

Building Regulations England Part L (BREL) Compliance Report

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

Date: Wed 03 Jul 2024 11:34:20

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

Dwelling Details			
Assessment Type	As designed	Total Floor Area	49 m ²
Site Reference	01108	Plot Reference	00001
Address	Flat 2 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	15.8 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	5.8 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	83.8 kWh _{PE} /m ²		
Dwelling primary energy	61.51 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	39.6 kWh/m ²		
Dwelling fabric energy efficiency	35.2 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	0.11	Heatloss Floor 1 (0.11)	OK
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)	51.218	0.18	
Sheltered wall: Walls (2)	5.54	0.16	
Party wall: Party Wall (1)	11.2	0 (!)	
Ground floor: Heatloss Floor 1, Heatloss Floor 1	49	0.11	

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
Opening, Windows	0.9	East	0.7	1 (!)
Opening, Windows	0.9	East	0.7	1 (!)
Opening, Windows	6.342	West	0.7	1 (!)
Opening, Doo to Hall	1.8	North	N/A	1.4
Opening, Windows	0.25	South	0.7	1 (!)
Opening, Windows	0.25	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	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.033 (!)	TD5
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.075	TD5
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.045	TD5
Party wall	P1: Ground floor	SAP table default	0.32	
External wall	E18: Party wall between dwellings	SAP table default	0.24	

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	317.3%
Emitter type	Underfloor
Flow temperature	35°C
System type	Heat Pump
Manufacturer	Vaillant Group UK Ltd
Model	aroTHERM 5kW
Commissioning	

Secondary heating system: N/A

Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water

Cylinder/store - type: Cylinder

Capacity	180 litres
Declared heat loss	1.4 kWh/day
Primary pipework insulated	Yes
Manufacturer	
Model	
Commissioning	

Waste water heat recovery system 1 - type: N/A

Efficiency	
Manufacturer	
Model	

6 Controls

Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services

Function	
Ecodesign class	
Manufacturer	
Model	

Water heating - type: N/A

Manufacturer	
Model	

7 Lighting

Minimum permitted light source efficacy	75 lm/W	
Lowest light source efficacy	90 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: N/A		
Maximum permitted specific fan power	N/A	
Specific fan power	N/A	N/A
Minimum permitted heat recovery efficiency	N/A	
Heat recovery efficiency	N/A	N/A
Manufacturer/Model		
Commissioning		
9 Local generation		
N/A		
10 Heat networks		
N/A		
11 Supporting documentary evidence		
N/A		
12 Declarations		
a. Assessor Declaration		
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.		
Signed: Name:	Assessor ID: Date:	
b. Client Declaration		
N/A		

Summary for Input Data

Property Reference	01108	Issued on Date	03/07/2024
Assessment Reference	00001	Prop Type Ref	
Property	Zoar Chapel , Flat 2 , South Street , Reading		

SAP Rating	80 C	DER	5.80	TER	15.80
Environmental	96 A	% DER < TER			63.29
CO ₂ Emissions (t/year)	0.27	DFEE	35.17	TFEE	39.63
Compliance Check	See BREL	% DFEE < TFEE			11.27
% DPER < TPER	26.60	DPER	61.51	TPER	83.80

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	Ground-floor flat
Which Floor	0
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

kJ/m²K

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	51.22	0.00	None	8.64	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

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Heatloss Floor 1	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.11	None	0.00	75.00	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	1.80	0
Opening	Windows	External Wall 1	West	6.34	0
Opening	Doo to Hall	Wall to Stairs	North	1.80	0
Opening	Windows	External Wall 1	South	0.50	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
E5 Ground floor (normal)	Independently assessed	27.43	0.03	0.03 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
P1 Party wall - Ground floor	Table K1 - Default	4.57	0.32	0.32	No
E18 Party wall between dwellings	Table K1 - Default	7.35	0.24	0.24	No

Y-value W/m²K

18.0 Pressure Testing

Designed AP₅₀ m²/(h.m²) @ 50 Pa

Property Tested?

Test Method

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System

22.0 Lighting

No Fixed Lighting

Name	Efficacy	Power	Capacity	Count
Lighting 1	90.00	5	450	8

24.0 Main Heating 1

Percentage of Heat %

Database Ref. No.

Fuel Type

SAP Code

In Winter

In Summer

Model Name

Manufacturer

System Type

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

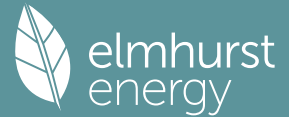
Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout



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Compliance Check	See BREL		% DFEE < TFEE				11.27
% DPER < TPER	26.60		DPER	61.51		TPER	83.80
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

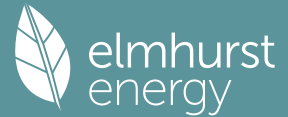
		m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
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)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Effective ac	0.3973	0.3895	0.3817	0.3428	0.3350	0.2960	0.2960	0.2882	0.3116	0.3350	0.3506	0.3661 (22b)
	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)			8.6400	0.9615	8.3077		(27)
Doo to Hall			1.8000	1.4000	2.5200		(26)
Heatloss Floor 1			49.0000	0.1100	5.3900	75.0000	3675.0000 (28a)
External Wall 1	59.8635	8.6400	51.2235	0.1800	9.2202	14.0000	717.1290 (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)			116.2035				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.3243		(33)
Party Wall 1			11.2000	0.0000	0.0000	20.0000	224.0000 (32)
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) =		6579.0390 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							134.2661 (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	
E5 Ground floor (normal)				27.4300	0.0330	0.9052	
E16 Corner (normal)				4.9000	0.0750	0.3675	

Full SAP Calculation Printout



E17 Corner (inverted - internal area greater than external area)	2.4500	-0.0450	-0.1103	
P1 Party wall - Ground floor	4.5700	0.3200	1.4624	
E18 Party wall between dwellings	7.3500	0.2400	1.7640	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				4.6131 (36)
Point Thermal bridges				0.0000
Total fabric heat loss		(33) + (36) + (36a) =		30.9374 (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												
	53.8723	53.7509	53.6319	53.0729	52.9684	52.4815	52.4815	52.3914	52.6690	52.9684	53.1799	53.4011 (39)
Average = Sum(39)m / 12 =												53.0724
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0994	1.0970	1.0945	1.0831	1.0810	1.0711	1.0711	1.0692	1.0749	1.0810	1.0853	1.0898 (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)
	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)	
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	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)

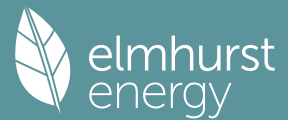
Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	74.7629	82.7732	74.7629	77.2550	74.7629	77.2550	74.7629	74.7629	77.2550	74.7629	77.2550	74.7629 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	144.6370	146.1379	142.3557	134.3039	124.1400	114.5873	108.2055	106.7047	110.4868	118.5386	128.7025	138.2552 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281 (71)
Water heating gains (Table 5)	134.1641	132.2249	128.4888	120.2995	115.2835	76.0671	72.8465	75.5068	78.6260	118.4170	126.2674	133.1169 (72)
Total internal gains	401.4744	409.0465	393.5179	379.7689	362.0969	315.8199	303.7254	304.8849	314.2783	359.6290	380.1354	394.0455 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
East				1.8000	19.6403		0.6300		0.7000		0.7700		10.8042 (76)
South				0.5000	46.7521		0.6300		0.7000		0.7700		7.1440 (78)
West				6.3400	19.6403		0.6300		0.7000		0.7700		38.0547 (80)
Solar gains	56.0029	107.2784	172.3077	246.4088	298.8926	304.8935	290.6937	251.5527	198.6361	126.0314	69.3894	46.3523	(83)
Total gains	457.4773	516.3249	565.8256	626.1777	660.9895	620.7135	594.4191	556.4376	512.9143	485.6604	449.5248	440.3978	(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	33.9230	33.9996	34.0751	34.4339	34.5019	34.8220	34.8220	34.8819	34.6980	34.5019	34.3647	34.2223	
alpha	3.2615	3.2666	3.2717	3.2956	3.3001	3.3215	3.3215	3.3255	3.3132	3.3001	3.2910	3.2815	
util living area	0.9426	0.9161	0.8705	0.7768	0.6450	0.5064	0.3780	0.4175	0.6233	0.8133	0.9135	0.9482 (86)	
Living	19.6756	19.8747	20.1561	20.4956	20.7318	20.8503	20.8909	20.8845	20.7915	20.4952	20.0402	19.6435	
Non living	18.4687	18.7170	19.0641	19.4746	19.7387	19.8649	19.8976	19.8953	19.8119	19.4864	18.9349	18.4346	
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	20.3225	19.8747	20.1561	20.4956	20.7318	20.8503	20.8909	20.8845	20.7915	20.4952	20.0402	19.8332 (87)	
Th 2	20.0013	20.0033	20.0053	20.0146	20.0164	20.0245	20.0245	20.0261	20.0214	20.0164	20.0129	20.0092 (88)	
util rest of house	0.9333	0.9029	0.8503	0.7438	0.5959	0.4393	0.2984	0.3350	0.5561	0.7776	0.8978	0.9397 (89)	
MIT 2	19.3903	18.7170	19.0641	19.4746	19.7387	19.8649	19.8976	19.8953	19.8119	19.4864	18.9349	18.7183 (90)	
Living area fraction									fLA = Living area / (4) =				0.5286 (91)
MIT	19.8830	19.3289	19.6413	20.0143	20.2636	20.3858	20.4226	20.4181	20.3297	20.0196	19.5191	19.3076 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.8830	19.3289	19.6413	20.0143	20.2636	20.3858	20.4226	20.4181	20.3297	20.0196	19.5191	19.3076 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9321	0.8926	0.8421	0.7438	0.6087	0.4648	0.3314	0.3689	0.5783	0.7777	0.8886	0.9327 (94)
Useful gains	426.3953	460.8620	476.4701	465.7433	402.3749	288.5282	196.9807	205.2718	296.6205	377.6938	399.4412	410.7420 (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	839.4944	775.5686	704.7937	589.8669	453.6015	303.6449	200.6176	210.5150	328.1109	498.9401	660.4467	806.7647 (97)
Space heating kWh	307.3457	211.4829	169.8728	89.3690	38.1126	0.0000	0.0000	0.0000	0.0000	90.2072	187.9239	294.6409 (98a)
Space heating requirement - total per year (kWh/year)												1388.9550
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	307.3457	211.4829	169.8728	89.3690	38.1126	0.0000	0.0000	0.0000	0.0000	90.2072	187.9239	294.6409 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1388.9550
Space heating per m2										(98c) / (4) =		28.3460 (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 %)													317.3343 (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	307.3457	211.4829	169.8728	89.3690	38.1126	0.0000	0.0000	0.0000	0.0000	90.2072	187.9239	294.6409 (98)	
Space heating efficiency (main heating system 1)	317.3343	317.3343	317.3343	317.3343	317.3343	0.0000	0.0000	0.0000	0.0000	317.3343	317.3343	317.3343 (210)	
Space heating fuel (main heating system)	96.8523	66.6435	53.5312	28.1624	12.0102	0.0000	0.0000	0.0000	0.0000	28.4265	59.2195	92.8487 (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	183.4781	183.4781	183.4781	183.4781	183.4781	183.4781	183.4781	183.4781	183.4781	183.4781	183.4781	183.4781 (216)	
Fuel for water heating, kWh/month	140.0310	124.3436	133.1098	119.1509	117.0053	90.3784	89.4633	92.7077	93.3984	120.8268	126.1942	138.7539 (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	17.1787	13.7814	12.4086	9.0911	7.0222	5.7372	6.4059	8.3266	10.8155	14.1905	16.0281	17.6562 (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													437.6945 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													183.4781
Water heating fuel used													1385.3633 (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)													138.6420 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													

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PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	1961.6998 (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	437.6945	0.1558	68.1952 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1385.3633	0.1416	196.2275 (264)
Space and water heating			264.4227 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	138.6420	0.1443	20.0103 (268)
Total CO2, kg/year			284.4330 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.8000 (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	437.6945	1.5768	690.1521 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1385.3633	1.5238	2111.0171 (278)
Space and water heating			2801.1692 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	138.6420	1.5338	212.6537 (282)
Total Primary energy kWh/year			3013.8229 (286)
Dwelling Primary energy Rate (DPER)			61.5100 (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)	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)

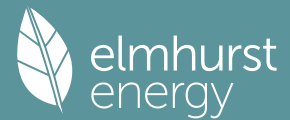
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1666 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4166	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [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)			8.6400	1.1450	9.8931		(27)
Heatloss Floor 1			49.0000	0.1300	6.3700		(28a)

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External Wall 1	59.8635	8.6400	51.2235	0.1800	9.2202	(29a)
Wall to Stairs	7.3400	1.8000	5.5400	0.1800	0.9972	(29a)
Total net area of external elements Aum(A, m2)			116.2035			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.2806	(33)
Party Wall 1			11.2000	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 144.2661 (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	
E5 Ground floor (normal)			27.4300	0.1600	4.3888	
E16 Corner (normal)			4.9000	0.0900	0.4410	
E17 Corner (inverted - internal area greater than external area)			2.4500	-0.0900	-0.2205	
P1 Party wall - Ground floor			4.5700	0.0800	0.3656	
E18 Party wall between dwellings			7.3500	0.0600	0.4410	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)					6.1969	(36)
Point Thermal bridges					0.0000	(36a) =
Total fabric heat loss					(33) + (36) + (36a) =	34.4775 (37)

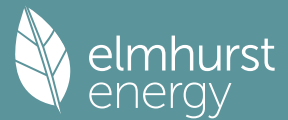
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(38)
Heat transfer coeff	23.8460	23.6892	23.5355	22.8136	22.6786	22.0499	22.0499	21.9335	22.2921	22.6786	22.9518	23.2374	(39)
Average = Sum(39)m / 12 =	58.3234	58.1666	58.0130	57.2911	57.1561	56.5273	56.5273	56.4109	56.7695	57.1561	57.4293	57.7149	(39)
												57.2905	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(40)
HLP (average)	1.1903	1.1871	1.1839	1.1692	1.1665	1.1536	1.1536	1.1512	1.1586	1.1665	1.1720	1.1779	(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													(42a)
Hot water usage for baths													(42b)
Hot water usage for other uses													(42c)
Average daily hot water use (litres/day)													(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													(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													(56)
If cylinder contains dedicated solar storage													(57)
Primary loss													(59)
Combi loss													(61)
Total heat required for water heating calculated for each month													(62)
WWHRS													(63a)
PV diverter													(63b)
Solar input													(63c)
FGHRS													(63d)
Output from w/h													(64)
12Total per year (kWh/year)													(64)
Electric shower(s)													(64a)
													(64a)
Heat gains from water heating, kWh/month													(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	(66)
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	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	74.7629	82.7732	74.7629	77.2550	74.7629	77.2550	74.7629	74.7629	77.2550	74.7629	77.2550	74.7629	(68)
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	(69)
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	(70)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(71)
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	(72)
Total internal gains	128.1265	126.1874	122.4513	114.2620	109.2460	104.0029	100.7822	103.4426	106.5618	112.3795	120.2299	127.0794	(73)

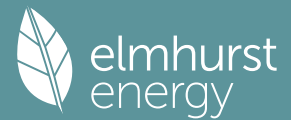
6. Solar gains													
[Jan]	Area	Solar flux	g	FF	Access	Gains							
	m2	Table 6a	Specific data	Specific data	factor	W							

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					W/m2	or Table 6b		or Table 6c		Table 6d					
East					1.8000	19.6403	0.6300	0.7000		0.7700		10.8042	(76)		
South					0.5000	46.7521	0.6300	0.7000		0.7700		7.1440	(78)		
West					6.3400	19.6403	0.6300	0.7000		0.7700		38.0547	(80)		
Solar gains	56.0029	107.2784	172.3077	246.4088	298.8926	304.8935	290.6937	251.5527	198.6361	126.0314	69.3894	46.3523	(83)		
Total gains	454.4398	513.2873	562.7881	623.1401	657.9519	648.6492	622.3549	584.3733	540.8501	482.6228	446.4873	437.3602	(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	33.6678	33.7586	33.8480	34.2745	34.3555	34.7376	34.7376	34.8093	34.5894	34.3555	34.1920	34.0228			
alpha	3.2445	3.2506	3.2565	3.2850	3.2904	3.3158	3.3158	3.3206	3.3060	3.2904	3.2795	3.2682			
util living area	0.9532	0.9306	0.8909	0.8057	0.6796	0.5190	0.3880	0.4269	0.6327	0.8397	0.9285	0.9579	(86)		
MIT	19.2419	19.5072	19.8935	20.3750	20.7238	20.9176	20.9761	20.9670	20.8376	20.3810	19.7465	19.2039	(87)		
Th 2	19.9278	19.9304	19.9329	19.9447	19.9469	19.9573	19.9573	19.9592	19.9533	19.9469	19.9424	19.9378	(88)		
util rest of house	0.9447	0.9184	0.8716	0.7725	0.6273	0.4462	0.3008	0.3370	0.5604	0.8043	0.9138	0.9502	(89)		
MIT 2	17.9166	18.2484	18.7264	19.3095	19.7008	19.9008	19.9464	19.9430	19.8305	19.3337	18.5611	17.8756	(90)		
Living area fraction									fLA =	Living area / (4) =		0.5286	(91)		
MIT	18.6171	18.9138	19.3433	19.8727	20.2415	20.4382	20.4907	20.4843	20.3628	19.8873	19.1877	18.5777	(92)		
Temperature adjustment												0.0000			
adjusted MIT	18.6171	18.9138	19.3433	19.8727	20.2415	20.4382	20.4907	20.4843	20.3628	19.8873	19.1877	18.5777	(93)		
8. Space heating requirement															
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Utilisation	0.9315	0.9043	0.8593	0.7700	0.6427	0.4807	0.3460	0.3832	0.5900	0.8020	0.9011	0.9376	(94)		
Useful gains	423.3160	464.1410	483.5765	479.8070	422.8510	311.7849	215.3599	223.9362	319.1201	387.0689	402.3380	410.0817	(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	835.0230	815.1361	745.0754	628.6396	488.2000	330.0189	219.9296	230.3985	355.5384	530.8230	694.1872	829.8074	(97)		
Space heating kWh	306.3100	235.8687	194.5552	107.1595	48.6196	0.0000	0.0000	0.0000	0.0000	106.9531	210.1314	312.2759	(98a)		
Space heating requirement - total per year (kWh/year)												1521.8734			
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	306.3100	235.8687	194.5552	107.1595	48.6196	0.0000	0.0000	0.0000	0.0000	106.9531	210.1314	312.2759	(98c)		
Space heating requirement after solar contribution - total per year (kWh/year)												1521.8734			
Space heating per m2										(98c) / (4) =		31.0586	(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	306.3100	235.8687	194.5552	107.1595	48.6196	0.0000	0.0000	0.0000	0.0000	106.9531	210.1314	312.2759	(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)	331.8635	255.5457	210.7857	116.0991	52.6756	0.0000	0.0000	0.0000	0.0000	115.8755	227.6613	338.3271	(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	85.0831	84.7755	84.2008	83.1532	81.7477	79.8000	79.8000	79.8000	79.8000	83.1196	84.4939	79.8000	(216)		
Fuel for water heating, kWh/month	227.6099	202.2345	217.0024	195.0253	193.5246	180.0137	178.7344	185.1100	186.3255	197.8711	205.0225	225.2062	(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	15.5342	12.4621	11.2208	8.2208	6.3500	5.1880	5.7927	7.5296	9.7801	12.8321	14.4938	15.9660	(232)		
Electricity generated by PVs (Appendix M) (negative quantity)	-16.8902	-24.6988	-36.8209	-43.0095	-47.8079	-45.1810	-44.6623	-41.4731	-36.0605	-28.9864	-18.8933	-14.5034	(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)	-7.0250	-15.0083	-30.2502	-46.0403	-61.4514	-61.9221	-61.1595	-51.4926	-37.3837	-21.6253	-9.4345	-5.5356	(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												1648.8336	(211)		
Space heating fuel - main system 2												0.0000	(213)		
Space heating fuel - secondary												0.0000	(215)		

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Efficiency of water heater	79.8000
Water heating fuel used	2393.6801 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	125.3703 (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	3446.5680 (238)

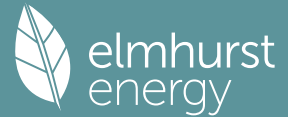
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1648.8336	0.2100	346.2550 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2393.6801	0.2100	502.6728 (264)
Space and water heating			848.9279 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	125.3703	0.1443	18.0948 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-398.9874	0.1338	-53.3822
PV Unit electricity exported	-408.3286	0.1255	-51.2543
Total			-104.6365 (269)
Total CO2, kg/year			774.3154 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.8000 (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	1648.8336	1.1300	1863.1819 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2393.6801	1.1300	2704.8585 (278)
Space and water heating			4568.0404 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	125.3703	1.5338	192.2971 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-398.9874	1.4944	-596.2610
PV Unit electricity exported	-408.3286	0.4607	-188.1320
Total			-784.3930 (283)
Total Primary energy kWh/year			4106.0453 (286)
Target Primary Energy Rate (TPER)			83.8000 (287)

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Property Reference	01108				Issued on Date	03/07/2024	
Assessment Reference	00001			Prop Type Ref			
Property	Zoar Chapel , Flat 2 , South Street , Reading						
SAP Rating	80 C		DER	5.80		TER	15.80
Environmental	96 A		% DER < TER				63.29
CO ₂ Emissions (t/year)	0.27		DFEE	35.17		TFEE	39.63
Compliance Check	See BREL		% DFEE < TFEE				11.27
% DPER < TPER	26.60		DPER	61.51		TPER	83.80
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

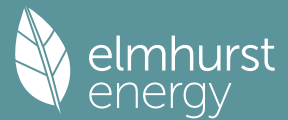
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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)			8.6400	0.9615	8.3077		(27)
Doo to Hall			1.8000	1.4000	2.5200		(26)
Heatloss Floor 1			49.0000	0.1100	5.3900	75.0000	3675.0000 (28a)
External Wall 1	59.8635	8.6400	51.2235	0.1800	9.2202	14.0000	717.1290 (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)			116.2035				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.3243		(33)
Party Wall 1			11.2000	0.0000	0.0000	20.0000	224.0000 (32)
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) =		7069.0390 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							144.2661 (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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E5 Ground floor (normal)	27.4300	0.0330	0.9052
E16 Corner (normal)	4.9000	0.0750	0.3675
E17 Corner (inverted - internal area greater than external area)	2.4500	-0.0450	-0.1103
P1 Party wall - Ground floor	4.5700	0.3200	1.4624
E18 Party wall between dwellings	7.3500	0.2400	1.7640
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.6131 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	30.9374 (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 =	53.8723	53.7509	53.6319	53.0729	52.9684	52.4815	52.4815	52.3914	52.6690	52.9684	53.1799	53.4011 (39)
												53.0724
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0994	1.0970	1.0945	1.0831	1.0810	1.0711	1.0711	1.0692	1.0749	1.0810	1.0853	1.0898 (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												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)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	54.1497	52.6649	51.0436	49.0251	47.2246	45.3534	44.9640	46.5820	48.2415	50.1632	52.1997	54.0736 (44)
Energy content (annual)	85.7599	74.9941	78.4522	67.1129	63.5734	55.7673	54.3801	57.6783	59.4866	68.0710	74.3680	84.6662 (45)
Distribution loss (46)m = 0.15 x (45)m												824.3098
Water storage loss:												
Total storage loss												0.0000 (46)
If cylinder contains dedicated solar storage												0.0000 (56)
Primary loss												0.0000 (57)
Combi loss												0.0000 (59)
Total heat required for water heating calculated for each month												0.0000 (61)
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)												701 (64)
Heat gains from water heating, kWh/month	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)
	28.6476	25.2238	26.8127	23.9395	23.3690	21.2557	21.2744	22.1163	22.3190	24.6067	25.7541	28.4152 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 474.2733 (64a)												

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	74.7629	82.7732	74.7629	77.2550	74.7629	77.2550	74.7629	74.7629	77.2550	74.7629	77.2550	74.7629 (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)
	305.8152	314.3570	301.0677	292.7187	278.2233	269.2746	259.4736	259.1042	266.6508	274.2856	289.6377	299.1211 (73)

6. Solar gains												
[Jan]			Area	Solar flux	g	FF	Access	Gains				
			m2	Table 6a	Specific data	Specific data	factor	W				
				W/m2	or Table 6b	or Table 6c	Table 6d					
East			1.8000	19.6403	0.6300	0.7000	0.7700	10.8042 (76)				
South			0.5000	46.7521	0.6300	0.7000	0.7700	7.1440 (78)				
West			6.3400	19.6403	0.6300	0.7000	0.7700	38.0547 (80)				
Solar gains	56.0029	107.2784	172.3077	246.4088	298.8926	304.8935	290.6937	251.5527	198.6361	126.0314	69.3894	46.3523 (83)
Total gains	361.8181	421.6354	473.3754	539.1275	577.1159	574.1681	550.1673	510.6569	465.2869	400.3169	359.0270	345.4733 (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	36.4495	36.5319	36.6129	36.9985	37.0716	37.4155	37.4155	37.4799	37.2823	37.0716	36.9241	36.7712
alpha	3.4300	3.4355	3.4409	3.4666	3.4714	3.4944	3.4944	3.4987	3.4855	3.4714	3.4616	3.4514
util living area	0.9732	0.9548	0.9203	0.8386	0.7114	0.5440	0.4078	0.4533	0.6732	0.8813	0.9560	0.9768 (86)
MIT	19.1753	19.4565	19.8586	20.3637	20.7251	20.9210	20.9779	20.9680	20.8316	20.3365	19.6752	19.1298 (87)
Th 2	20.0013	20.0033	20.0053	20.0146	20.0164	20.0245	20.0245	20.0261	20.0214	20.0164	20.0129	20.0092 (88)
util rest of house	0.9682	0.9464	0.9055	0.8097	0.6624	0.4733	0.3222	0.3646	0.6046	0.8530	0.9465	0.9724 (89)
MIT 2	18.3498	18.6268	19.0186	19.5012	19.8213	19.9811	20.0163	20.0133	19.9188	19.4895	18.8522	18.3107 (90)
Living area fraction									FLA = Living area / (4) =			0.5286 (91)
MIT	18.7861	19.0654	19.4626	19.9571	20.2991	20.4779	20.5246	20.5179	20.4013	19.9372	19.2872	18.7437 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7861	19.0654	19.4626	19.9571	20.2991	20.4779	20.5246	20.5179	20.4013	19.9372	19.2872	18.7437 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9603	0.9368	0.8961	0.8078	0.6772	0.5071	0.3667	0.4103	0.6326	0.8504	0.9378	0.9652 (94)
Useful gains	347.4433	394.9986	424.1986	435.5100	390.8345	291.1354	201.7573	209.5000	294.3219	340.4316	336.7004	333.4351 (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	780.4001	761.4009	695.2111	586.8311	455.4780	308.4821	205.9682	215.7435	331.8809	494.5751	648.1162	776.6491 (97)
Space heating kWh	322.1199	246.2223	201.6333	108.9512	48.0948	0.0000	0.0000	0.0000	0.0000	114.6828	224.2194	329.7512 (98a)
Space heating requirement - total per year (kWh/year)												1595.6748
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	322.1199	246.2223	201.6333	108.9512	48.0948	0.0000	0.0000	0.0000	0.0000	114.6828	224.2194	329.7512 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1595.6748
Space heating per m2										(98c) / (4) =		32.5648 (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	493.3262	388.3632	398.1743	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8676	0.9159	0.8936	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	428.0320	355.7138	355.8048	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	643.2971	616.7746	572.0361	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	154.9909	194.2292	160.8761	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	38.7477	48.5573	40.2190	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												127.5241 (107)
Energy for space heating												32.5648 (99)
Energy for space cooling												2.6025 (108)
Total												35.1673 (109)
Fabric Energy Efficiency (DFEE)												35.2 (109)

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

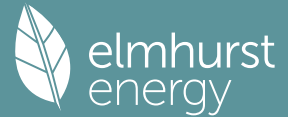
1. Overall dwelling characteristics

	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)

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Infiltration rate												0.4166 (18)
Number of sides sheltered												2 (19)
Shelter factor												(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) = 0.3541 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.4515	0.4426	0.4338	0.3895	0.3807	0.3364	0.3364	0.3275	0.3541	0.3807	0.3984	0.4161 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.6019	0.5980	0.5941	0.5759	0.5725	0.5566	0.5566	0.5536	0.5627	0.5725	0.5793	0.5866 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8000	1.0000	1.8000			(26)				
TER Opening Type (Uw = 1.20)			8.6400	1.1450	9.8931			(27)				
Heatloss Floor 1			49.0000	0.1300	6.3700			(28a)				
External Wall 1	59.8635	8.6400	51.2235	0.1800	9.2202			(29a)				
Wall to Stairs	7.3400	1.8000	5.5400	0.1800	0.9972			(29a)				
Total net area of external elements Aum(A, m2)			116.2035					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26)... (30) + (32) =	28.2806			(33)				
Party Wall 1			11.2000	0.0000	0.0000			(32)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								144.2661 (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						
E5 Ground floor (normal)				27.4300	0.1600	4.3888						
E16 Corner (normal)				4.9000	0.0900	0.4410						
E17 Corner (inverted - internal area greater than external area)				2.4500	-0.0900	-0.2205						
P1 Party wall - Ground floor				4.5700	0.0800	0.3656						
E18 Party wall between dwellings				7.3500	0.0600	0.4410						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								6.1969 (36)				
Point Thermal bridges								(36a) = 0.0000				
Total fabric heat loss								(33) + (36) + (36a) = 34.4775 (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	58.3234	58.1666	58.0130	57.2911	57.1561	56.5273	56.5273	56.4109	56.7695	57.1561	57.4293	57.7149 (39)
Average = Sum(39)m / 12 =												57.2905
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1903	1.1871	1.1839	1.1692	1.1665	1.1536	1.1536	1.1512	1.1586	1.1665	1.1720	1.1779 (40)
HLP (average)												1.1692
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

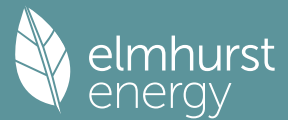
4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6607 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
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 (42c)
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)
												49.6337 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	54.1497	52.6649	51.0436	49.0251	47.2246	45.3534	44.9640	46.5820	48.2415	50.1632	52.1997	54.0736 (44)
Energy content (annual)	85.7599	74.9941	78.4522	67.1129	63.5734	55.7673	54.3801	57.6783	59.4866	68.0710	74.3680	84.6662 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 824.3098
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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	72.8959	63.7450	66.6843	57.0459	54.0374	47.4022	46.2231	49.0265	50.5636	57.8604	63.2128	71.9662 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	72.8959	63.7450	66.6843	57.0459	54.0374	47.4022	46.2231	49.0265	50.5636	57.8604	63.2128	71.9662 (64)
12Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m = 700.6633 (64)
Electric shower(s)	41.6946	37.1502	40.5666	38.7122	39.4386	37.6206	38.8746	39.4386	38.7122	40.5666	39.8038	41.6946 (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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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(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	74.7629	82.7732	74.7629	77.2550	74.7629	77.2550	74.7629	74.7629	77.2550	74.7629	77.2550	74.7629	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	144.6370	146.1379	142.3557	134.3039	124.1400	114.5873	108.2055	106.7047	110.4868	118.5386	128.7025	138.2552	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	(71)
Water heating gains (Table 5)	38.5049	37.5354	36.0386	33.2494	31.4099	29.5218	28.5947	29.7262	30.9986	33.0736	35.7696	38.1925	(72)
Total internal gains	305.8152	314.3570	301.0677	292.7187	278.2233	269.2746	259.4736	259.1042	266.6508	274.2856	289.6377	299.1211	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W	
East					1.8000	19.6403	0.6300		0.7000	0.7700	10.8042 (76)	
South					0.5000	46.7521	0.6300		0.7000	0.7700	7.1440 (78)	
West					6.3400	19.6403	0.6300		0.7000	0.7700	38.0547 (80)	
Solar gains	56.0029	107.2784	172.3077	246.4088	298.8926	304.8935	290.6937	251.5527	198.6361	126.0314	69.3894	46.3523 (83)
Total gains	361.8181	421.6354	473.3754	539.1275	577.1159	574.1681	550.1673	510.6569	465.2869	400.3169	359.0270	345.4733 (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	33.6678	33.7586	33.8480	34.2745	34.3555	34.7376	34.7376	34.8093	34.5894	34.3555	34.1920	34.0228
alpha	3.2445	3.2506	3.2565	3.2850	3.2904	3.3158	3.3158	3.3206	3.3060	3.2904	3.2795	3.2682
util living area	0.9743	0.9575	0.9264	0.8524	0.7345	0.5717	0.4337	0.4803	0.6979	0.8911	0.9586	0.9776 (86)
MIT	18.9798	19.2666	19.6888	20.2361	20.6477	20.8900	20.9667	20.9532	20.7804	20.2223	19.5165	18.9391 (87)
Th 2	19.9278	19.9304	19.9329	19.9447	19.9469	19.9573	19.9573	19.9592	19.9533	19.9469	19.9424	19.9378 (88)
util rest of house	0.9693	0.9493	0.9120	0.8239	0.6843	0.4955	0.3383	0.3822	0.6265	0.8634	0.9493	0.9733 (89)
MIT 2	18.1049	18.3882	18.8012	19.3282	19.6968	19.8972	19.9452	19.9408	19.8196	19.3299	18.6464	18.0719 (90)
Living area fraction	18.5673	18.8525	19.2704	19.8081	20.1994	20.4220	20.4852	20.4759	20.3274	19.8016	19.1063	18.5302 (91)
MIT	18.5673	18.8525	19.2704	19.8081	20.1994	20.4220	20.4852	20.4759	20.3274	19.8016	19.1063	18.5302 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5673	18.8525	19.2704	19.8081	20.1994	20.4220	20.4852	20.4759	20.3274	19.8016	19.1063	18.5302 (93)

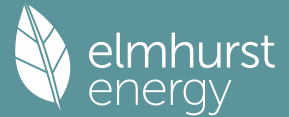
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9610	0.9391	0.9014	0.8198	0.6971	0.5307	0.3875	0.4322	0.6537	0.8590	0.9399	0.9656	(94)
Useful gains	347.6926	395.9377	426.6933	441.9509	402.3137	304.7041	213.2159	220.7006	304.1544	343.8573	337.4627	333.5859	(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	832.1205	811.5706	740.8460	624.9344	485.7919	329.0998	219.6175	229.9279	353.5281	525.9262	689.5144	827.0687	(97)
Space heating kWh	360.4143	279.3053	233.7296	131.7481	62.1077	0.0000	0.0000	0.0000	0.0000	135.4593	253.4772	367.1512	(98a)
Space heating requirement - total per year (kWh/year)												1823.3928	
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	360.4143	279.3053	233.7296	131.7481	62.1077	0.0000	0.0000	0.0000	0.0000	135.4593	253.4772	367.1512	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1823.3928	
Space heating per m2											(98c) / (4) =	37.2121	(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	531.3570	418.3023	428.7229	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8357	0.8908	0.8650	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	444.0429	372.6057	370.8539	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	643.2971	616.7746	572.0361	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	143.4630	181.6616	149.6796	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	35.8657	45.4154	37.4199	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												118.7010 (107)
Energy for space heating												37.2121 (99)
Energy for space cooling												2.4225 (108)
Total												39.6346 (109)
Fabric Energy Efficiency (TFEE)												39.6 (109)

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Property Reference	01108				Issued on Date	03/07/2024	
Assessment Reference	00001			Prop Type Ref			
Property	Zoar Chapel , Flat 2 , South Street , Reading						
SAP Rating	80 C		DER	5.80		TER	15.80
Environmental	96 A		% DER < TER				63.29
CO ₂ Emissions (t/year)	0.27		DFEE	35.17		TFEE	39.63
Compliance Check	See BREL		% DFEE < TFEE				11.27
% DPER < TPER	26.60		DPER	61.51		TPER	83.80
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)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Effective ac	0.3973	0.3895	0.3817	0.3428	0.3350	0.2960	0.2960	0.2882	0.3116	0.3350	0.3506	0.3661 (22b)
	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)			8.6400	0.9615	8.3077		(27)
Doo to Hall			1.8000	1.4000	2.5200		(26)
Heatloss Floor 1			49.0000	0.1100	5.3900	75.0000	3675.0000 (28a)
External Wall 1	59.8635	8.6400	51.2235	0.1800	9.2202	14.0000	717.1290 (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)			116.2035				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.3243		(33)
Party Wall 1			11.2000	0.0000	0.0000	20.0000	224.0000 (32)
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) =		6579.0390 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							134.2661 (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
E5 Ground floor (normal)				27.4300	0.0330		0.9052
E16 Corner (normal)				4.9000	0.0750		0.3675

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E17 Corner (inverted - internal area greater than external area)	2.4500	-0.0450	-0.1103
P1 Party wall - Ground floor	4.5700	0.3200	1.4624
E18 Party wall between dwellings	7.3500	0.2400	1.7640
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.6131 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	30.9374 (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
Heat transfer coeff												(38)
	53.8723	53.7509	53.6319	53.0729	52.9684	52.4815	52.4815	52.3914	52.6690	52.9684	53.1799	53.4011
Average = Sum(39)m / 12 =												53.0724
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0994	1.0970	1.0945	1.0831	1.0810	1.0711	1.0711	1.0692	1.0749	1.0810	1.0853	1.0898
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31
												(40)
												1.0831
												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)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =	2541.8378	(64a)	
Electric shower(s)											2542	(64)	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)	
												0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													
Heat gains from water heating, kWh/month													
99.8181	88.8551	95.5957	86.6157	85.7710	54.7683	54.1978	56.1771	56.6107	88.1023	90.9125	99.0390	(65)	

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

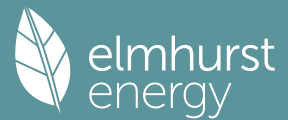
Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	74.7629	82.7732	74.7629	77.2550	74.7629	77.2550	74.7629	74.7629	77.2550	74.7629	77.2550	74.7629	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	144.6370	146.1379	142.3557	134.3039	124.1400	114.5873	108.2055	106.7047	110.4868	118.5386	128.7025	138.2552	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	(71)
Water heating gains (Table 5)													
	134.1641	132.2249	128.4888	120.2995	115.2835	76.0671	72.8465	75.5068	78.6260	118.4170	126.2674	133.1169	(72)
Total internal gains													
	401.4744	409.0465	393.5179	379.7689	362.0969	315.8199	303.7254	304.8849	314.2783	359.6290	380.1354	394.0455	(73)

6. Solar gains

[Jan]												
					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c	Access factor Table 6d		Gains W
East					1.8000	19.6403	0.6300		0.7000	0.7700		10.8042 (76)
South					0.5000	46.7521	0.6300		0.7000	0.7700		7.1440 (78)
West					6.3400	19.6403	0.6300		0.7000	0.7700		38.0547 (80)
Solar gains	56.0029	107.2784	172.3077	246.4088	298.8926	304.8935	290.6937	251.5527	198.6361	126.0314	69.3894	46.3523 (83)
Total gains	457.4773	516.3249	565.8256	626.1777	660.9895	620.7135	594.4191	556.4376	512.9143	485.6604	449.5248	440.3978 (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	33.9230	33.9996	34.0751	34.4339	34.5019	34.8220	34.8220	34.8819	34.6980	34.5019	34.3647	34.2223	
alpha	3.2615	3.2666	3.2717	3.2956	3.3001	3.3215	3.3215	3.3255	3.3132	3.3001	3.2910	3.2815	
util living area	0.9426	0.9161	0.8705	0.7768	0.6450	0.5064	0.3780	0.4175	0.6233	0.8133	0.9135	0.9482 (86)	
Living	19.6756	19.8747	20.1561	20.4956	20.7318	20.8503	20.8909	20.8845	20.7915	20.4952	20.0402	19.6435	
Non living	18.4687	18.7170	19.0641	19.4746	19.7387	19.8649	19.8976	19.8953	19.8119	19.4864	18.9349	18.4346	
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	20.3225	19.8747	20.1561	20.4956	20.7318	20.8503	20.8909	20.8845	20.7915	20.4952	20.0402	19.8332 (87)	
Th 2	20.0013	20.0033	20.0053	20.0146	20.0164	20.0245	20.0245	20.0261	20.0214	20.0164	20.0129	20.0092 (88)	
util rest of house	0.9333	0.9029	0.8503	0.7438	0.5959	0.4393	0.2984	0.3350	0.5561	0.7776	0.8978	0.9397 (89)	
MIT 2	19.3903	18.7170	19.0641	19.4746	19.7387	19.8649	19.8976	19.8953	19.8119	19.4864	18.9349	18.7183 (90)	
Living area fraction									fLA = Living area / (4) =				0.5286 (91)
MIT	19.8830	19.3289	19.6413	20.0143	20.2636	20.3858	20.4226	20.4181	20.3297	20.0196	19.5191	19.3076 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.8830	19.3289	19.6413	20.0143	20.2636	20.3858	20.4226	20.4181	20.3297	20.0196	19.5191	19.3076 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9321	0.8926	0.8421	0.7438	0.6087	0.4648	0.3314	0.3689	0.5783	0.7777	0.8886	0.9327 (94)
Useful gains	426.3953	460.8620	476.4701	465.7433	402.3749	288.5282	196.9807	205.2718	296.6205	377.6938	399.4412	410.7420 (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	839.4944	775.5686	704.7937	589.8669	453.6015	303.6449	200.6176	210.5150	328.1109	498.9401	660.4467	806.7647 (97)
Space heating kWh	307.3457	211.4829	169.8728	89.3690	38.1126	0.0000	0.0000	0.0000	0.0000	90.2072	187.9239	294.6409 (98a)
Space heating requirement - total per year (kWh/year)												1388.9550
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	307.3457	211.4829	169.8728	89.3690	38.1126	0.0000	0.0000	0.0000	0.0000	90.2072	187.9239	294.6409 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1388.9550
Space heating per m2										(98c) / (4) =		28.3460 (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 %)													317.3343 (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	307.3457	211.4829	169.8728	89.3690	38.1126	0.0000	0.0000	0.0000	0.0000	90.2072	187.9239	294.6409 (98)	
Space heating efficiency (main heating system 1)	317.3343	317.3343	317.3343	317.3343	317.3343	0.0000	0.0000	0.0000	0.0000	317.3343	317.3343	317.3343 (210)	
Space heating fuel (main heating system)	96.8523	66.6435	53.5312	28.1624	12.0102	0.0000	0.0000	0.0000	0.0000	28.4265	59.2195	92.8487 (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	183.4781	183.4781	183.4781	183.4781	183.4781	183.4781	183.4781	183.4781	183.4781	183.4781	183.4781	183.4781 (216)	
Fuel for water heating, kWh/month	140.0310	124.3436	133.1098	119.1509	117.0053	90.3784	89.4633	92.7077	93.3984	120.8268	126.1942	138.7539 (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	17.1787	13.7814	12.4086	9.0911	7.0222	5.7372	6.4059	8.3266	10.8155	14.1905	16.0281	17.6562 (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													437.6945 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													183.4781
Water heating fuel used													1385.3633 (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)													138.6420 (232)

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

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PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	1961.6998 (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	437.6945	0.1558	68.1952 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1385.3633	0.1416	196.2275 (264)
Space and water heating			264.4227 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	138.6420	0.1443	20.0103 (268)
Total CO2, kg/year			284.4330 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.8000 (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	437.6945	1.5768	690.1521 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1385.3633	1.5238	2111.0171 (278)
Space and water heating			2801.1692 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	138.6420	1.5338	212.6537 (282)
Total Primary energy kWh/year			3013.8229 (286)
Dwelling Primary energy Rate (DPER)			61.5100 (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)	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

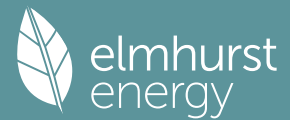
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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)			8.6400	1.1450	9.8931		(27)
Heatloss Floor 1			49.0000	0.1300	6.3700		(28a)

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External Wall 1	59.8635	8.6400	51.2235	0.1800	9.2202	(29a)
Wall to Stairs	7.3400	1.8000	5.5400	0.1800	0.9972	(29a)
Total net area of external elements Aum(A, m2)			116.2035			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.2806	(33)
Party Wall 1			11.2000	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 144.2661 (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	
E5 Ground floor (normal)			27.4300	0.1600	4.3888	
E16 Corner (normal)			4.9000	0.0900	0.4410	
E17 Corner (inverted - internal area greater than external area)			2.4500	-0.0900	-0.2205	
P1 Party wall - Ground floor			4.5700	0.0800	0.3656	
E18 Party wall between dwellings			7.3500	0.0600	0.4410	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)					6.1969	(36)
Point Thermal bridges					0.0000	(36a) =
Total fabric heat loss					(33) + (36) + (36a) =	34.4775 (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	(38)
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 =	58.3234	58.1666	58.0130	57.2911	57.1561	56.5273	56.5273	56.4109	56.7695	57.1561	57.4293	57.7149	(39)
												57.2905	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1903	1.1871	1.1839	1.1692	1.1665	1.1536	1.1536	1.1512	1.1586	1.1665	1.1720	1.1779	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6607 (42)
Hot water usage for mixer showers													
Hot water usage for baths	52.0640	51.2816	50.1414	47.9600	46.3501	44.5548	43.5344	44.6659	45.9062	47.8338	50.0621	51.8645	(42a)
Hot water usage for other uses	22.5124	22.1781	21.7073	20.8392	20.1891	19.4684	19.0790	19.5466	20.0556	20.8269	21.7129	22.4363	(42b)
Average daily hot water use (litres/day)	31.6372	30.4868	29.3364	28.1859	27.0355	25.8850	25.8850	27.0355	28.1859	29.3364	30.4868	31.6372	(42c)
												97.6350	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	106.2137	103.9465	101.1851	96.9850	93.5747	89.9082	88.4984	91.2479	94.1477	97.9970	102.2618	105.9381	(44)
Energy content (annual)	168.2165	148.0184	155.5177	132.7677	125.9695	110.5526	107.0312	112.9839	116.0936	132.9811	145.6907	165.8734	(45)
Distribution loss (46)m = 0.15 x (45)m	25.2325	22.2028	23.3276	19.9152	18.8954	16.5829	16.0547	16.9476	17.4140	19.9472	21.8536	24.8810	(46)
Water storage loss:													
Store volume													180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.5520 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8381 (55)
Total storage loss	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(56)
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	217.4592	192.4956	204.7603	180.4219	175.2122	158.2068	156.2738	162.2266	163.7478	182.2237	193.3449	215.1161	(62)
WWHRS	-23.8015	-21.0502	-22.0426	-18.2521	-17.0103	-14.5559	-13.6438	-14.5088	-15.0601	-17.7541	-20.1133	-23.3607	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	193.6577	171.4454	182.7177	162.1697	158.2019	143.6509	142.6300	147.7178	148.6877	164.4696	173.2316	191.7554	(64)
12Total per year (kWh/year)													1980.3355 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month	95.3261	84.7979	91.1038	82.2686	81.2790	74.8821	74.9820	76.9613	76.7245	83.6103	86.5655	94.5471	(65)

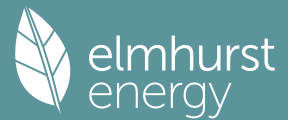
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	74.7629	82.7732	74.7629	77.2550	74.7629	77.2550	74.7629	74.7629	77.2550	74.7629	77.2550	74.7629	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	144.6370	146.1379	142.3557	134.3039	124.1400	114.5873	108.2055	106.7047	110.4868	118.5386	128.7025	138.2552	(68)
Pumps, fans	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	(69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Water heating gains (Table 5)	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	(71)
Total internal gains	128.1265	126.1874	122.4513	114.2620	109.2460	104.0029	100.7822	103.4426	106.5618	112.3795	120.2299	127.0794	(72)
	398.4369	406.0089	390.4804	376.7313	359.0593	343.7557	331.6612	332.8206	342.2141	356.5915	377.0979	391.0080	(73)

6. Solar gains

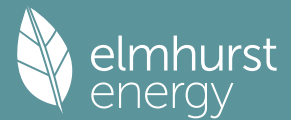
[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W
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					W/m2	or Table 6b		or Table 6c		Table 6d			
East					1.8000	19.6403	0.6300	0.7000		0.7700	10.8042 (76)		
South					0.5000	46.7521	0.6300	0.7000		0.7700	7.1440 (78)		
West					6.3400	19.6403	0.6300	0.7000		0.7700	38.0547 (80)		
Solar gains	56.0029	107.2784	172.3077	246.4088	298.8926	304.8935	290.6937	251.5527	198.6361	126.0314	69.3894	46.3523	(83)
Total gains	454.4398	513.2873	562.7881	623.1401	657.9519	648.6492	622.3549	584.3733	540.8501	482.6228	446.4873	437.3602	(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	33.6678	33.7586	33.8480	34.2745	34.3555	34.7376	34.7376	34.8093	34.5894	34.3555	34.1920	34.0228	
alpha	3.2445	3.2506	3.2565	3.2850	3.2904	3.3158	3.3158	3.3206	3.3060	3.2904	3.2795	3.2682	
util living area	0.9532	0.9306	0.8909	0.8057	0.6796	0.5190	0.3880	0.4269	0.6327	0.8397	0.9285	0.9579	(86)
MIT	19.2419	19.5072	19.8935	20.3750	20.7238	20.9176	20.9761	20.9670	20.8376	20.3810	19.7465	19.2039	(87)
Th 2	19.9278	19.9304	19.9329	19.9447	19.9469	19.9573	19.9573	19.9592	19.9533	19.9469	19.9424	19.9378	(88)
util rest of house	0.9447	0.9184	0.8716	0.7725	0.6273	0.4462	0.3008	0.3370	0.5604	0.8043	0.9138	0.9502	(89)
MIT 2	17.9166	18.2484	18.7264	19.3095	19.7008	19.9008	19.9464	19.9430	19.8305	19.3337	18.5611	17.8756	(90)
Living area fraction									fLA =	Living area / (4) =			0.5286 (91)
MIT	18.6171	18.9138	19.3433	19.8727	20.2415	20.4382	20.4907	20.4843	20.3628	19.8873	19.1877	18.5777	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6171	18.9138	19.3433	19.8727	20.2415	20.4382	20.4907	20.4843	20.3628	19.8873	19.1877	18.5777	(93)
8. Space heating requirement													
Utilisation	0.9315	0.9043	0.8593	0.7700	0.6427	0.4807	0.3460	0.3832	0.5900	0.8020	0.9011	0.9376	(94)
Useful gains	423.3160	464.1410	483.5765	479.8070	422.8510	311.7849	215.3599	223.9362	319.1201	387.0689	402.3380	410.0817	(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	835.0230	815.1361	745.0754	628.6396	488.2000	330.0189	219.9296	230.3985	355.5384	530.8230	694.1872	829.8074	(97)
Space heating kWh	306.3100	235.8687	194.5552	107.1595	48.6196	0.0000	0.0000	0.0000	0.0000	106.9531	210.1314	312.2759	(98a)
Space heating requirement - total per year (kWh/year)												1521.8734	
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	306.3100	235.8687	194.5552	107.1595	48.6196	0.0000	0.0000	0.0000	0.0000	106.9531	210.1314	312.2759	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1521.8734	
Space heating per m2										(98c) / (4) =		31.0586	(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	306.3100	235.8687	194.5552	107.1595	48.6196	0.0000	0.0000	0.0000	0.0000	106.9531	210.1314	312.2759	(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)	331.8635	255.5457	210.7857	116.0991	52.6756	0.0000	0.0000	0.0000	0.0000	115.8755	227.6613	338.3271	(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	85.0831	84.7755	84.2008	83.1532	81.7477	79.8000	79.8000	79.8000	79.8000	83.1196	84.4939	85.1466	(216)
Fuel for water heating, kWh/month	227.6099	202.2345	217.0024	195.0253	193.5246	180.0137	178.7344	185.1100	186.3255	197.8711	205.0225	225.2062	(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	15.5342	12.4621	11.2208	8.2208	6.3500	5.1880	5.7927	7.5296	9.7801	12.8321	14.4938	15.9660	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-16.8902	-24.6988	-36.8209	-43.0095	-47.8079	-45.1810	-44.6623	-41.4731	-36.0605	-28.9864	-18.8933	-14.5034	(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)	-7.0250	-15.0083	-30.2502	-46.0403	-61.4514	-61.9221	-61.1595	-51.4926	-37.3837	-21.6253	-9.4345	-5.5356	(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												1648.8336	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

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Efficiency of water heater	79.8000
Water heating fuel used	2393.6801 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	125.3703 (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	3446.5680 (238)

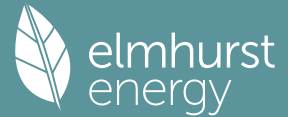
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1648.8336	0.2100	346.2550 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2393.6801	0.2100	502.6728 (264)
Space and water heating			848.9279 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	125.3703	0.1443	18.0948 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-398.9874	0.1338	-53.3822
PV Unit electricity exported	-408.3286	0.1255	-51.2543
Total			-104.6365 (269)
Total CO2, kg/year			774.3154 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.8000 (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	1648.8336	1.1300	1863.1819 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2393.6801	1.1300	2704.8585 (278)
Space and water heating			4568.0404 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	125.3703	1.5338	192.2971 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-398.9874	1.4944	-596.2610
PV Unit electricity exported	-408.3286	0.4607	-188.1320
Total			-784.3930 (283)
Total Primary energy kWh/year			4106.0453 (286)
Target Primary Energy Rate (TPER)			83.8000 (287)

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Property Reference	01108				Issued on Date	03/07/2024	
Assessment Reference	00001			Prop Type Ref			
Property	Zoar Chapel , Flat 2 , South Street , Reading						
SAP Rating	80 C		DER	5.80		TER	15.80
Environmental	96 A		% DER < TER				63.29
CO ₂ Emissions (t/year)	0.27		DFEE	35.17		TFEE	39.63
Compliance Check	See BREL		% DFEE < TFEE				11.27
% DPER < TPER	26.60		DPER	61.51		TPER	83.80
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

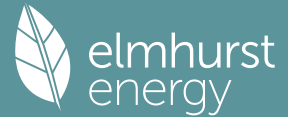
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.00)			8.6400	0.9615	8.3077		(27)
Doo to Hall			1.8000	1.4000	2.5200		(26)
Heatloss Floor 1			49.0000	0.1100	5.3900	75.0000	3675.0000 (28a)
External Wall 1	59.8635	8.6400	51.2235	0.1800	9.2202	14.0000	717.1290 (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)			116.2035				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.3243		(33)
Party Wall 1			11.2000	0.0000	0.0000	20.0000	224.0000 (32)
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)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
(28)...(30) + (32) + (32a)...(32e) = 7069.0390 (34)
144.2661 (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
E5 Ground floor (normal)	27.4300	0.0330	0.9052
E16 Corner (normal)	4.9000	0.0750	0.3675

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E17 Corner (inverted - internal area greater than external area)	2.4500	-0.0450	-0.1103										
P1 Party wall - Ground floor	4.5700	0.3200	1.4624										
E18 Party wall between dwellings	7.3500	0.2400	1.7640										
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				4.6131 (36)									
Point Thermal bridges				0.0000									
Total fabric heat loss		(33) + (36) + (36a) =		30.9374 (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	53.8723	53.7509	53.6319	53.0729	52.9684	52.4815	52.4815	52.3914	52.6690	52.9684	53.1799	53.4011	(39)
Average = Sum(39)m / 12 =												53.0724	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0994	1.0970	1.0945	1.0831	1.0810	1.0711	1.0711	1.0692	1.0749	1.0810	1.0853	1.0898	(40)
HLP (average)												1.0831	
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	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	22.4363 (42b)	
Hot water usage for other uses													
31.6372	30.4868	29.3364	28.1859	27.0355	25.8850	25.8850	27.0355	28.1859	29.3364	30.4868	31.6372	31.6372 (42c)	
Average daily hot water use (litres/day)													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	33.8520	(56)
If cylinder contains dedicated solar storage													
33.8520	30.5760	33.8520	32.7600	33.8520	32.7600	33.8520	33.8520	32.7600	33.8520	32.7600	33.8520	33.8520	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	22.5120	54.8576	53.0880	54.8576	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)										Total per year (kWh/year) =	Sum(64)m =	2541.8378	(64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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)

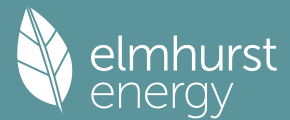
Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	19.6262	17.4318	14.1765	10.7325	8.0227	6.7731	7.3186	9.5130	12.7683	16.2122	18.9221	20.1717 (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												
	449.5053	447.6119	434.9755	411.3246	388.4287	333.7050	321.5048	324.1194	336.1389	391.3915	417.1218	439.4786 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
East				1.8000	19.6403	0.6300	0.7000	0.7700	10.8042 (76)			
South				0.5000	46.7521	0.6300	0.7000	0.7700	7.1440 (78)			
West				6.3400	19.6403	0.6300	0.7000	0.7700	38.0547 (80)			
Solar gains	56.0029	107.2784	172.3077	246.4088	298.8926	304.8935	290.6937	251.5527	198.6361	126.0314	69.3894	46.3523 (83)
Total gains	505.5082	554.8903	607.2832	657.7333	687.3213	638.5985	612.1985	575.6721	534.7750	517.4229	486.5112	485.8309 (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	36.4495	36.5319	36.6129	36.9985	37.0716	37.4155	37.4155	37.4799	37.2823	37.0716	36.9241	36.7712
alpha	3.4300	3.4355	3.4409	3.4666	3.4714	3.4944	3.4944	3.4987	3.4855	3.4714	3.4616	3.4514
util living area	0.9342	0.9094	0.8596	0.7667	0.6342	0.4980	0.3693	0.4068	0.6107	0.8000	0.9050	0.9409 (86)
Living	19.8419	20.0081	20.2707	20.5650	20.7688	20.8669	20.8997	20.8948	20.8190	20.5673	20.1609	19.8081
Non living	18.6702	18.8766	19.1980	19.5516	19.7765	19.8803	19.9057	19.9045	19.8377	19.5655	19.0777	18.6344
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	20.4076	20.0081	20.2707	20.5650	20.7688	20.8669	20.8997	20.8948	20.8190	20.5673	20.1609	19.9748 (87)
Th 2	20.0013	20.0033	20.0053	20.0146	20.0164	20.0245	20.0245	20.0261	20.0214	20.0164	20.0129	20.0092 (88)
util rest of house	0.9233	0.8949	0.8377	0.7321	0.5840	0.4307	0.2907	0.3254	0.5425	0.7619	0.8874	0.9311 (89)
MIT 2	19.4706	18.8766	19.1980	19.5516	19.7765	19.8803	19.9057	19.9045	19.8377	19.5655	19.0777	18.8821 (90)
Living area fraction									fLA = Living area	/ (4) =		0.5286 (91)
MIT	19.9659	19.4747	19.7650	20.0872	20.3010	20.4018	20.4311	20.4280	20.3564	20.0950	19.6502	19.4597 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9659	19.4747	19.7650	20.0872	20.3010	20.4018	20.4311	20.4280	20.3564	20.0950	19.6502	19.4597 (93)

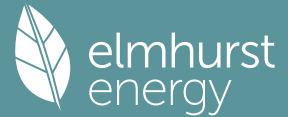
8. Space heating requirement												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9229	0.8861	0.8318	0.7349	0.5991	0.4574	0.3239	0.3596	0.5668	0.7652	0.8800	0.9247 (94)
Useful gains	466.5365	491.7078	505.1395	483.3358	411.7645	292.0669	198.2857	206.9943	303.1189	395.9364	428.1223	449.2540 (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	843.9571	783.4012	711.4279	593.7398	455.5811	304.4858	201.0630	211.0308	329.5174	502.9357	667.4210	814.8843 (97)
Space heating kWh	280.8009	196.0179	153.4786	79.4909	32.5995	0.0000	0.0000	0.0000	0.0000	79.6075	172.2951	272.0289 (98a)
Space heating requirement - total per year (kWh/year)												1266.3193
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	280.8009	196.0179	153.4786	79.4909	32.5995	0.0000	0.0000	0.0000	0.0000	79.6075	172.2951	272.0289 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1266.3193
Space heating per m2										(98c) / (4) =		25.8433 (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 %)												317.3343 (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	280.8009	196.0179	153.4786	79.4909	32.5995	0.0000	0.0000	0.0000	0.0000	79.6075	172.2951	272.0289 (98)
Space heating efficiency (main heating system 1)	317.3343	317.3343	317.3343	317.3343	317.3343	0.0000	0.0000	0.0000	0.0000	317.3343	317.3343	317.3343 (210)
Space heating fuel (main heating system)	88.4874	61.7702	48.3650	25.0496	10.2729	0.0000	0.0000	0.0000	0.0000	25.0863	54.2945	85.7231 (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	183.4781	183.4781	183.4781	183.4781	183.4781	183.4781	183.4781	183.4781	183.4781	183.4781	183.4781	183.4781 (216)
Fuel for water heating, kWh/month	140.0310	124.3436	133.1098	119.1509	117.0053	90.3784	89.4633	92.7077	93.3984	120.8268	126.1942	138.7539 (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	17.1787	13.7814	12.4086	9.0911	7.0222	5.7372	6.4059	8.3266	10.8155	14.1905	16.0281	17.6562 (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												399.0489 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												183.4781
Water heating fuel used												1385.3633 (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)												138.6420 (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	1923.0543 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	399.0489	16.4900	65.8032 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1385.3633	16.4900	228.4464 (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	138.6420	16.4900	22.8621 (250)
Additional standing charges			0.0000 (251)
Total energy cost			317.1116 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	1.2145 (257)
SAP value	80.3134
SAP rating (Section 12)	80 (258)
SAP band	C

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	399.0489	0.1559	62.2277 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1385.3633	0.1416	196.2275 (264)
Space and water heating			258.4552 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	138.6420	0.1443	20.0103 (268)
Total CO2, kg/year			278.6655 (272)
CO2 emissions per m2			5.6800 (273)
EI value			96.0304
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)

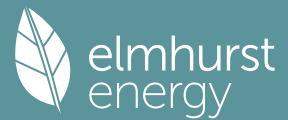
2. Ventilation rate

	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												

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

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Windows (Uw = 1.00)			8.6400	0.9615	8.3077			(27)
Doo to Hall			1.8000	1.4000	2.5200			(26)
Heatloss Floor 1			49.0000	0.1100	5.3900	75.0000	3675.0000	(28a)
External Wall 1	59.8635	8.6400	51.2235	0.1800	9.2202	14.0000	717.1290	(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)			116.2035					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.3243			(33)
Party Wall 1			11.2000	0.0000		20.0000	224.0000	(32)
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)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
(28)...(30) + (32) + (32a)...(32e) = 7069.0390 (34)
144.2661 (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
E5 Ground floor (normal)	27.4300	0.0330	0.9052
E16 Corner (normal)	4.9000	0.0750	0.3675
E17 Corner (inverted - internal area greater than external area)	2.4500	-0.0450	-0.1103
P1 Party wall - Ground floor	4.5700	0.3200	1.4624
E18 Party wall between dwellings	7.3500	0.2400	1.7640

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Point Thermal bridges
(36a) = 4.6131 (36)

Total fabric heat loss
(33) + (36) + (36a) = 30.9374 (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	52.8662	52.6690	52.6690	52.3914	52.3914	52.0548	52.1353	51.9766	52.0548	52.2183	52.2183	52.4815	(39)
Average = Sum(39)m / 12 =												52.3439	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0789	1.0749	1.0749	1.0692	1.0692	1.0623	1.0640	1.0607	1.0623	1.0657	1.0657	1.0711	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

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

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
106.2137	103.9465	101.1851	96.9850	93.5747	89.9082	88.4984	91.2479	94.1477	97.9970	102.2618	105.9381	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
a) If manufacturer declared loss factor is known (kWh/day):
Temperature factor from Table 2b
Enter (49) or (54) in (55)
Total storage loss
180.0000 (47)
1.4000 (48)
0.7800 (49)
1.0920 (55)

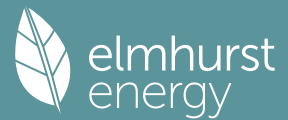
33.8520	30.5760	33.8520	32.7600	33.8520	32.7600	33.8520	33.8520	33.8520	32.7600	33.8520	32.7600	33.8520	(56)
If cylinder contains dedicated solar storage	33.8520	30.5760	33.8520	32.7600	33.8520	32.7600	33.8520	33.8520	32.7600	33.8520	32.7600	33.8520	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	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 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	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	19.6262	17.4318	14.1765	10.7325	8.0227	6.7731	7.3186	9.5130	12.7683	16.2122	18.9221	20.1717	(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)

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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	449.5053	447.6119	434.9755	411.3246	388.4287	333.7050	321.5048	324.1194	336.1389	391.3915	417.1218	439.4786 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W	
East				1.8000	22.3313	0.6300	0.7000		0.7700		12.2845 (76)	
South				0.5000	50.9848	0.6300	0.7000		0.7700		7.7908 (78)	
West				6.3400	22.3313	0.6300	0.7000		0.7700		43.2689 (80)	
Solar gains	63.3442	109.2050	173.1206	254.7120	300.6533	328.0794	309.4669	274.0900	216.1899	136.9565	80.4155	51.9139 (83)
Total gains	512.8495	556.8169	608.0961	666.0366	689.0820	661.7844	630.9717	598.2094	552.3288	528.3480	497.5373	491.3925 (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	37.1433	37.2823	37.2823	37.4799	37.4799	37.7222	37.6640	37.7789	37.7222	37.6041	37.6041	37.4155
alpha	3.4762	3.4855	3.4855	3.4987	3.4987	3.5148	3.5109	3.5186	3.5148	3.5069	3.5069	3.4944
util living area	0.9214	0.8963	0.8359	0.7223	0.5614	0.3842	0.2545	0.2758	0.5149	0.7486	0.8808	0.9288 (86)
Living	19.9863	20.1264	20.3883	20.6587	20.8306	20.8971	20.9097	20.9091	20.8681	20.6717	20.3051	19.9594
Non living	18.8630	19.0369	19.3526	19.6672	19.8473	19.9110	19.9171	19.9197	19.8905	19.6928	19.2660	18.8355
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	20.4814	20.1264	20.3883	20.6587	20.8306	20.8971	20.9097	20.9091	20.8681	20.6717	20.3051	20.1050 (87)
Th 2	20.0181	20.0214	20.0214	20.0261	20.0261	20.0317	20.0304	20.0330	20.0317	20.0290	20.0290	20.0245 (88)
util rest of house	0.9083	0.8797	0.8103	0.6824	0.5047	0.3133	0.1757	0.1935	0.4393	0.7024	0.8588	0.9167 (89)
MIT 2	19.5576	19.0369	19.3526	19.6672	19.8473	19.9110	19.9171	19.9197	19.8905	19.6928	19.2660	19.0498 (90)
Living area fraction	20.0459	19.6128	19.9000	20.1913	20.3670	20.4322	20.4418	20.4427	20.4072	20.2102	19.8152	19.6075 (92)
MIT	20.0459	19.6128	19.9000	20.1913	20.3670	20.4322	20.4418	20.4427	20.4072	20.2102	19.8152	19.6075 (93)
Temperature adjustment												0.0000
adjusted MIT	20.0459	19.6128	19.9000	20.1913	20.3670	20.4322	20.4418	20.4427	20.4072	20.2102	19.8152	19.6075 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9087	0.8718	0.8068	0.6895	0.5251	0.3430	0.2093	0.2286	0.4694	0.7116	0.8534	0.9108 (94)
Useful gains	466.0269	485.4404	490.6415	459.2480	361.8444	226.9852	132.0786	136.7592	259.2766	375.9883	424.5821	447.5388 (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	790.1328	738.0400	658.3628	539.1742	385.9696	230.7191	132.5159	137.3572	271.0599	449.6095	616.9701	761.3769 (97)
Space heating kWh	241.1348	169.7469	124.7847	57.5469	17.9491	0.0000	0.0000	0.0000	0.0000	54.7742	138.5193	233.4956 (98a)
Space heating requirement - total per year (kWh/year)												1037.9516
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	241.1348	169.7469	124.7847	57.5469	17.9491	0.0000	0.0000	0.0000	0.0000	54.7742	138.5193	233.4956 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1037.9516
Space heating per m2										(98c) / (4) =		21.1827 (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 %)												317.1547 (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	241.1348	169.7469	124.7847	57.5469	17.9491	0.0000	0.0000	0.0000	0.0000	54.7742	138.5193	233.4956 (98)
Space heating efficiency (main heating system 1)	317.1547	317.1547	317.1547	317.1547	317.1547	0.0000	0.0000	0.0000	0.0000	317.1547	317.1547	317.1547 (210)
Space heating fuel (main heating system)	76.0307	53.5218	39.3451	18.1447	5.6594	0.0000	0.0000	0.0000	0.0000	17.2705	43.6756	73.6220 (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	183.5678	183.5678	183.5678	183.5678	183.5678	183.5678	183.5678	183.5678	183.5678	183.5678	183.5678	183.5678 (216)
Fuel for water heating, kWh/month	139.9625	124.2828	133.0447	119.0926	116.9481	90.3342	89.4196	92.6624	93.3527	120.7677	126.1325	138.6861 (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)

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Lighting	17.1787	13.7814	12.4086	9.0911	7.0222	5.7372	6.4059	8.3266	10.8155	14.1905	16.0281	17.6562 (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												327.2699 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												183.5678
Water heating fuel used												1384.6860 (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)												138.6420 (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												1850.5979 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	327.2699	26.0600	85.2865 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1384.6860	26.0600	360.8492 (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	138.6420	26.0600	36.1301 (250)
Additional standing charges			0.0000 (251)
Total energy cost			482.2658 (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	327.2699	0.1566	51.2622 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1384.6860	0.1416	196.1315 (264)
Space and water heating			247.3937 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	138.6420	0.1443	20.0103 (268)
Total CO2, kg/year			267.4041 (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	327.2699	1.5799	517.0426 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1384.6860	1.5238	2109.9850 (278)
Space and water heating			2627.0276 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	138.6420	1.5338	212.6537 (282)
Total Primary energy kWh/year			2839.6813 (286)

SAP 10 EPC IMPROVEMENTS

00001

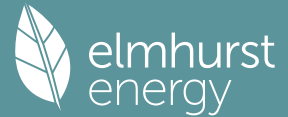
Current energy efficiency rating: C 80
Current environmental impact rating: A 96

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

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Total Savings £0 0.00 kg/m²

Potential energy efficiency rating: C 80
Potential environmental impact rating: A 96

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

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

	Current £482	Potential £482	Saving £0
Electricity			
Space heating	£85	£85	£0
Water heating	£361	£361	£0
Lighting	£36	£36	£0
Total cost of fuels	£482	£482	£0
Total cost of uses	£482	£482	£0
Delivered energy	38 kWh/m²	38 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	5 kg/m²	5 kg/m²	0 kg/m²
Primary energy	58 kWh/m²	58 kWh/m²	0 kWh/m²

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

1. Overall dwelling characteristics

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

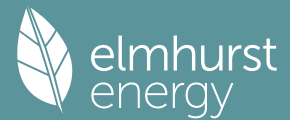
	m³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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	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 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)			8.6400	0.9615	8.3077		(27)
Doo to Hall			1.8000	1.4000	2.5200		(26)
Heatloss Floor 1			49.0000	0.1100	5.3900	75.0000	3675.0000 (28a)
External Wall 1	59.8635	8.6400	51.2235	0.1800	9.2202	14.0000	717.1290 (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)			116.2035				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.3243		(33)
Party Wall 1			11.2000	0.0000	0.0000	20.0000	224.0000 (32)
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) =		7069.0390 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K							144.2661 (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	
E5 Ground floor (normal)				27.4300	0.0330	0.9052	
E16 Corner (normal)				4.9000	0.0750	0.3675	

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E17 Corner (inverted - internal area greater than external area)	2.4500	-0.0450	-0.1103	
P1 Party wall - Ground floor	4.5700	0.3200	1.4624	
E18 Party wall between dwellings	7.3500	0.2400	1.7640	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				4.6131 (36)
Point Thermal bridges				0.0000
Total fabric heat loss		(33) + (36) + (36a) =		30.9374 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)				
Jan	Feb	Mar	Apr	May
22.9349	22.8135	22.6945	22.1355	22.0309
Jun	Jul	Aug	Sep	Oct
21.5441	21.5441	21.4539	21.7316	22.0309
Nov	Dec			
22.2425	22.4637			
Heat transfer coeff	53.8723	53.7509	53.6319	53.0729
52.9684	52.4815	52.4815	52.3914	52.6690
52.9684	53.1799	53.4011	53.0724	
Average = Sum(39)m / 12 =				
Jan	Feb	Mar	Apr	May
1.0994	1.0970	1.0945	1.0831	1.0810
Jun	Jul	Aug	Sep	Oct
1.0711	1.0711	1.0692	1.0749	1.0810
Nov	Dec			
1.0853	1.0898			
HLP (average)	1.0831			
Days in mont	31	28	31	30
31	31	30	31	31

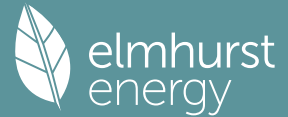
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												1.6607 (42)
Hot water usage for mixer showers												
52.0640	51.2816	50.1414	47.9600	46.3501	44.5548	43.5344	44.6659	45.9062	47.8338	50.0621	51.8645	(42a)
Hot water usage for baths												
22.5124	22.1781	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	
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)												
Distribution loss (46)m = 0.15 x (45)m												1621.6962
25.2325	22.2028	23.3276	19.9152	18.8954	16.5829	16.0547	16.9476	17.4140	19.9472	21.8536	24.8810	(46)
Water storage loss:												180.0000 (47)
Store volume												1.4000 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.7800 (49)
Temperature factor from Table 2b												1.0920 (55)
Enter (49) or (54) in (55)												
Total storage loss												
33.8520	30.5760	33.8520	32.7600	33.8520	32.7600	33.8520	33.8520	32.7600	33.8520	32.7600	33.8520	(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	53.0880	54.8576	53.0880	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month												
256.9261	228.1432	244.2273	218.6157	214.6791	165.8246	164.1456	170.0983	171.3656	221.6907	231.5387	254.5830	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
256.9261	228.1432	244.2273	218.6157	214.6791	165.8246	164.1456	170.0983	171.3656	221.6907	231.5387	254.5830	(64)
Electric shower(s)												
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	
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												
19.6262	17.4318	14.1765	10.7325	8.0227	6.7731	7.3186	9.5130	12.7683	16.2122	18.9221	20.1717	(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	(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												
449.5053	447.6119	434.9755	411.3246	388.4287	333.7050	321.5048	324.1194	336.1389	391.3915	417.1218	439.4786	(73)

6. Solar gains												
[Jan]												
	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
East	1.8000	19.6403	0.6300	0.7000	0.7700	10.8042	(76)					
South	0.5000	46.7521	0.6300	0.7000	0.7700	7.1440	(78)					
West	6.3400	19.6403	0.6300	0.7000	0.7700	38.0547	(80)					
Solar gains	56.0029	107.2784	172.3077	246.4088	298.8926	304.8935	290.6937	251.5527	198.6361	126.0314	69.3894	46.3523 (83)
Total gains	505.5082	554.8903	607.2832	657.7333	687.3213	638.5985	612.1985	575.6721	534.7750	517.4229	486.5112	485.8309 (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	36.4495	36.5319	36.6129	36.9985	37.0716	37.4155	37.4155	37.4799	37.2823	37.0716	36.9241	36.7712
alpha	3.4300	3.4355	3.4409	3.4666	3.4714	3.4944	3.4944	3.4987	3.4855	3.4714	3.4616	3.4514
util living area	0.9342	0.9094	0.8596	0.7667	0.6342	0.4980	0.3693	0.4068	0.6107	0.8000	0.9050	0.9409 (86)
Living	19.8419	20.0081	20.2707	20.5650	20.7688	20.8669	20.8997	20.8948	20.8190	20.5673	20.1609	19.8081
Non living	18.6702	18.8766	19.1980	19.5516	19.7765	19.8803	19.9057	19.9045	19.8377	19.5655	19.0777	18.6344
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	20.4076	20.0081	20.2707	20.5650	20.7688	20.8669	20.8997	20.8948	20.8190	20.5673	20.1609	19.9748 (87)
Th 2	20.0013	20.0033	20.0053	20.0146	20.0164	20.0245	20.0245	20.0261	20.0214	20.0164	20.0129	20.0092 (88)
util rest of house	0.9233	0.8949	0.8377	0.7321	0.5840	0.4307	0.2907	0.3254	0.5425	0.7619	0.8874	0.9311 (89)
MIT 2	19.4706	18.8766	19.1980	19.5516	19.7765	19.8803	19.9057	19.9045	19.8377	19.5655	19.0777	18.8821 (90)
Living area fraction									fLA = Living area	/ (4) =		0.5286 (91)
MIT	19.9659	19.4747	19.7650	20.0872	20.3010	20.4018	20.4311	20.4280	20.3564	20.0950	19.6502	19.4597 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9659	19.4747	19.7650	20.0872	20.3010	20.4018	20.4311	20.4280	20.3564	20.0950	19.6502	19.4597 (93)

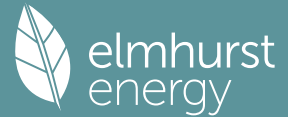
8. Space heating requirement												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9229	0.8861	0.8318	0.7349	0.5991	0.4574	0.3239	0.3596	0.5668	0.7652	0.8800	0.9247 (94)
Useful gains	466.5365	491.7078	505.1395	483.3358	411.7645	292.0669	198.2857	206.9943	303.1189	395.9364	428.1223	449.2540 (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	843.9571	783.4012	711.4279	593.7398	455.5811	304.4858	201.0630	211.0308	329.5174	502.9357	667.4210	814.8843 (97)
Space heating kWh	280.8009	196.0179	153.4786	79.4909	32.5995	0.0000	0.0000	0.0000	0.0000	79.6075	172.2951	272.0289 (98a)
Space heating requirement - total per year (kWh/year)												1266.3193
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	280.8009	196.0179	153.4786	79.4909	32.5995	0.0000	0.0000	0.0000	0.0000	79.6075	172.2951	272.0289 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1266.3193
Space heating per m2										(98c) / (4) =		25.8433 (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 %)												317.3343 (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	280.8009	196.0179	153.4786	79.4909	32.5995	0.0000	0.0000	0.0000	0.0000	79.6075	172.2951	272.0289 (98)
Space heating efficiency (main heating system 1)	317.3343	317.3343	317.3343	317.3343	317.3343	0.0000	0.0000	0.0000	0.0000	317.3343	317.3343	317.3343 (210)
Space heating fuel (main heating system)	88.4874	61.7702	48.3650	25.0496	10.2729	0.0000	0.0000	0.0000	0.0000	25.0863	54.2945	85.7231 (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	183.4781	183.4781	183.4781	183.4781	183.4781	183.4781	183.4781	183.4781	183.4781	183.4781	183.4781	183.4781 (216)
Fuel for water heating, kWh/month	140.0310	124.3436	133.1098	119.1509	117.0053	90.3784	89.4633	92.7077	93.3984	120.8268	126.1942	138.7539 (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	17.1787	13.7814	12.4086	9.0911	7.0222	5.7372	6.4059	8.3266	10.8155	14.1905	16.0281	17.6562 (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												399.0489 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												183.4781
Water heating fuel used												1385.3633 (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)												138.6420 (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	1923.0543 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	399.0489	16.4900	65.8032 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1385.3633	16.4900	228.4464 (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	138.6420	16.4900	22.8621 (250)
Additional standing charges			0.0000 (251)
Total energy cost			317.1116 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	1.2145 (257)
SAP value	80.3134
SAP rating (Section 12)	80 (258)
SAP band	C

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	399.0489	0.1559	62.2277 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1385.3633	0.1416	196.2275 (264)
Space and water heating			258.4552 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	138.6420	0.1443	20.0103 (268)
Total CO2, kg/year			278.4655 (272)
CO2 emissions per m2			5.6800 (273)
EI value			96.0304
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)

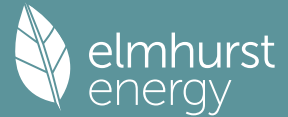
2. Ventilation rate

	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	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate												

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

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Windows (Uw = 1.00)			8.6400	0.9615	8.3077		(27)
Doo to Hall			1.8000	1.4000	2.5200		(26)
Heatloss Floor 1			49.0000	0.1100	5.3900	75.0000	3675.0000 (28a)
External Wall 1	59.8635	8.6400	51.2235	0.1800	9.2202	14.0000	717.1290 (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)			116.2035				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.3243		(33)
Party Wall 1			11.2000	0.0000	0.0000	20.0000	224.0000 (32)
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)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
(28)...(30) + (32) + (32a)...(32e) = 7069.0390 (34)
144.2661 (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
E5 Ground floor (normal)	27.4300	0.0330	0.9052
E16 Corner (normal)	4.9000	0.0750	0.3675
E17 Corner (inverted - internal area greater than external area)	2.4500	-0.0450	-0.1103
P1 Party wall - Ground floor	4.5700	0.3200	1.4624
E18 Party wall between dwellings	7.3500	0.2400	1.7640

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Point Thermal bridges
(36a) = 4.6131 (36)

Total fabric heat loss
(33) + (36) + (36a) = 30.9374 (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	52.8662	52.6690	52.6690	52.3914	52.3914	52.0548	52.1353	51.9766	52.0548	52.2183	52.2183	52.4815 (39)
Average = Sum(39)m / 12 =												52.3439

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0789	1.0749	1.0749	1.0692	1.0692	1.0623	1.0640	1.0607	1.0623	1.0657	1.0657	1.0711 (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
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
a) If manufacturer declared loss factor is known (kWh/day):
Temperature factor from Table 2b
Enter (49) or (54) in (55)
Total storage loss
33.8520 30.5760 33.8520 32.7600 33.8520 32.7600 33.8520 33.8520 32.7600 33.8520 32.7600 33.8520 33.8520 (56)

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

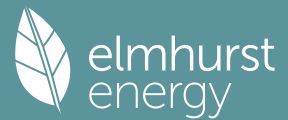
Electric shower(s)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

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	19.6262	17.4318	14.1765	10.7325	8.0227	6.7731	7.3186	9.5130	12.7683	16.2122	18.9221	20.1717 (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)

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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	449.5053	447.6119	434.9755	411.3246	388.4287	333.7050	321.5048	324.1194	336.1389	391.3915	417.1218	439.4786 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W	
East				1.8000	22.3313	0.6300	0.7000		0.7700		12.2845 (76)	
South				0.5000	50.9848	0.6300	0.7000		0.7700		7.7908 (78)	
West				6.3400	22.3313	0.6300	0.7000		0.7700		43.2689 (80)	
Solar gains	63.3442	109.2050	173.1206	254.7120	300.6533	328.0794	309.4669	274.0900	216.1899	136.9565	80.4155	51.9139 (83)
Total gains	512.8495	556.8169	608.0961	666.0366	689.0820	661.7844	630.9717	598.2094	552.3288	528.3480	497.5373	491.3925 (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	37.1433	37.2823	37.2823	37.4799	37.4799	37.7222	37.6640	37.7789	37.7222	37.6041	37.6041	37.4155
alpha	3.4762	3.4855	3.4855	3.4987	3.4987	3.5148	3.5109	3.5186	3.5148	3.5069	3.5069	3.4944
util living area	0.9214	0.8963	0.8359	0.7223	0.5614	0.3842	0.2545	0.2758	0.5149	0.7486	0.8808	0.9288 (86)
Living	19.9863	20.1264	20.3883	20.6587	20.8306	20.8971	20.9097	20.9091	20.8681	20.6717	20.3051	19.9594
Non living	18.8630	19.0369	19.3526	19.6672	19.8473	19.9110	19.9171	19.9197	19.8905	19.6928	19.2660	18.8355
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	20.4814	20.1264	20.3883	20.6587	20.8306	20.8971	20.9097	20.9091	20.8681	20.6717	20.3051	20.1050 (87)
Th 2	20.0181	20.0214	20.0214	20.0261	20.0261	20.0317	20.0304	20.0330	20.0317	20.0290	20.0290	20.0245 (88)
util rest of house	0.9083	0.8797	0.8103	0.6824	0.5047	0.3133	0.1757	0.1935	0.4393	0.7024	0.8588	0.9167 (89)
MIT 2	19.5576	19.0369	19.3526	19.6672	19.8473	19.9110	19.9171	19.9197	19.8905	19.6928	19.2660	19.0498 (90)
Living area fraction	20.0459	19.6128	19.9000	20.1913	20.3670	20.4322	20.4418	20.4427	20.4072	20.2102	19.8152	19.6075 (92)
MIT	20.0459	19.6128	19.9000	20.1913	20.3670	20.4322	20.4418	20.4427	20.4072	20.2102	19.8152	19.6075 (93)
Temperature adjustment												0.0000
adjusted MIT	20.0459	19.6128	19.9000	20.1913	20.3670	20.4322	20.4418	20.4427	20.4072	20.2102	19.8152	19.6075 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9087	0.8718	0.8068	0.6895	0.5251	0.3430	0.2093	0.2286	0.4694	0.7116	0.8534	0.9108 (94)
Useful gains	466.0269	485.4404	490.6415	459.2480	361.8444	226.9852	132.0786	136.7592	259.2766	375.9883	424.5821	447.5388 (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	790.1328	738.0400	658.3628	539.1742	385.9696	230.7191	132.5159	137.3572	271.0599	449.6095	616.9701	761.3769 (97)
Space heating kWh	241.1348	169.7469	124.7847	57.5469	17.9491	0.0000	0.0000	0.0000	0.0000	54.7742	138.5193	233.4956 (98a)
Space heating requirement - total per year (kWh/year)												1037.9516
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	241.1348	169.7469	124.7847	57.5469	17.9491	0.0000	0.0000	0.0000	0.0000	54.7742	138.5193	233.4956 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1037.9516
Space heating per m2										(98c) / (4) =		21.1827 (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 %)												317.1547 (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	241.1348	169.7469	124.7847	57.5469	17.9491	0.0000	0.0000	0.0000	0.0000	54.7742	138.5193	233.4956 (98)
Space heating efficiency (main heating system 1)	317.1547	317.1547	317.1547	317.1547	317.1547	0.0000	0.0000	0.0000	0.0000	317.1547	317.1547	317.1547 (210)
Space heating fuel (main heating system)	76.0307	53.5218	39.3451	18.1447	5.6594	0.0000	0.0000	0.0000	0.0000	17.2705	43.6756	73.6220 (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	183.5678	183.5678	183.5678	183.5678	183.5678	183.5678	183.5678	183.5678	183.5678	183.5678	183.5678	183.5678 (216)
Fuel for water heating, kWh/month	139.9625	124.2828	133.0447	119.0926	116.9481	90.3342	89.4196	92.6624	93.3527	120.7677	126.1325	138.6861 (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)

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Lighting	17.1787	13.7814	12.4086	9.0911	7.0222	5.7372	6.4059	8.3266	10.8155	14.1905	16.0281	17.6562 (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												327.2699 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												183.5678
Water heating fuel used												1384.6860 (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)												138.6420 (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												1850.5979 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	327.2699	26.0600	85.2865 (240)	
Total CO2 associated with community systems			0.0000 (473)	
Water heating (other fuel)	1384.6860	26.0600	360.8492 (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	138.6420	26.0600	36.1301 (250)	
Additional standing charges			0.0000 (251)	
Total energy cost			482.2658 (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	327.2699	0.1566	51.2622 (261)	
Total CO2 associated with community systems			0.0000 (373)	
Water heating (other fuel)	1384.6860	0.1416	196.1315 (264)	
Space and water heating			247.3937 (265)	
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)	
Energy for lighting	138.6420	0.1443	20.0103 (268)	
Total CO2, kg/year			267.4041 (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	327.2699	1.5799	517.0426 (275)	
Total CO2 associated with community systems			0.0000 (473)	
Water heating (other fuel)	1384.6860	1.5238	2109.9850 (278)	
Space and water heating			2627.0276 (279)	
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)	
Energy for lighting	138.6420	1.5338	212.6537 (282)	
Total Primary energy kWh/year			2839.6813 (286)	

Predicted Energy Assessment



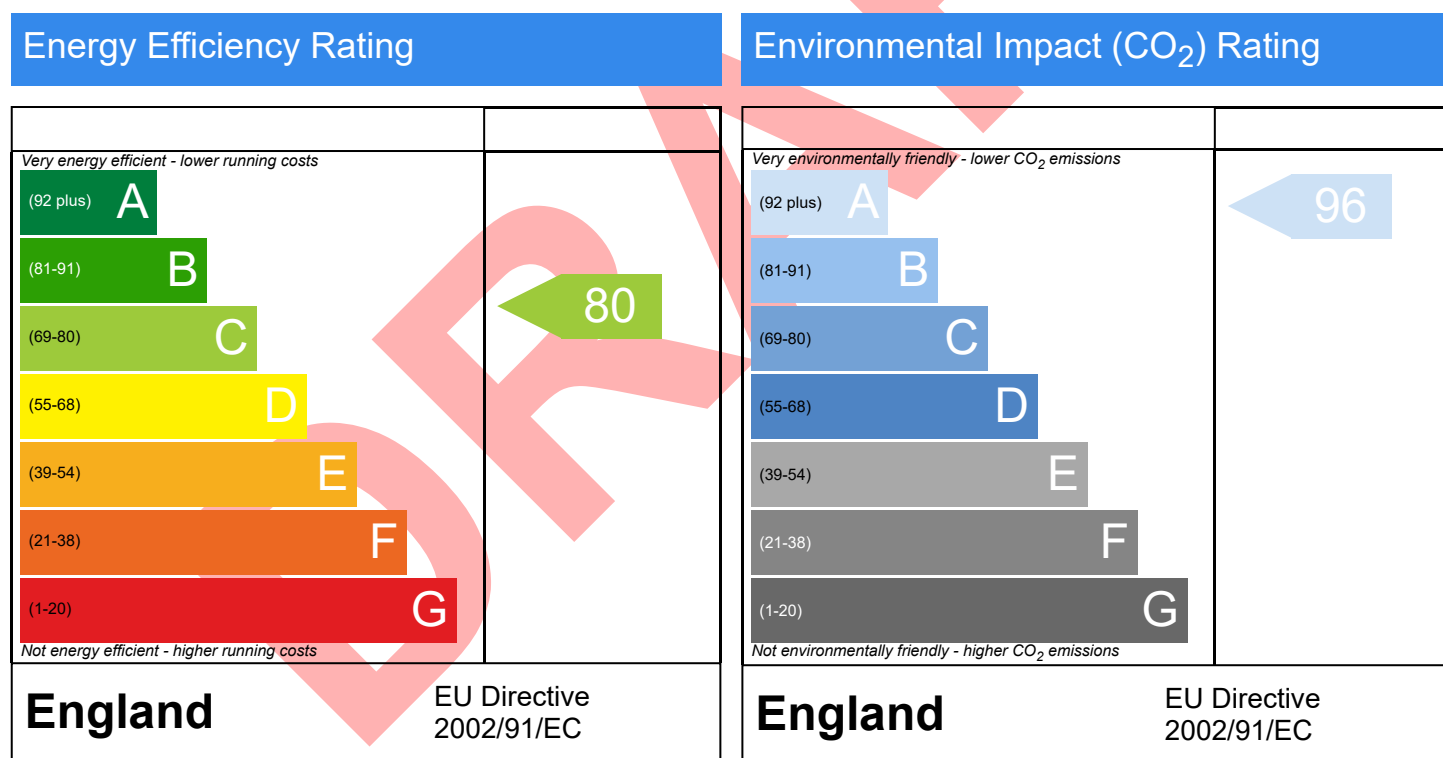
Zoar Chapel , Flat 2 , South Street , Reading

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.

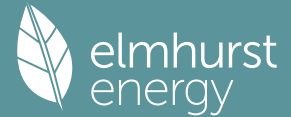
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.



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	01108	Issued on Date	03/07/2024
Assessment Reference	00001	Prop Type Ref	Semi-Detached Flat
Property	Zoar Chapel , Flat 2 , South Street , Reading		

SAP Rating	80 C	DER	5.80	TER	15.80
Environmental	96 A	% DER < TER			63.29
CO ₂ Emissions (t/year)	0.27	DFEE	35.17	TFEE	39.63
Compliance Check	See BREL	% DFEE < TFEE			11.27
% DPER < TPER	26.60	DPER	61.51	TPER	83.80

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	E5 Ground floor (normal)	Independently assessed	0.033	27.43	0.91	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
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.320	4.57	1.46	
External wall	E18 Party wall between dwellings	Table K1 - Default	0.240	7.35	1.76	

Total: 62.32 W/mK:
Y-Value: 0.04 W/m²K: