134.4011	120.3067	118.1404	91.2552	90.3312	93.6071	94.3045	121.9989	127.4184	140.1000 (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	17.0392	13.6695	12.3079	9.0173	6.9652	5.6906	6.3539	8.2590	10.7276	14.0752	15.8980	17.5128 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												

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(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												248.6699	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												181.7152	
Water heating fuel used												1398.8027	(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)												137.5161	(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												1784.9888	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	248.6699	26.0600	64.8034 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1398.8027	26.0600	364.5280 (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	137.5161	26.0600	35.8367 (250)
Additional standing charges			0.0000 (251)
Total energy cost			465.1681 (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	248.6699	0.1568	38.9843 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1398.8027	0.1416	198.1311 (264)
Space and water heating			237.1154 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	137.5161	0.1443	19.8478 (268)
Total CO2, kg/year			256.9632 (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	248.6699	1.5804	392.9877 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1398.8027	1.5238	2131.4961 (278)
Space and water heating			2524.4838 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	137.5161	1.5338	210.9269 (282)
Total Primary energy kWh/year			2735.4106 (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)

Recommended measures Typical annual savings Energy Environmental
(none) efficiency impact

Total Savings £0 0.00 kg/m²

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Potential energy efficiency rating:
Potential environmental impact rating:

B 81
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):

	Current £465	Potential £465	£0	Saving
Electricity				
Space heating	£65	£65	£0	
Water heating	£365	£365	£0	
Lighting	£36	£36	£0	
Total cost of fuels	£465	£465	£0	
Total cost of uses	£466	£466	£0	
Delivered energy	36 kWh/m ²	36 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	56 kWh/m ²	56 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

	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

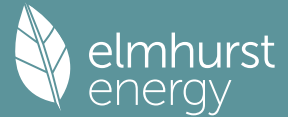
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.00)			9.1000	0.9615	8.7500		(27)
Doo to Hall			1.8000	1.4000	2.5200		(26)
External Wall 1	59.8635	9.1000	50.7635	0.1800	9.1374	14.0000	710.6890 (29a)
Wall to Stairs	7.3400	1.8000	5.5400	0.1600	0.8864	14.0000	77.5600 (29a)
Total net area of external elements Aum(A, m ²)			67.2035				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.2938		(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			49.0000			40.0000	1960.0000 (32b)
Internal Wall 1			46.1500			9.0000	415.3500 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	5347.5990 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		109.1347 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.0000	0.0060	0.0360
E3 Sill	3.0000	0.0120	0.0360
E4 Jamb	6.6200	0.0230	0.1523
E16 Corner (normal)	4.9000	0.0750	0.3675
E17 Corner (inverted - internal area greater than external area)	2.4500	-0.0450	-0.1103
E18 Party wall between dwellings	7.3500	0.2400	1.7640
E7 Party floor between dwellings (in blocks of flats)	27.0000	0.0220	0.5940

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

Point Thermal bridges
Total fabric heat loss

(33) + (36) + (36a) =
2.8395 (36)
0.0000
24.1333 (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	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	47.0683	46.9469	46.8278	46.2689	46.1643	45.6774	45.6774	45.5873	45.8650	46.1643	46.3759	46.5970	(39)
Average = Sum(39)m / 12 =												46.2684	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9606	0.9581	0.9557	0.9443	0.9421	0.9322	0.9322	0.9304	0.9360	0.9421	0.9464	0.9510	(40)
HLP (average)												0.9443	
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 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												
	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	19.4668	17.2903	14.0614	10.6454	7.9575	6.7181	7.2591	9.4357	12.6646	16.0806	18.7684	20.0079 (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	449.3459	447.4703	434.8604	411.2374	388.3636	333.6500	321.4454	324.0422	336.0352	391.2599	416.9681	439.3148 (73)

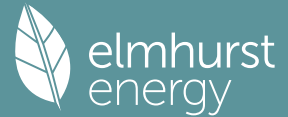
6. Solar gains

[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						3.7800	19.6403	0.6300	0.7000			0.7700			22.6888 (76)
South						1.0100	46.7521	0.6300	0.7000			0.7700			14.4309 (78)
West						4.3100	19.6403	0.6300	0.7000			0.7700			25.8700 (80)
Solar gains	62.9897	118.6254	186.5427	262.1801	315.0686	320.3548	305.8445	266.4551	213.3917	138.2067	77.6526			52.4020 (83)	
Total gains	512.3356	566.0957	621.4031	673.4175	703.4322	654.0048	627.2899	590.4973	549.4269	529.4666	494.6208			491.7168 (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		

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tau	31.5594	31.6410	31.7214	32.1046	32.1773	32.5203	32.5203	32.5846	32.3873	32.1773	32.0306	31.8785
alpha	3.1040	3.1094	3.1148	3.1403	3.1452	3.1680	3.1680	3.1723	3.1592	3.1452	3.1354	3.1252
util living area	0.8885	0.8530	0.7894	0.6845	0.5525	0.4270	0.3144	0.3464	0.5285	0.7204	0.8476	0.8981 (86)
Living	19.8573	20.0392	20.3057	20.5883	20.7732	20.8613	20.8910	20.8867	20.8196	20.5890	20.1874	19.8215
Non living	18.7910	19.0153	19.3395	19.6793	19.8859	19.9838	20.0090	20.0077	19.9438	19.6904	19.2104	18.7534
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	20.4154	20.0392	20.3057	20.5883	20.7732	20.8613	20.8910	20.8867	20.8196	20.5890	20.1874	19.9863 (87)
Th 2	20.1163	20.1184	20.1204	20.1300	20.1318	20.1402	20.1402	20.1418	20.1370	20.1318	20.1282	20.1244 (88)
util rest of house	0.8753	0.8365	0.7667	0.6530	0.5113	0.3750	0.2552	0.2849	0.4735	0.6846	0.8280	0.8859 (89)
MIT 2	19.5880	19.0153	19.3395	19.6793	19.8859	19.9838	20.0090	20.0077	19.9438	19.6904	19.2104	19.0005 (90)
Living area fraction									fLA = Living area / (4) =			0.5286 (91)
MIT	20.0253	19.5565	19.8502	20.1598	20.3549	20.4476	20.4752	20.4723	20.4067	20.1654	19.7268	19.5216 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0253	19.5565	19.8502	20.1598	20.3549	20.4476	20.4752	20.4723	20.4067	20.1654	19.7268	19.5216 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8739	0.8248	0.7592	0.6541	0.5222	0.3939	0.2785	0.3089	0.4912	0.6861	0.8179	0.8764 (94)
Useful gains	447.7198	466.9056	471.8001	440.4917	367.3208	257.6160	174.6896	182.3799	269.8648	363.2535	404.5552	430.9435 (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	740.1649	688.0781	625.1614	520.9760	399.5468	267.1040	177.0097	185.6463	289.2571	441.5782	585.5788	713.9400 (97)
Space heating kWh	217.5792	148.6279	114.1008	57.9487	23.9762	0.0000	0.0000	0.0000	0.0000	58.2735	130.3370	210.5494 (98a)
Space heating requirement - total per year (kWh/year)												961.3927
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	217.5792	148.6279	114.1008	57.9487	23.9762	0.0000	0.0000	0.0000	0.0000	58.2735	130.3370	210.5494 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												961.3927
Space heating per m2										(98c) / (4) =		19.6203 (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 %)												313.4964 (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	217.5792	148.6279	114.1008	57.9487	23.9762	0.0000	0.0000	0.0000	0.0000	58.2735	130.3370	210.5494 (98)
Space heating efficiency (main heating system 1)	313.4964	313.4964	313.4964	313.4964	313.4964	0.0000	0.0000	0.0000	0.0000	313.4964	313.4964	313.4964 (210)
Space heating fuel (main heating system)	69.4041	47.4098	36.3962	18.4847	7.6480	0.0000	0.0000	0.0000	0.0000	18.5883	41.5753	67.1617 (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	182.2287	182.2287	182.2287	182.2287	182.2287	182.2287	182.2287	182.2287	182.2287	182.2287	182.2287	182.2287 (216)
Fuel for water heating, kWh/month	140.9910	125.1960	134.0224	119.9677	117.8075	90.9981	90.0767	93.3433	94.0387	121.6552	127.0594	139.7052 (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	17.0392	13.6695	12.3079	9.0173	6.9652	5.6906	6.3539	8.2590	10.7276	14.0752	15.8980	17.5128 (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												306.6679 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												182.2287
Water heating fuel used												1394.8611 (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)												137.5161 (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)

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Appendix Q - special features

Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	1839.0451 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	306.6679	16.4900	50.5695 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1394.8611	16.4900	230.0126 (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	137.5161	16.4900	22.6764 (250)
Additional standing charges			0.0000 (251)
Total energy cost			303.2585 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	1.1614 (257)
SAP value	81.1735
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	306.6679	0.1561	47.8731 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1394.8611	0.1416	197.5728 (264)
Space and water heating			245.4459 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	137.5161	0.1443	19.8478 (268)
Total CO2, kg/year			265.2937 (272)
CO2 emissions per m2			5.4100 (273)
EI value			96.2182
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)	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	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	0.8500	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
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)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Windows (Uw = 1.00)			9.1000	0.9615	8.7500			(27)
Doo to Hall			1.8000	1.4000	2.5200			(26)
External Wall 1	59.8635	9.1000	50.7635	0.1800	9.1374	14.0000	710.6890	(29a)
Wall to Stairs	7.3400	1.8000	5.5400	0.1600	0.8864	14.0000	77.5600	(29a)
Total net area of external elements Aum(A, m2)			67.2035					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.2938			(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			49.0000			40.0000	1960.0000	(32b)
Internal Wall 1			46.1500			9.0000	415.3500	(32c)

Heat capacity Cm = Sum(A x k)

(28)...(30) + (32) + (32a)...(32e) = 5347.5990 (34)

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

109.1347 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.0000	0.0060	0.0360
E3 Sill	3.0000	0.0120	0.0360
E4 Jamb	6.6200	0.0230	0.1523
E16 Corner (normal)	4.9000	0.0750	0.3675
E17 Corner (inverted - internal area greater than external area)	2.4500	-0.0450	-0.1103
E18 Party wall between dwellings	7.3500	0.2400	1.7640
E7 Party floor between dwellings (in blocks of flats)	27.0000	0.0220	0.5940

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

2.8395 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 24.1333 (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	46.0621	45.8650	45.8650	45.5873	45.5873	45.2507	45.3312	45.1725	45.2507	45.4142	45.4142	45.6774	(39)
Average = Sum(39)m / 12 =												45.5398	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9400	0.9360	0.9360	0.9304	0.9304	0.9235	0.9251	0.9219	0.9235	0.9268	0.9268	0.9322	(40)
HLP (average)												0.9294	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

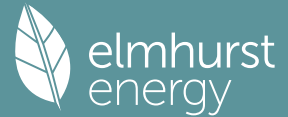
4. Water heating energy requirements (kWh/year)

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	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)
								Total per year (kWh/year) = Sum(64)m =				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) = 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	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	19.4668	17.2903	14.0614	10.6454	7.9575	6.7181	7.2591	9.4357	12.6646	16.0806	18.7684	20.0079	(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)													

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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)
	449.3459	447.4703	434.8604	411.2374	388.3636	333.6500	321.4454	324.0422	336.0352	391.2599	416.9681	439.3148 (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				3.7800	22.3313	0.6300	0.7000		0.7700		25.7975 (76)	
South				1.0100	50.9848	0.6300	0.7000		0.7700		15.7374 (78)	
West				4.3100	22.3313	0.6300	0.7000		0.7700		29.4146 (80)	
Solar gains	70.9496	120.2843	186.8183	270.3999	316.4423	344.3018	325.1601	289.7653	231.5866	149.6333	89.6215	58.4423 (83)
Total gains	520.2955	567.7546	621.6786	681.6373	704.8059	677.9518	646.6054	613.8074	567.6218	540.8932	506.5896	497.7571 (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	32.2487	32.3873	32.3873	32.5846	32.5846	32.8270	32.7687	32.8838	32.8270	32.7088	32.7088	32.5203
alpha	3.1499	3.1592	3.1592	3.1723	3.1723	3.1885	3.1846	3.1923	3.1885	3.1806	3.1806	3.1680
util living area	0.8699	0.8351	0.7608	0.6379	0.4845	0.3269	0.2160	0.2337	0.4403	0.6645	0.8155	0.8801 (86)
Living	20.0133	20.1638	20.4229	20.6760	20.8289	20.8889	20.9007	20.9002	20.8634	20.6880	20.3373	19.9846
Non living	18.9977	19.1830	19.4936	19.7891	19.9530	20.0145	20.0213	20.0240	19.9946	19.8126	19.4050	18.9685
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	20.4952	20.1638	20.4229	20.6760	20.8289	20.8889	20.9007	20.9002	20.8634	20.6880	20.3373	20.1266 (87)
Th 2	20.1336	20.1370	20.1370	20.1418	20.1418	20.1476	20.1462	20.1489	20.1476	20.1448	20.1448	20.1402 (88)
util rest of house	0.8545	0.8167	0.7354	0.6031	0.4396	0.2735	0.1571	0.1723	0.3819	0.6235	0.7921	0.8657 (89)
MIT 2	19.6807	19.1830	19.4936	19.7891	19.9530	20.0145	20.0213	20.0240	19.9946	19.8126	19.4050	19.1797 (90)
Living area fraction	20.1113	19.7014	19.9848	20.2579	20.4160	20.4767	20.4862	20.4871	20.4539	20.2753	19.8978	0.5286 (91)
MIT	20.1113	19.7014	19.9848	20.2579	20.4160	20.4767	20.4862	20.4871	20.4539	20.2753	19.8978	19.6802 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1113	19.7014	19.9848	20.2579	20.4160	20.4767	20.4862	20.4871	20.4539	20.2753	19.8978	19.6802 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8541	0.8065	0.7307	0.6080	0.4542	0.2943	0.1807	0.1969	0.4032	0.6300	0.7847	0.8571 (94)
Useful gains	444.3975	457.9083	454.2384	414.4290	320.1324	199.5356	116.8160	120.8324	228.8933	340.7869	397.5341	426.6364 (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	691.4500	646.7601	577.2018	472.1891	338.0752	202.5727	117.2337	121.3845	237.7403	393.9801	540.3299	665.9863 (97)
Space heating kWh	183.8071	126.9084	91.4848	41.5873	13.3495	0.0000	0.0000	0.0000	0.0000	39.5758	102.8129	178.0763 (98a)
Space heating requirement - total per year (kWh/year)												777.6020
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	183.8071	126.9084	91.4848	41.5873	13.3495	0.0000	0.0000	0.0000	0.0000	39.5758	102.8129	178.0763 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												777.6020
Space heating per m2										(98c) / (4) =		15.8694 (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 %)												312.7045 (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	183.8071	126.9084	91.4848	41.5873	13.3495	0.0000	0.0000	0.0000	0.0000	39.5758	102.8129	178.0763 (98)
Space heating efficiency (main heating system 1)	312.7045	312.7045	312.7045	312.7045	312.7045	0.0000	0.0000	0.0000	0.0000	312.7045	312.7045	312.7045 (210)
Space heating fuel (main heating system)	58.7798	40.5841	29.2560	13.2992	4.2690	0.0000	0.0000	0.0000	0.0000	12.6560	32.8786	56.9472 (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	181.7152	181.7152	181.7152	181.7152	181.7152	181.7152	181.7152	181.7152	181.7152	181.7152	181.7152	181.7152 (216)
Fuel for water heating, kWh/month	141.3894	125.5498	134.4011	120.3067	118.1404	91.2552	90.3312	93.6071	94.3045	121.9989	127.4184	140.1000 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	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	17.0392	13.6695	12.3079	9.0173	6.9652	5.6906	6.3539	8.2590	10.7276	14.0752	15.8980	17.5128 (232)
Electricity generated by PVs (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 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												

Full SAP Calculation Printout



(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												248.6699	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												181.7152	
Water heating fuel used												1398.8027	(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)												137.5161	(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												1784.9888	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	248.6699	26.0600	64.8034	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1398.8027	26.0600	364.5280	(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	137.5161	26.0600	35.8367	(250)
Additional standing charges			0.0000	(251)
Total energy cost			465.1681	(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	248.6699	0.1568	38.9843	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1398.8027	0.1416	198.1311	(264)
Space and water heating			237.1154	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	137.5161	0.1443	19.8478	(268)
Total CO2, kg/year			256.9632	(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	248.6699	1.5804	392.9877	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1398.8027	1.5238	2131.4961	(278)
Space and water heating			2524.4838	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	137.5161	1.5338	210.9269	(282)
Total Primary energy kWh/year			2735.4106	(286)

Predicted Energy Assessment



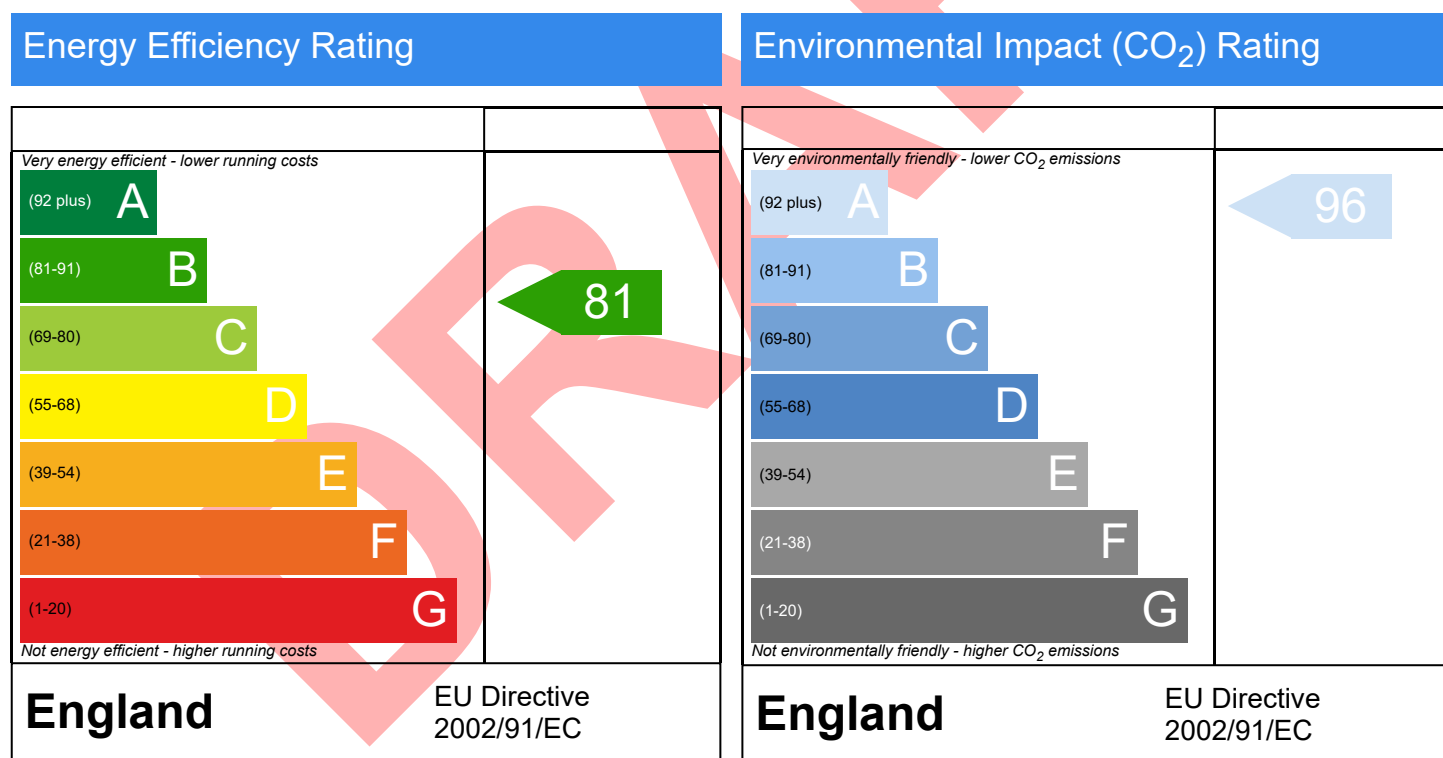
Zoar Chapel , Flat 6, South Street , Reading

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.

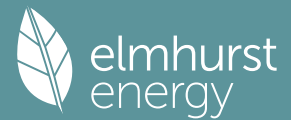
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.



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	01112	Issued on Date	03/07/2024
Assessment Reference	00001	Prop Type Ref	Semi-Detached Flat
Property	Zoar Chapel , Flat 6, South Street , Reading		

SAP Rating	81 B	DER	5.53	TER	13.94
Environmental	96 A	% DER < TER			60.33
CO ₂ Emissions (t/year)	0.26	DFEE	28.43	TFEE	30.72
Compliance Check	See BREL	% DFEE < TFEE			7.46
% DPER < TPER	20.41	DPER	58.69	TPER	73.74

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	6.00	0.04	TD5
External wall	E3 Sill	Independently assessed	0.012	3.00	0.04	TD5
External wall	E4 Jamb	Independently assessed	0.023	6.62	0.15	TD5
External wall	E16 Corner (normal)	Independently assessed	0.075	4.90	0.37	TD5
External wall	E17 Corner (inverted – internal area greater than external area)	Independently assessed	-0.045	2.45	-0.11	TD5
External wall	E18 Party wall between dwellings	Table K1 - Default	0.240	7.35	1.76	
External wall	E7 Party floor between dwellings (in blocks of flats)	Independently assessed	0.022	27.00	0.59	TD5

Total: 57.32 W/mK:
Y-Value: 0.04 W/m²K: