

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	01107	Plot Reference	00001
Address	Flat 1 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	15.7 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	5.81 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	83.32 kWh _{PE} /m ²		
Dwelling primary energy	61.59 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	38.9 kWh/m ²		
Dwelling fabric energy efficiency	34.9 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	1.08	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)	52.618	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	6.342	West	0.7	1 (!)
Opening, Windows	0.9	East	0.7	1 (!)
Opening, Doo to Hall	1.8	South	N/A	1.4

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part 1 - Main Dwelling: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.006 (!)	TD5
External wall	E3: Sill	Calculated by person with suitable expertise	0.012 (!)	TD5

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E4: Jamb	Calculated by person with suitable expertise	0.023 (!)	TD5
External wall	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	317.1%
Emitter type	Underfloor
Flow temperature	35°C
System type	Heat Pump
Manufacturer	Vaillant Group UK Ltd
Model	aroTHERM 5kW
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water	
Cylinder/store - type: Cylinder	
Capacity	180 litres
Declared heat loss	1.4 kWh/day
Primary pipework insulated	Yes
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 - type: N/A	
Efficiency	
Manufacturer	
Model	

6 Controls	
Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services	
Function	
Ecodesign class	
Manufacturer	
Model	
Water heating - type: N/A	
Manufacturer	
Model	

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

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

Summary for Input Data

Property Reference	01107	Issued on Date	03/07/2024
Assessment Reference	00001	Prop Type Ref	
Property	Zoar Chapel, Flat 1 , South Street, Reading		

SAP Rating	80 C	DER	5.81	TER	15.70
Environmental	96 A	% DER < TER			62.99
CO ₂ Emissions (t/year)	0.27	DFEE	34.87	TFEE	38.88
Compliance Check	See BREL	% DFEE < TFEE			10.31
% DPER < TPER	26.09	DPER	61.59	TPER	83.32

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	52.62	0.00	None	7.24	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	West	6.34	0
Opening	Windows	External Wall 1	East	0.90	0
Opening	Doo to Hall	Wall to Stairs	South	1.80	0

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	3.92	0.01	0.01 TD5	No
E3 Sill	Independently assessed	0.90	0.01	0.01 TD5	No
E4 Jamb	Independently assessed	6.20	0.02	0.02 TD5	No
E5 Ground floor (normal)	Independently assessed	27.43	0.03	0.03 TD5	No
E16 Corner (normal)	Independently assessed	7.35	0.07	0.07 TD5	No
E17 Corner (inverted – internal area greater than external area)	Independently assessed	4.90	-0.04	-0.04 TD5	No
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	0.04	W/m²K
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18.0 Pressure Testing

Designed AP ₅₀	4.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation
Mechanical Ventilation System Present
No

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System	No
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22.0 Lighting

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

24.0 Main Heating 1

Database	Database	
Percentage of Heat	100.00	%
Database Ref. No.	103748	
Fuel Type	Electricity	
SAP Code	0	
In Winter	317.07	
In Summer	183.61	
Model Name	aroTHERM 5kW	
Manufacturer	Vaillant Group UK Ltd	
System Type	Heat Pump	
Controls SAP Code	2207	

Summary for Input Data

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	
Cylinder Stat	No
Cylinder In Heated Space	No
Independent Time Control	No
Insulation Type	Measured Loss
Cylinder Volume	180.00 L

Summary for Input Data



Loss	1.40	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	

31.0 Thermal Store

Recommendations

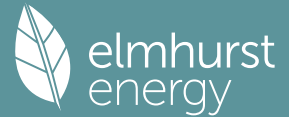
Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout



Property Reference	01107				Issued on Date	03/07/2024	
Assessment Reference	00001			Prop Type Ref			
Property	Zoar Chapel, Flat 1 , South Street, Reading						
SAP Rating	80 C		DER	5.81		TER	15.70
Environmental	96 A		% DER < TER				62.99
CO ₂ Emissions (t/year)	0.27		DFEE	34.87		TFEE	38.88
Compliance Check	See BREL		% DFEE < TFEE				10.31
% DPER < TPER	26.09		DPER	61.59		TPER	83.32
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)

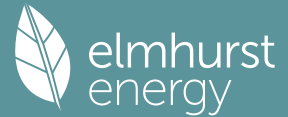
3. Heat losses and heat loss parameter

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)			7.2400	0.9615	6.9615		(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	7.2400	52.6235	0.1800	9.4722	14.0000	736.7290 (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) =		25.2302		(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) =		6598.6390 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							134.6661 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	3.9200	0.0060	0.0235
E3 Sill	0.9000	0.0120	0.0108
E4 Jamb	6.2000	0.0230	0.1426
E5 Ground floor (normal)	27.4300	0.0330	0.9052
E16 Corner (normal)	7.3500	0.0750	0.5512

Full SAP Calculation Printout



E17 Corner (inverted - internal area greater than external area)	4.9000	-0.0450	-0.2205									
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)				4.6393 (36)								
Point Thermal bridges				0.0000								
Total fabric heat loss		(33) + (36) + (36a) =		29.8694 (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	52.8044	52.6829	52.5639	52.0050	51.9004	51.4135	51.4135	51.3234	51.6010	51.9004	52.1119	52.3331 (39)
Average = Sum(39)m / 12 =												52.0045
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0776	1.0752	1.0727	1.0613	1.0592	1.0493	1.0493	1.0474	1.0531	1.0592	1.0635	1.0680 (40)
HLP (average)												1.0613
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6607 (42)
Hot water usage for mixer showers	52.0640	51.2816	50.1414	47.9600	46.3501	44.5548	43.5344	44.6659	45.9062	47.8338	50.0621	51.8645	(42a)
Hot water usage for baths	22.5124	22.1781	21.7073	20.8392	20.1891	19.4684	19.0790	19.5466	20.0556	20.8269	21.7129	22.4363	(42b)
Hot water usage for other uses	31.6372	30.4868	29.3364	28.1859	27.0355	25.8850	25.8850	27.0355	28.1859	29.3364	30.4868	31.6372	(42c)
Average daily hot water use (litres/day)													97.6350 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.2137	103.9465	101.1851	96.9850	93.5747	89.9082	88.4984	91.2479	94.1477	97.9970	102.2618	105.9381	(44)
Energy content (annual)	168.2165	148.0184	155.5177	132.7677	125.9695	110.5526	107.0312	112.9839	116.0936	132.9811	145.6907	165.8734	(45)
Distribution loss (46)m = 0.15 x (45)m	25.2325	22.2028	23.3276	19.9152	18.8954	16.5829	16.0547	16.9476	17.4140	19.9472	21.8536	24.8810	(46)
Water storage loss:													
Store volume													180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.4000 (48)
Temperature factor from Table 2b													0.7800 (49)
Enter (49) or (54) in (55)													1.0920 (55)
Total storage loss	33.8520	30.5760	33.8520	32.7600	33.8520	32.7600	33.8520	33.8520	32.7600	33.8520	32.7600	33.8520	(56)
If cylinder contains dedicated solar storage	33.8520	30.5760	33.8520	32.7600	33.8520	32.7600	33.8520	33.8520	32.7600	33.8520	32.7600	33.8520	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	256.9261	228.1432	244.2273	218.6157	214.6791	165.8246	164.1456	170.0983	171.3656	221.6907	231.5387	254.5830	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	256.9261	228.1432	244.2273	218.6157	214.6791	165.8246	164.1456	170.0983	171.3656	221.6907	231.5387	254.5830	(64)
12Total per year (kWh/year)													2541.8378 (64)
Electric shower(s)													2542 (64)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
													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)

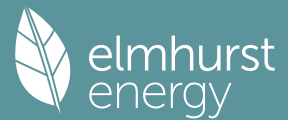
Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	77.3634	85.6524	77.3634	79.9422	77.3634	79.9422	77.3634	77.3634	79.9422	77.3634	79.9422	77.3634	(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													
	404.0750	411.9257	396.1185	382.4562	364.6975	318.5072	306.3260	307.4854	316.9656	362.2296	382.8227	396.6461	(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				0.9000	19.6403	0.6300	0.7000	0.7700	5.4021 (76)			
West				6.3400	19.6403	0.6300	0.7000	0.7700	38.0547 (80)			
Solar gains	43.4568	85.0107	140.0005	204.1824	250.2332	256.1582	243.8731	209.4834	162.8264	100.8724	54.1855	35.7368 (83)
Total gains	447.5318	496.9364	536.1190	586.6386	614.9307	574.6654	550.1991	516.9688	479.7920	463.1020	437.0082	432.3829 (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	34.7122	34.7922	34.8710	35.2458	35.3168	35.6512	35.6512	35.7139	35.5217	35.3168	35.1734	35.0248
alpha	3.3141	3.3195	3.3247	3.3497	3.3545	3.3767	3.3767	3.3809	3.3681	3.3545	3.3449	3.3350
util living area												
	0.9450	0.9221	0.8822	0.7963	0.6699	0.5318	0.3989	0.4386	0.6459	0.8255	0.9177	0.9500 (86)
Living	19.6968	19.8780	20.1436	20.4785	20.7208	20.8465	20.8909	20.8840	20.7860	20.4906	20.0517	19.6688
Non living	18.5086	18.7353	19.0642	19.4720	19.7455	19.8805	19.9166	19.9139	19.8250	19.4974	18.9632	18.4797
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	20.3334	19.8780	20.1436	20.4785	20.7208	20.8465	20.8909	20.8840	20.7860	20.4906	20.0517	19.8550 (87)
Th 2	20.0191	20.0212	20.0232	20.0325	20.0343	20.0425	20.0425	20.0440	20.0393	20.0343	20.0307	20.0270 (88)
util rest of house												
	0.9361	0.9097	0.8635	0.7650	0.6216	0.4639	0.3169	0.3543	0.5794	0.7913	0.9026	0.9418 (89)
MIT 2	19.4170	18.7353	19.0642	19.4720	19.7455	19.8805	19.9166	19.9139	19.8250	19.4974	18.9632	18.7585 (90)
Living area fraction												
MIT	19.9013	19.3393	19.6347	20.0040	20.2610	20.3911	20.4315	20.4267	20.3329	20.0224	19.5385	19.3381 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9013	19.3393	19.6347	20.0040	20.2610	20.3911	20.4315	20.4267	20.3329	20.0224	19.5385	19.3381 (93)

8. Space heating requirement												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9349	0.8997	0.8551	0.7640	0.6335	0.4894	0.3508	0.3888	0.6008	0.7909	0.8937	0.9350 (94)
Useful gains	418.3816	447.0865	458.4207	448.1882	389.5774	281.2354	193.0070	200.9725	288.2419	366.2512	390.5445	404.2796 (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	823.8187	760.7038	690.4128	577.4642	444.3182	297.7398	196.9933	206.6636	321.6252	489.0265	648.1960	792.2242 (97)
Space heating kWh	301.6452	210.7508	172.6022	93.0787	40.7271	0.0000	0.0000	0.0000	0.0000	91.3448	185.5091	288.6308 (98a)
Space heating requirement - total per year (kWh/year)												1384.2887
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	301.6452	210.7508	172.6022	93.0787	40.7271	0.0000	0.0000	0.0000	0.0000	91.3448	185.5091	288.6308 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1384.2887
Space heating per m2										(98c) / (4) =		28.2508 (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 %)												317.0693 (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	301.6452	210.7508	172.6022	93.0787	40.7271	0.0000	0.0000	0.0000	0.0000	91.3448	185.5091	288.6308 (98)
Space heating efficiency (main heating system 1)	317.0693	317.0693	317.0693	317.0693	317.0693	0.0000	0.0000	0.0000	0.0000	317.0693	317.0693	317.0693 (210)
Space heating fuel (main heating system)	95.1354	66.4684	54.4367	29.3560	12.8449	0.0000	0.0000	0.0000	0.0000	28.8091	58.5074	91.0308 (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	183.6105	183.6105	183.6105	183.6105	183.6105	183.6105	183.6105	183.6105	183.6105	183.6105	183.6105	183.6105 (216)
Fuel for water heating, kWh/month	139.9299	124.2539	133.0138	119.0649	116.9209	90.3132	89.3988	92.6409	93.3310	120.7396	126.1032	138.6538 (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	17.7763	14.2608	12.8402	9.4073	7.2665	5.9368	6.6287	8.6163	11.1917	14.6841	16.5856	18.2703 (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												436.5887 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												183.6105
Water heating fuel used												1384.3640 (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)												143.4646 (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	1964.4173 (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	436.5887	0.1556	67.9549 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1384.3640	0.1416	196.0859 (264)
Space and water heating			264.0409 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	143.4646	0.1443	20.7064 (268)
Total CO2, kg/year			284.7472 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.8100 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	436.5887	1.5762	688.1597 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1384.3640	1.5238	2109.4943 (278)
Space and water heating			2797.6540 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	143.4646	1.5338	220.0508 (282)
Total Primary energy kWh/year			3017.7048 (286)
Dwelling Primary energy Rate (DPER)			61.5900 (287)

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

1. Overall dwelling characteristics

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

2. Ventilation rate

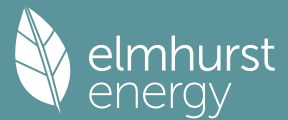
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1666 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4166 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3541 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4515	0.4426	0.4338	0.3895	0.3807	0.3364	0.3364	0.3275	0.3541	0.3807	0.3984	0.4161 (22b)
Effective ac	0.6019	0.5980	0.5941	0.5759	0.5725	0.5566	0.5566	0.5536	0.5627	0.5725	0.5793	0.5866 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			1.8000	1.0000	1.8000		(26)
TER Opening Type (Uw = 1.20)			7.2400	1.1450	8.2901		(27)
Heatloss Floor 1			49.0000	0.1300	6.3700		(28a)
External Wall 1	59.8635	7.2400	52.6235	0.1800	9.4722		(29a)

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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) =		26.9295	(33)
Party Wall 1			11.2000	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 144.6661 (35)

List of Thermal Bridges						
K1 Element			Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)			3.9200	0.0500	0.1960	
E3 Sill			0.9000	0.0500	0.0450	
E4 Jamb			6.2000	0.0500	0.3100	
E5 Ground floor (normal)			27.4300	0.1600	4.3888	
E16 Corner (normal)			7.3500	0.0900	0.6615	
E17 Corner (inverted - internal area greater than external area)			4.9000	-0.0900	-0.4410	
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) 5.9669 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 32.8964 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	23.8460	23.6892	23.5355	22.8136	22.6786	22.0499	22.0499	21.9335	22.2921	22.6786	22.9518	23.2374	(38)
Average = Sum(39)m / 12 =	56.7424	56.5856	56.4319	55.7101	55.5750	54.9463	54.9463	54.8299	55.1885	55.5750	55.8482	56.1339	(39)
	55.7094												
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1580	1.1548	1.1517	1.1369	1.1342	1.1214	1.1214	1.1190	1.1263	1.1342	1.1398	1.1456	(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)
													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)

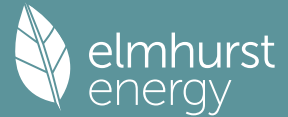
5. Internal gains (see Table 5 and 5a)

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	77.3634	85.6524	77.3634	79.9422	77.3634	79.9422	77.3634	77.3634	79.9422	77.3634	79.9422	77.3634	(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)
	401.0374	408.8881	393.0809	379.4186	361.6599	346.4430	334.2617	335.4212	344.9013	359.1921	379.7852	393.6085	(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
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East	0.9000	19.6403	0.6300	0.7000	0.7700	5.4021 (76)
West	6.3400	19.6403	0.6300	0.7000	0.7700	38.0547 (80)

Solar gains	43.4568	85.0107	140.0005	204.1824	250.2332	256.1582	243.8731	209.4834	162.8264	100.8724	54.1855	35.7368 (83)
Total gains	444.4942	493.8988	533.0815	583.6010	611.8931	602.6012	578.1348	544.9046	507.7277	460.0644	433.9707	429.3453 (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	34.7019	34.7980	34.8928	35.3449	35.4308	35.8362	35.8362	35.9123	35.6790	35.4308	35.2575	35.0781
alpha	3.3135	3.3199	3.3262	3.3563	3.3621	3.3891	3.3891	3.3942	3.3786	3.3621	3.3505	3.3385
util living area	0.9551	0.9354	0.9006	0.8225	0.7019	0.5403	0.4052	0.4440	0.6510	0.8497	0.9317	0.9593 (86)
MIT	19.2879	19.5290	19.8913	20.3612	20.7123	20.9139	20.9752	20.9660	20.8340	20.3837	19.7765	19.2554 (87)
Th 2	19.9537	19.9563	19.9589	19.9708	19.9730	19.9834	19.9834	19.9854	19.9794	19.9730	19.9685	19.9638 (88)
util rest of house	0.9469	0.9240	0.8828	0.7913	0.6511	0.4674	0.3169	0.3534	0.5799	0.8161	0.9177	0.9519 (89)
MIT 2	17.9909	18.2933	18.7434	19.3161	19.7136	19.9235	19.9719	19.9684	19.8522	19.3581	18.6160	17.9569 (90)
Living area fraction	18.6765	18.9465	19.3501	19.8685	20.2415	20.4470	20.5022	20.4957	20.3711	19.9002	19.2294	18.6433 (92)
MIT	18.6765	18.9465	19.3501	19.8685	20.2415	20.4470	20.5022	20.4957	20.3711	19.9002	19.2294	18.6433 (93)
Temperature adjustment												0.0000
adjusted MIT	18.6765	18.9465	19.3501	19.8685	20.2415	20.4470	20.5022	20.4957	20.3711	19.9002	19.2294	18.6433 (93)

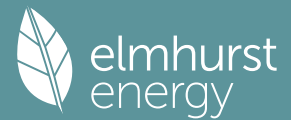
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9343	0.9105	0.8707	0.7878	0.6651	0.5016	0.3627	0.3999	0.6086	0.8134	0.9056	0.9398 (94)
Useful gains	415.3127	449.7079	464.1307	459.7772	406.9971	302.2735	209.6747	217.9171	308.9795	374.2158	392.9858	403.5199 (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	815.7552	794.8281	725.1575	611.0556	474.6927	321.2700	214.4136	224.5684	346.0939	516.8605	677.4061	810.7572 (97)
Space heating kWh	297.9292	231.9208	194.2039	108.9205	50.3655	0.0000	0.0000	0.0000	0.0000	106.1277	204.7826	302.9845 (98a)
Space heating requirement - total per year (kWh/year)												1497.2348
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	297.9292	231.9208	194.2039	108.9205	50.3655	0.0000	0.0000	0.0000	0.0000	106.1277	204.7826	302.9845 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1497.2348
Space heating per m2										(98c) / (4) =		30.5558 (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	297.9292	231.9208	194.2039	108.9205	50.3655	0.0000	0.0000	0.0000	0.0000	106.1277	204.7826	302.9845 (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)	322.7835	251.2685	210.4051	118.0070	54.5672	0.0000	0.0000	0.0000	0.0000	114.9812	221.8663	328.2606 (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	85.0225	84.7380	84.1968	83.1875	81.8021	79.8000	79.8000	79.8000	79.8000	83.1033	84.4360	79.8000 (216)
Fuel for water heating, kWh/month	227.7723	202.3242	217.0128	194.9448	193.3959	180.0137	178.7344	185.1100	186.3255	197.9097	205.1632	225.3802 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	16.0746	12.8956	11.6111	8.5068	6.5709	5.3685	5.9942	7.7915	10.1203	13.2784	14.9980	16.5214 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-16.8984	-24.7132	-36.8437	-43.0356	-47.8346	-45.2049	-44.6890	-41.5032	-36.0900	-29.0084	-18.9046	-14.5103 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-7.0168	-14.9939	-30.2273	-46.0142	-61.4247	-61.8982	-61.1329	-51.4626	-37.3542	-21.6033	-9.4233	-5.5287 (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												1622.1395 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.8000
Water heating fuel used												2394.0868 (219)

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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)	129.7312 (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	3424.6416 (238)

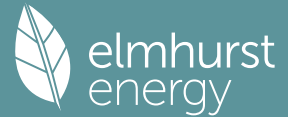
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1622.1395	0.2100	340.6493 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2394.0868	0.2100	502.7582 (264)
Space and water heating			843.4075 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	129.7312	0.1443	18.7242 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-399.2358	0.1338	-53.4152
PV Unit electricity exported	-408.0801	0.1255	-51.2212
Total			-104.6364 (269)
Total CO2, kg/year			769.4246 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.7000 (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	1622.1395	1.1300	1833.0177 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2394.0868	1.1300	2705.3180 (278)
Space and water heating			4538.3357 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	129.7312	1.5338	198.9860 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-399.2358	1.4944	-596.6313
PV Unit electricity exported	-408.0801	0.4607	-188.0104
Total			-784.6418 (283)
Total Primary energy kWh/year			4082.7808 (286)
Target Primary Energy Rate (TPER)			83.3200 (287)

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Property Reference	01107				Issued on Date	03/07/2024	
Assessment Reference	00001			Prop Type Ref			
Property	Zoar Chapel, Flat 1 , South Street, Reading						
SAP Rating	80 C		DER	5.81		TER	15.70
Environmental	96 A		% DER < TER				62.99
CO ₂ Emissions (t/year)	0.27		DFEE	34.87		TFEE	38.88
Compliance Check	See BREL		% DFEE < TFEE				10.31
% DPER < TPER	26.09		DPER	61.59		TPER	83.32
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

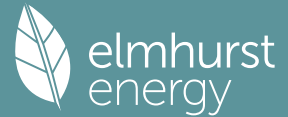
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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)			7.2400	0.9615	6.9615		(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	7.2400	52.6235	0.1800	9.4722	14.0000	736.7290 (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) =	25.2302		(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) =		7088.6390 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							144.6661 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				3.9200	0.0060	0.0235	
E3 Sill				0.9000	0.0120	0.0108	
E4 Jamb				6.2000	0.0230	0.1426	

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E5 Ground floor (normal)	27.4300	0.0330	0.9052
E16 Corner (normal)	7.3500	0.0750	0.5512
E17 Corner (inverted - internal area greater than external area)	4.9000	-0.0450	-0.2205
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)			4.6393 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	29.8694 (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 =	52.8044	52.6829	52.5639	52.0050	51.9004	51.4135	51.4135	51.3234	51.6010	51.9004	52.1119	52.3331 (39)
												52.0045
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0776	1.0752	1.0727	1.0613	1.0592	1.0493	1.0493	1.0474	1.0531	1.0592	1.0635	1.0680 (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)
												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	77.3634	85.6524	77.3634	79.9422	77.3634	79.9422	77.3634	77.3634	79.9422	77.3634	79.9422	77.3634 (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)
	308.4158	317.2362	303.6683	295.4060	280.8239	271.9619	262.0742	261.7048	269.3381	276.8861	292.3249	301.7216 (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	0.9000	19.6403	0.6300	0.7000	0.7700	5.4021 (76)						
West	6.3400	19.6403	0.6300	0.7000	0.7700	38.0547 (80)						
Solar gains	43.4568	85.0107	140.0005	204.1824	250.2332	256.1582	243.8731	209.4834	162.8264	100.8724	54.1855	35.7368 (83)
Total gains	351.8726	402.2469	443.6688	499.5884	531.0571	528.1201	505.9473	471.1882	432.1645	377.7585	346.5104	337.4584 (84)

7. Mean internal temperature (heating season)												
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	37.2898	37.3758	37.4604	37.8631	37.9394	38.2986	38.2986	38.3659	38.1594	37.9394	37.7853	37.6256
alpha	3.4860	3.4917	3.4974	3.5242	3.5293	3.5532	3.5532	3.5577	3.5440	3.5293	3.5190	3.5084
util living area	0.9752	0.9597	0.9310	0.8590	0.7406	0.5736	0.4326	0.4787	0.6991	0.8937	0.9596	0.9783 (86)
MIT	19.1973	19.4524	19.8300	20.3272	20.6994	20.9119	20.9752	20.9645	20.8183	20.3200	19.6835	19.1577 (87)
Th 2	20.0191	20.0212	20.0232	20.0325	20.0343	20.0425	20.0425	20.0440	20.0393	20.0343	20.0307	20.0270 (88)
util rest of house	0.9705	0.9522	0.9178	0.8325	0.6935	0.5022	0.3443	0.3878	0.6319	0.8677	0.9508	0.9742 (89)
MIT 2	18.3842	18.6361	19.0058	19.4845	19.8181	19.9933	20.0331	20.0296	19.9269	19.4898	18.8737	18.3509 (90)
Living area fraction	18.8140	19.0676	19.4414	19.9299	20.2839	20.4788	20.5311	20.5237	20.3981	19.9286	19.3018	18.7773 (92)
MIT	18.8140	19.0676	19.4414	19.9299	20.2839	20.4788	20.5311	20.5237	20.3981	19.9286	19.3018	18.7773 (93)
Temperature adjustment												0.0000
adjusted MIT												18.7773 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9630	0.9432	0.9086	0.8294	0.7064	0.5357	0.3901	0.4344	0.6585	0.8644	0.9426	0.9673 (94)
Useful gains	338.8590	379.4044	403.1257	414.3505	375.1409	282.9345	197.3812	204.7022	284.5652	326.5324	326.6084	326.4196 (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	766.4005	746.3902	680.2534	573.6108	445.5088	302.2523	202.1106	211.6438	324.9875	484.1587	635.8580	762.8764 (97)
Space heating kWh	318.0909	246.6144	206.1830	114.6674	52.3537	0.0000	0.0000	0.0000	0.0000	117.2740	222.6597	324.7239 (98a)
Space heating requirement - total per year (kWh/year)												1602.5670
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	318.0909	246.6144	206.1830	114.6674	52.3537	0.0000	0.0000	0.0000	0.0000	117.2740	222.6597	324.7239 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1602.5670
Space heating per m2												32.7054 (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	483.2871	380.4600	390.0575	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8490	0.9029	0.8787	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	410.3155	343.5180	342.7262	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	586.5613	562.2950	523.1837	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	126.8970	162.7701	134.2604	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	31.7242	40.6925	33.5651	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												105.9819 (107)
Energy for space heating												32.7054 (99)
Energy for space cooling												2.1629 (108)
Total												34.8683 (109)
Fabric Energy Efficiency (DFEE)												34.9 (109)

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

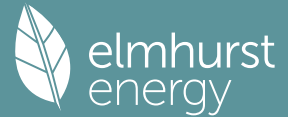
1. Overall dwelling characteristics

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

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 20.0000 / (5) = 0.1666 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4166 (18)

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Number of sides sheltered

2 (19)

Shelter factor

(20) = 1 - [0.075 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)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													(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)			7.2400	1.1450	8.2901			(27)
Heatloss Floor 1			49.0000	0.1300	6.3700			(28a)
External Wall 1	59.8635	7.2400	52.6235	0.1800	9.4722			(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) =	26.9295		(33)
Party Wall 1			11.2000	0.0000	0.0000			(32)

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

144.6661 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	3.9200	0.0500	0.1960	
E3 Sill	0.9000	0.0500	0.0450	
E4 Jamb	6.2000	0.0500	0.3100	
E5 Ground floor (normal)	27.4300	0.1600	4.3888	
E16 Corner (normal)	7.3500	0.0900	0.6615	
E17 Corner (inverted - internal area greater than external area)	4.9000	-0.0900	-0.4410	
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)

Point Thermal bridges

5.9669 (36)

Total fabric heat loss

(33) + (36) + (36a) = 32.8964 (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	56.7424	56.5856	56.4319	55.7101	55.5750	54.9463	54.9463	54.8299	55.1885	55.5750	55.8482	56.1339	(39)
Average = Sum(39)m / 12 =												55.7094	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1580	1.1548	1.1517	1.1369	1.1342	1.1214	1.1214	1.1190	1.1263	1.1342	1.1398	1.1456	(40)
HLP (average)												1.1369	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

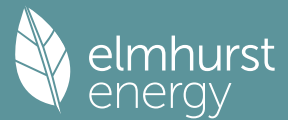
4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6607 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	22.5124	22.1781	21.7073	20.8392	20.1891	19.4684	19.0790	19.5466	20.0556	20.8269	21.7129	22.4363	(42b)
Hot water usage for other uses	31.6372	30.4868	29.3364	28.1859	27.0355	25.8850	25.8850	27.0355	28.1859	29.3364	30.4868	31.6372	(42c)
Average daily hot water use (litres/day)												49.6337	(43)
Daily hot water use	54.1497	52.6649	51.0436	49.0251	47.2246	45.3534	44.9640	46.5820	48.2415	50.1632	52.1997	54.0736	(44)
Energy conte	85.7599	74.9941	78.4522	67.1129	63.5734	55.7673	54.3801	57.6783	59.4866	68.0710	74.3680	84.6662	(45)
Energy content (annual)										Total = Sum(45)m =		824.3098	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	72.8959	63.7450	66.6843	57.0459	54.0374	47.4022	46.2231	49.0265	50.5636	57.8604	63.2128	71.9662	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	72.8959	63.7450	66.6843	57.0459	54.0374	47.4022	46.2231	49.0265	50.5636	57.8604	63.2128	71.9662	(64)
12Total per year (kWh/year)										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)
												474.2733	(64a)
Heat gains from water heating, kWh/month	28.6476	25.2238	26.8127	23.9395	23.3690	21.2557	21.2744	22.1163	22.3190	24.6067	25.7541	28.4152	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	(66)

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Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.3634	85.6524	77.3634	79.9422	77.3634	79.9422	77.3634	77.3634	79.9422	77.3634	79.9422	77.3634 (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	308.4158	317.2362	303.6683	295.4060	280.8239	271.9619	262.0742	261.7048	269.3381	276.8861	292.3249	301.7216 (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					0.9000	19.6403		0.6300	0.7000	0.7700	5.4021 (76)	
West					6.3400	19.6403		0.6300	0.7000	0.7700	38.0547 (80)	
Solar gains	43.4568	85.0107	140.0005	204.1824	250.2332	256.1582	243.8731	209.4834	162.8264	100.8724	54.1855	35.7368 (83)
Total gains	351.8726	402.2469	443.6688	499.5884	531.0571	528.1201	505.9473	471.1882	432.1645	377.7585	346.5104	337.4584 (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	34.7019	34.7980	34.8928	35.3449	35.4308	35.8362	35.8362	35.9123	35.6790	35.4308	35.2575	35.0781
alpha	3.3135	3.3199	3.3262	3.3563	3.3621	3.3891	3.3891	3.3942	3.3786	3.3621	3.3505	3.3385
util living area	0.9761	0.9619	0.9357	0.8701	0.7602	0.5985	0.4566	0.5034	0.7206	0.9017	0.9617	0.9790 (86)
MIT	19.0225	19.2830	19.6782	20.2118	20.6272	20.8824	20.9644	20.9503	20.7709	20.2180	19.5426	18.9878 (87)
Th 2	19.9537	19.9563	19.9589	19.9708	19.9730	19.9834	19.9834	19.9854	19.9794	19.9730	19.9685	19.9638 (88)
util rest of house	0.9714	0.9545	0.9229	0.8440	0.7124	0.5226	0.3595	0.4044	0.6514	0.8762	0.9531	0.9749 (89)
MIT 2	18.1652	18.4231	18.8111	19.3286	19.7047	19.9180	19.9702	19.9654	19.8376	19.3474	18.6908	18.1380 (90)
Living area fraction	18.6184	18.8776	19.2694	19.7954	20.1923	20.4277	20.4957	20.4860	20.3309	19.8076	19.1410	18.5872 (92)
MIT	18.6184	18.8776	19.2694	19.7954	20.1923	20.4277	20.4957	20.4860	20.3309	19.8076	19.1410	18.5872 (93)
Temperature adjustment												0.0000
adjusted MIT	18.6184	18.8776	19.2694	19.7954	20.1923	20.4277	20.4957	20.4860	20.3309	19.8076	19.1410	18.5872 (93)

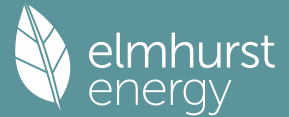
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9636	0.9450	0.9127	0.8390	0.7234	0.5570	0.4095	0.4547	0.6769	0.8714	0.9443	0.9677 (94)
Useful gains	339.0597	380.1087	404.9468	419.1766	384.1481	294.1880	207.2069	214.2392	292.5440	329.1910	327.2183	326.5445 (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	812.4585	790.9315	720.6042	606.9848	471.9609	320.2111	214.0559	224.0359	343.8752	511.7113	672.4703	807.6082 (97)
Space heating kWh	352.2088	276.0729	234.8491	135.2219	65.3327	0.0000	0.0000	0.0000	0.0000	135.7951	248.5815	357.9114 (98a)
Space heating requirement - total per year (kWh/year)												1805.9733
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	352.2088	276.0729	234.8491	135.2219	65.3327	0.0000	0.0000	0.0000	0.0000	135.7951	248.5815	357.9114 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1805.9733
Space heating per m2										(98c) / (4) =		36.8566 (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	516.4951	406.6025	416.7069	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8186	0.8784	0.8513	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	422.7950	357.1627	354.7289	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	586.5613	562.2950	523.1837	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	117.9118	152.6185	125.3304	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	29.4779	38.1546	31.3326	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												98.9652 (107)
Energy for space heating												36.8566 (99)
Energy for space cooling												2.0197 (108)
Total												38.8763 (109)
Fabric Energy Efficiency (TFEE)												38.9 (109)

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Property Reference	01107				Issued on Date	03/07/2024	
Assessment Reference	00001			Prop Type Ref			
Property	Zoar Chapel, Flat 1 , South Street, Reading						
SAP Rating	80 C		DER	5.81		TER	15.70
Environmental	96 A		% DER < TER				62.99
CO ₂ Emissions (t/year)	0.27		DFEE	34.87		TFEE	38.88
Compliance Check	See BREL		% DFEE < TFEE				10.31
% DPER < TPER	26.09		DPER	61.59		TPER	83.32
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

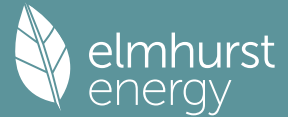
		m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
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)			7.2400	0.9615	6.9615		(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	7.2400	52.6235	0.1800	9.4722	14.0000	736.7290 (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) =	25.2302			(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) =	6598.6390	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K						134.6661	(35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				3.9200	0.0060	0.0235	
E3 Sill				0.9000	0.0120	0.0108	
E4 Jamb				6.2000	0.0230	0.1426	
E5 Ground floor (normal)				27.4300	0.0330	0.9052	
E16 Corner (normal)				7.3500	0.0750	0.5512	

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E17 Corner (inverted - internal area greater than external area)	4.9000	-0.0450	-0.2205										
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)				4.6393 (36)									
Point Thermal bridges				0.0000									
Total fabric heat loss		(33) + (36) + (36a) =		29.8694 (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	52.8044	52.6829	52.5639	52.0050	51.9004	51.4135	51.4135	51.3234	51.6010	51.9004	52.1119	52.3331	(39)
Average = Sum(39)m / 12 =												52.0045	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0776	1.0752	1.0727	1.0613	1.0592	1.0493	1.0493	1.0474	1.0531	1.0592	1.0635	1.0680	(40)
HLP (average)												1.0613	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

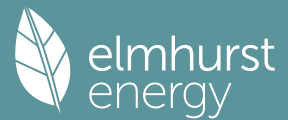
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												1.6607 (42)
Hot water usage for mixer showers												
52.0640	51.2816	50.1414	47.9600	46.3501	44.5548	43.5344	44.6659	45.9062	47.8338	50.0621	51.8645	(42a)
Hot water usage for baths												
22.5124	22.1781	21.7073	20.8392	20.1891	19.4684	19.0790	19.5466	20.0556	20.8269	21.7129	22.4363	(42b)
Hot water usage for other uses												
31.6372	30.4868	29.3364	28.1859	27.0355	25.8850	25.8850	27.0355	28.1859	29.3364	30.4868	31.6372	(42c)
Average daily hot water use (litres/day)												97.6350 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
106.2137	103.9465	101.1851	96.9850	93.5747	89.9082	88.4984	91.2479	94.1477	97.9970	102.2618	105.9381	(44)
Energy conte	168.2165	148.0184	155.5177	132.7677	125.9695	110.5526	107.0312	112.9839	116.0936	132.9811	145.6907	165.8734 (45)
Energy content (annual)												
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	22.5120	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month												
256.9261	228.1432	244.2273	218.6157	214.6791	165.8246	164.1456	170.0983	171.3656	221.6907	231.5387	254.5830	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	256.9261	228.1432	244.2273	218.6157	214.6791	165.8246	164.1456	170.0983	171.3656	221.6907	231.5387	254.5830 (64)
12Total per year (kWh/year)												2541.8378 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	99.8181	88.8551	95.5957	86.6157	85.7710	54.7683	54.1978	56.1771	56.6107	88.1023	90.9125	99.0390 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.3634	85.6524	77.3634	79.9422	77.3634	79.9422	77.3634	77.3634	79.9422	77.3634	79.9422	(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	(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	(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	(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	(72)
Total internal gains	404.0750	411.9257	396.1185	382.4562	364.6975	318.5072	306.3260	307.4854	316.9656	362.2296	382.8227	396.6461 (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		0.9000	19.6403	0.6300	0.7000	0.7700	5.4021 (76)					
West		6.3400	19.6403	0.6300	0.7000	0.7700	38.0547 (80)					
Solar gains	43.4568	85.0107	140.0005	204.1824	250.2332	256.1582	243.8731	209.4834	162.8264	100.8724	54.1855	35.7368 (83)
Total gains	447.5318	496.9364	536.1190	586.6386	614.9307	574.6654	550.1991	516.9688	479.7920	463.1020	437.0082	432.3829 (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	34.7122	34.7922	34.8710	35.2458	35.3168	35.6512	35.6512	35.7139	35.5217	35.3168	35.1734	35.0248
alpha	3.3141	3.3195	3.3247	3.3497	3.3545	3.3767	3.3767	3.3809	3.3681	3.3545	3.3449	3.3350
util living area												
	0.9450	0.9221	0.8822	0.7963	0.6699	0.5318	0.3989	0.4386	0.6459	0.8255	0.9177	0.9500 (86)
Living	19.6968	19.8780	20.1436	20.4785	20.7208	20.8465	20.8909	20.8840	20.7860	20.4906	20.0517	19.6688
Non living	18.5086	18.7353	19.0642	19.4720	19.7455	19.8805	19.9166	19.9139	19.8250	19.4974	18.9632	18.4797
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	20.3334	19.8780	20.1436	20.4785	20.7208	20.8465	20.8909	20.8840	20.7860	20.4906	20.0517	19.8550 (87)
Th 2	20.0191	20.0212	20.0232	20.0325	20.0343	20.0425	20.0425	20.0440	20.0393	20.0343	20.0307	20.0270 (88)
util rest of house												
	0.9361	0.9097	0.8635	0.7650	0.6216	0.4639	0.3169	0.3543	0.5794	0.7913	0.9026	0.9418 (89)
MIT 2	19.4170	18.7353	19.0642	19.4720	19.7455	19.8805	19.9166	19.9139	19.8250	19.4974	18.9632	18.7585 (90)
Living area fraction												
MIT	19.9013	19.3393	19.6347	20.0040	20.2610	20.3911	20.4315	20.4267	20.3329	20.0224	19.5385	19.3381 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9013	19.3393	19.6347	20.0040	20.2610	20.3911	20.4315	20.4267	20.3329	20.0224	19.5385	19.3381 (93)

8. Space heating requirement												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9349	0.8997	0.8551	0.7640	0.6335	0.4894	0.3508	0.3888	0.6008	0.7909	0.8937	0.9350 (94)
Useful gains	418.3816	447.0865	458.4207	448.1882	389.5774	281.2354	193.0070	200.9725	288.2419	366.2512	390.5445	404.2796 (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	823.8187	760.7038	690.4128	577.4642	444.3182	297.7398	196.9933	206.6636	321.6252	489.0265	648.1960	792.2242 (97)
Space heating kWh	301.6452	210.7508	172.6022	93.0787	40.7271	0.0000	0.0000	0.0000	0.0000	91.3448	185.5091	288.6308 (98a)
Space heating requirement - total per year (kWh/year)												1384.2887
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	301.6452	210.7508	172.6022	93.0787	40.7271	0.0000	0.0000	0.0000	0.0000	91.3448	185.5091	288.6308 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1384.2887
Space heating per m2										(98c) / (4) =		28.2508 (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 %)												317.0693 (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	301.6452	210.7508	172.6022	93.0787	40.7271	0.0000	0.0000	0.0000	0.0000	91.3448	185.5091	288.6308 (98)
Space heating efficiency (main heating system 1)	317.0693	317.0693	317.0693	317.0693	317.0693	0.0000	0.0000	0.0000	0.0000	317.0693	317.0693	317.0693 (210)
Space heating fuel (main heating system)	95.1354	66.4684	54.4367	29.3560	12.8449	0.0000	0.0000	0.0000	0.0000	28.8091	58.5074	91.0308 (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	183.6105	183.6105	183.6105	183.6105	183.6105	183.6105	183.6105	183.6105	183.6105	183.6105	183.6105	183.6105 (216)
Fuel for water heating, kWh/month	139.9299	124.2539	133.0138	119.0649	116.9209	90.3132	89.3988	92.6409	93.3310	120.7396	126.1032	138.6538 (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	17.7763	14.2608	12.8402	9.4073	7.2665	5.9368	6.6287	8.6163	11.1917	14.6841	16.5856	18.2703 (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												436.5887 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												183.6105
Water heating fuel used												1384.3640 (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)												143.4646 (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	1964.4173 (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	436.5887	0.1556	67.9549 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1384.3640	0.1416	196.0859 (264)
Space and water heating			264.0409 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	143.4646	0.1443	20.7064 (268)
Total CO2, kg/year			284.7472 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.8100 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	436.5887	1.5762	688.1597 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1384.3640	1.5238	2109.4943 (278)
Space and water heating			2797.6540 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	143.4646	1.5338	220.0508 (282)
Total Primary energy kWh/year			3017.7048 (286)
Dwelling Primary energy Rate (DPER)			61.5900 (287)

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

1. Overall dwelling characteristics

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

2. Ventilation rate

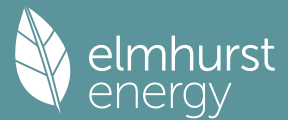
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1666 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4166 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3541 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4515	0.4426	0.4338	0.3895	0.3807	0.3364	0.3364	0.3275	0.3541	0.3807	0.3984	0.4161 (22b)
Effective ac	0.6019	0.5980	0.5941	0.5759	0.5725	0.5566	0.5566	0.5536	0.5627	0.5725	0.5793	0.5866 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			1.8000	1.0000	1.8000		(26)
TER Opening Type (Uw = 1.20)			7.2400	1.1450	8.2901		(27)
Heatloss Floor 1			49.0000	0.1300	6.3700		(28a)
External Wall 1	59.8635	7.2400	52.6235	0.1800	9.4722		(29a)

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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) =		26.9295	(33)
Party Wall 1			11.2000	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 144.6661 (35)

List of Thermal Bridges						
K1 Element			Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)			3.9200	0.0500	0.1960	
E3 Sill			0.9000	0.0500	0.0450	
E4 Jamb			6.2000	0.0500	0.3100	
E5 Ground floor (normal)			27.4300	0.1600	4.3888	
E16 Corner (normal)			7.3500	0.0900	0.6615	
E17 Corner (inverted - internal area greater than external area)			4.9000	-0.0900	-0.4410	
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) 5.9669 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 32.8964 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	23.8460	23.6892	23.5355	22.8136	22.6786	22.0499	22.0499	21.9335	22.2921	22.6786	22.9518	23.2374	(38)
Average = Sum(39)m / 12 =	56.7424	56.5856	56.4319	55.7101	55.5750	54.9463	54.9463	54.8299	55.1885	55.5750	55.8482	56.1339	(39)
	55.7094												
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1580	1.1548	1.1517	1.1369	1.1342	1.1214	1.1214	1.1190	1.1263	1.1342	1.1398	1.1456	(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)
													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)

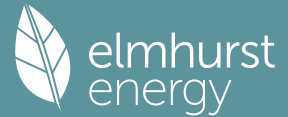
5. Internal gains (see Table 5 and 5a)

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	77.3634	85.6524	77.3634	79.9422	77.3634	79.9422	77.3634	77.3634	79.9422	77.3634	79.9422	77.3634	(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)
	401.0374	408.8881	393.0809	379.4186	361.6599	346.4430	334.2617	335.4212	344.9013	359.1921	379.7852	393.6085	(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
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East	0.9000	19.6403	0.6300	0.7000	0.7700	5.4021 (76)
West	6.3400	19.6403	0.6300	0.7000	0.7700	38.0547 (80)

Solar gains	43.4568	85.0107	140.0005	204.1824	250.2332	256.1582	243.8731	209.4834	162.8264	100.8724	54.1855	35.7368 (83)
Total gains	444.4942	493.8988	533.0815	583.6010	611.8931	602.6012	578.1348	544.9046	507.7277	460.0644	433.9707	429.3453 (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	34.7019	34.7980	34.8928	35.3449	35.4308	35.8362	35.8362	35.9123	35.6790	35.4308	35.2575	35.0781
alpha	3.3135	3.3199	3.3262	3.3563	3.3621	3.3891	3.3891	3.3942	3.3786	3.3621	3.3505	3.3385
util living area	0.9551	0.9354	0.9006	0.8225	0.7019	0.5403	0.4052	0.4440	0.6510	0.8497	0.9317	0.9593 (86)
MIT	19.2879	19.5290	19.8913	20.3612	20.7123	20.9139	20.9752	20.9660	20.8340	20.3837	19.7765	19.2554 (87)
Th 2	19.9537	19.9563	19.9589	19.9708	19.9730	19.9834	19.9834	19.9854	19.9794	19.9730	19.9685	19.9638 (88)
util rest of house	0.9469	0.9240	0.8828	0.7913	0.6511	0.4674	0.3169	0.3534	0.5799	0.8161	0.9177	0.9519 (89)
MIT 2	17.9909	18.2933	18.7434	19.3161	19.7136	19.9235	19.9719	19.9684	19.8522	19.3581	18.6160	17.9569 (90)
Living area fraction	18.6765	18.9465	19.3501	19.8685	20.2415	20.4470	20.5022	20.4957	20.3711	19.9002	19.2294	18.6433 (92)
MIT	18.6765	18.9465	19.3501	19.8685	20.2415	20.4470	20.5022	20.4957	20.3711	19.9002	19.2294	18.6433 (93)
Temperature adjustment												0.0000
adjusted MIT	18.6765	18.9465	19.3501	19.8685	20.2415	20.4470	20.5022	20.4957	20.3711	19.9002	19.2294	18.6433 (93)

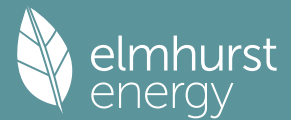
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9343	0.9105	0.8707	0.7878	0.6651	0.5016	0.3627	0.3999	0.6086	0.8134	0.9056	0.9398 (94)
Useful gains	415.3127	449.7079	464.1307	459.7772	406.9971	302.2735	209.6747	217.9171	308.9795	374.2158	392.9858	403.5199 (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	815.7552	794.8281	725.1575	611.0556	474.6927	321.2700	214.4136	224.5684	346.0939	516.8605	677.4061	810.7572 (97)
Space heating kWh	297.9292	231.9208	194.2039	108.9205	50.3655	0.0000	0.0000	0.0000	0.0000	106.1277	204.7826	302.9845 (98a)
Space heating requirement - total per year (kWh/year)												1497.2348
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	297.9292	231.9208	194.2039	108.9205	50.3655	0.0000	0.0000	0.0000	0.0000	106.1277	204.7826	302.9845 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1497.2348
Space heating per m2										(98c) / (4) =		30.5558 (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	297.9292	231.9208	194.2039	108.9205	50.3655	0.0000	0.0000	0.0000	0.0000	106.1277	204.7826	302.9845 (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)	322.7835	251.2685	210.4051	118.0070	54.5672	0.0000	0.0000	0.0000	0.0000	114.9812	221.8663	328.2606 (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	85.0225	84.7380	84.1968	83.1875	81.8021	79.8000	79.8000	79.8000	79.8000	83.1033	84.4360	79.8000 (216)
Fuel for water heating, kWh/month	227.7723	202.3242	217.0128	194.9448	193.3959	180.0137	178.7344	185.1100	186.3255	197.9097	205.1632	225.3802 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	16.0746	12.8956	11.6111	8.5068	6.5709	5.3685	5.9942	7.7915	10.1203	13.2784	14.9980	16.5214 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-16.8984	-24.7132	-36.8437	-43.0356	-47.8346	-45.2049	-44.6890	-41.5032	-36.0900	-29.0084	-18.9046	-14.5103 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-7.0168	-14.9939	-30.2273	-46.0142	-61.4247	-61.8982	-61.1329	-51.4626	-37.3542	-21.6033	-9.4233	-5.5287 (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												1622.1395 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.8000
Water heating fuel used												2394.0868 (219)

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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)	129.7312 (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	3424.6416 (238)

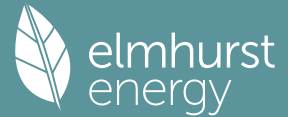
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1622.1395	0.2100	340.6493 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2394.0868	0.2100	502.7582 (264)
Space and water heating			843.4075 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	129.7312	0.1443	18.7242 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-399.2358	0.1338	-53.4152
PV Unit electricity exported	-408.0801	0.1255	-51.2212
Total			-104.6364 (269)
Total CO2, kg/year			769.4246 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.7000 (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	1622.1395	1.1300	1833.0177 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2394.0868	1.1300	2705.3180 (278)
Space and water heating			4538.3357 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	129.7312	1.5338	198.9860 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-399.2358	1.4944	-596.6313
PV Unit electricity exported	-408.0801	0.4607	-188.0104
Total			-784.6418 (283)
Total Primary energy kWh/year			4082.7808 (286)
Target Primary Energy Rate (TPER)			83.3200 (287)

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Property Reference	01107				Issued on Date	03/07/2024	
Assessment Reference	00001			Prop Type Ref			
Property	Zoar Chapel, Flat 1 , South Street, Reading						
SAP Rating	80 C		DER	5.81		TER	15.70
Environmental	96 A		% DER < TER				62.99
CO ₂ Emissions (t/year)	0.27		DFEE	34.87		TFEE	38.88
Compliance Check	See BREL		% DFEE < TFEE				10.31
% DPER < TPER	26.09		DPER	61.59		TPER	83.32
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)

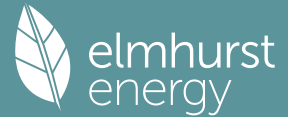
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3973	0.3895	0.3817	0.3428	0.3350	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)			7.2400	0.9615	6.9615		(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	7.2400	52.6235	0.1800	9.4722	14.0000	736.7290 (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) =	25.2302		(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) =		7088.6390 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							144.6661 (35)

List of Thermal Bridges		
K1 Element	Length	Psi-value
E2 Other lintels (including other steel lintels)	3.9200	0.0060
E3 Sill	0.9000	0.0120
E4 Jamb	6.2000	0.0230
E5 Ground floor (normal)	27.4300	0.0330
E16 Corner (normal)	7.3500	0.0750

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E17 Corner (inverted - internal area greater than external area)	4.9000	-0.0450	-0.2205	
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)				4.6393 (36)
Point Thermal bridges				0.0000
Total fabric heat loss		(33) + (36) + (36a) =		29.8694 (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												
	52.8044	52.6829	52.5639	52.0050	51.9004	51.4135	51.4135	51.3234	51.6010	51.9004	52.1119	52.3331 (39)
Average = Sum(39)m / 12 =												52.0045
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0776	1.0752	1.0727	1.0613	1.0592	1.0493	1.0493	1.0474	1.0531	1.0592	1.0635	1.0680 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

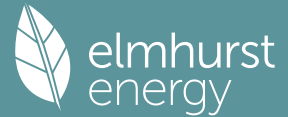
4. Water heating energy requirements (kWh/year)													
Assumed occupancy												1.6607 (42)	
Hot water usage for mixer showers													
52.0640	51.2816	50.1414	47.9600	46.3501	44.5548	43.5344	44.6659	45.9062	47.8338	50.0621	51.8645	(42a)	
Hot water usage for baths													
22.5124	22.1781	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)
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)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
99.8181	88.8551	95.5957	86.6157	85.7710	54.7683	54.1978	56.1771	56.6107	88.1023	90.9125	99.0390	(65)	

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
20.3089	18.0382	14.6696	11.1059	8.3018	7.0087	7.5731	9.8439	13.2124	16.7762	19.5803	20.8733	(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	450.1880	448.2182	435.4686	411.6979	388.7078	333.9406	321.7594	324.4503	336.5830	391.9555	417.7800	440.1803 (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	0.9000	19.6403	0.6300	0.7000	0.7700	5.4021 (76)						
West	6.3400	19.6403	0.6300	0.7000	0.7700	38.0547 (80)						
Solar gains	43.4568	85.0107	140.0005	204.1824	250.2332	256.1582	243.8731	209.4834	162.8264	100.8724	54.1855	35.7368 (83)
Total gains	493.6448	533.2290	575.4691	615.8803	638.9410	590.0988	565.6324	533.9337	499.4095	492.8278	471.9655	475.9170 (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	37.2898	37.3758	37.4604	37.8631	37.9394	38.2986	38.2986	38.3659	38.1594	37.9394	37.7853	37.6256
alpha	3.4860	3.4917	3.4974	3.5242	3.5293	3.5532	3.5532	3.5577	3.5440	3.5293	3.5190	3.5084
util living area	0.9371	0.9161	0.8722	0.7873	0.6600	0.5243	0.3905	0.4283	0.6344	0.8132	0.9098	0.9432 (86)
Living	19.8594	20.0084	20.2578	20.5485	20.7588	20.8636	20.8998	20.8947	20.8139	20.5621	20.1693	19.8293
Non living	18.7058	18.8916	19.1983	19.5503	19.7846	19.8964	19.9248	19.9233	19.8514	19.5763	19.1024	18.6746
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	20.4165	20.0084	20.2578	20.5485	20.7588	20.8636	20.8998	20.8947	20.8139	20.5621	20.1693	19.9930 (87)
Th 2	20.0191	20.0212	20.0232	20.0325	20.0343	20.0425	20.0425	20.0440	20.0393	20.0343	20.0307	20.0270 (88)
util rest of house	0.9266	0.9025	0.8517	0.7543	0.6104	0.4560	0.3094	0.3448	0.5665	0.7767	0.8930	0.9337 (89)
MIT 2	19.4955	18.8916	19.1983	19.5503	19.7846	19.8964	19.9248	19.9233	19.8514	19.5763	19.1024	18.9183 (90)
Living area fraction									FLA = Living area / (4) =			
MIT	19.9823	19.4819	19.7584	20.0779	20.2996	20.4076	20.4402	20.4368	20.3602	20.0974	19.6663	19.4864 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9823	19.4819	19.7584	20.0779	20.2996	20.4076	20.4402	20.4368	20.3602	20.0974	19.6663	19.4864 (93)

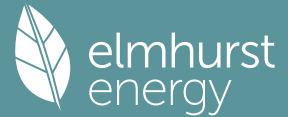
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9262	0.8939	0.8455	0.7559	0.6246	0.4827	0.3436	0.3797	0.5902	0.7793	0.8858	0.9275 (94)
Useful gains	457.2217	476.6777	486.5535	465.5688	399.0909	284.8631	194.3592	202.7520	294.7680	384.0533	418.0638	441.4268 (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	828.0961	768.2189	696.9116	581.3064	446.3203	298.5896	197.4381	207.1799	323.0310	492.9166	654.8557	799.9827 (97)
Space heating kWh	275.9305	195.9157	156.5065	83.3311	35.1387	0.0000	0.0000	0.0000	0.0000	80.9943	170.4901	266.7656 (98a)
Space heating requirement - total per year (kWh/year)												1265.0725
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	275.9305	195.9157	156.5065	83.3311	35.1387	0.0000	0.0000	0.0000	0.0000	80.9943	170.4901	266.7656 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1265.0725
Space heating per m2										(98c) / (4) =		25.8178 (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 %)												317.0693 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	275.9305	195.9157	156.5065	83.3311	35.1387	0.0000	0.0000	0.0000	0.0000	80.9943	170.4901	266.7656 (98)
Space heating efficiency (main heating system 1)	317.0693	317.0693	317.0693	317.0693	317.0693	0.0000	0.0000	0.0000	0.0000	317.0693	317.0693	317.0693 (210)
Space heating fuel (main heating system)	87.0253	61.7896	49.3603	26.2817	11.0823	0.0000	0.0000	0.0000	0.0000	25.5447	53.7706	84.1348 (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	183.6105	183.6105	183.6105	183.6105	183.6105	183.6105	183.6105	183.6105	183.6105	183.6105	183.6105	183.6105 (216)
Fuel for water heating, kWh/month	139.9299	124.2539	133.0138	119.0649	116.9209	90.3132	89.3988	92.6409	93.3310	120.7396	126.1032	138.6538 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	17.7763	14.2608	12.8402	9.4073	7.2665	5.9368	6.6287	8.6163	11.1917	14.6841	16.5856	18.2703 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												398.9893 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												183.6105
Water heating fuel used												1384.3640 (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)												143.4646 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)

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Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	1926.8179 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	398.9893	16.4900	65.7933 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1384.3640	16.4900	228.2816 (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	143.4646	16.4900	23.6573 (250)
Additional standing charges			0.0000 (251)
Total energy cost			317.7323 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	1.2168 (257)
SAP value	80.2749
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	398.9893	0.1558	62.1521 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1384.3640	0.1416	196.0859 (264)
Space and water heating			258.2381 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	143.4646	0.1443	20.7064 (268)
Total CO2, kg/year			278.9444 (272)
CO2 emissions per m2			5.6900 (273)
EI value			96.0236
EI rating			96 (274)
EI band			A

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

1. Overall dwelling characteristics

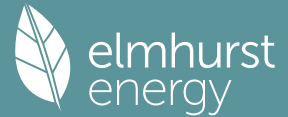
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	49.0000 (1b)	x 2.4500 (2b)	= 120.0500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	120.0500 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1666 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3666 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3116 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.3272	0.3116	0.3116	0.2882	0.2882	0.2571	0.2649	0.2493	0.2571	0.2727	0.2727	0.2960 (22b)

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Effective ac 0.5535 0.5485 0.5485 0.5415 0.5415 0.5330 0.5351 0.5311 0.5330 0.5372 0.5372 0.5438 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Windows (Uw = 1.00)			7.2400	0.9615	6.9615			(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	7.2400	52.6235	0.1800	9.4722	14.0000	736.7290	(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) =		25.2302			(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) = 7088.6390 (34)

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

144.6661 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	3.9200	0.0060	0.0235
E3 Sill	0.9000	0.0120	0.0108
E4 Jamb	6.2000	0.0230	0.1426
E5 Ground floor (normal)	27.4300	0.0330	0.9052
E16 Corner (normal)	7.3500	0.0750	0.5512
E17 Corner (inverted - internal area greater than external area)	4.9000	-0.0450	-0.2205
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)

4.6393 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 29.8694 (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	51.7982	51.6010	51.6010	51.3234	51.3234	50.9868	51.0673	50.9086	50.9868	51.1503	51.1503	51.4135	(39)
Average = Sum(39)m / 12 =												51.2759	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0571	1.0531	1.0531	1.0474	1.0474	1.0405	1.0422	1.0390	1.0405	1.0439	1.0439	1.0493	(40)
HLP (average)												1.0464	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6607 (42)
Hot water usage for mixer showers													
52.0640	51.2816	50.1414	47.9600	46.3501	44.5548	43.5344	44.6659	45.9062	47.8338	50.0621	51.8645	(42a)	
Hot water usage for baths													
22.5124	22.1781	21.7073	20.8392	20.1891	19.4684	19.0790	19.5466	20.0556	20.8269	21.7129	22.4363	(42b)	
Hot water usage for other uses													
31.6372	30.4868	29.3364	28.1859	27.0355	25.8850	25.8850	27.0355	28.1859	29.3364	30.4868	31.6372	(42c)	
Average daily hot water use (litres/day)												97.6350	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.2137	103.9465	101.1851	96.9850	93.5747	89.9082	88.4984	91.2479	94.1477	97.9970	102.2618	105.9381	(44)
Energy content	168.2165	148.0184	155.5177	132.7677	125.9695	110.5526	107.0312	112.9839	116.0936	132.9811	145.6907	165.8734	(45)
Energy content (annual)										Total = Sum(45)m =		1621.6962	
Distribution loss (46)m = 0.15 x (45)m													
25.2325	22.2028	23.3276	19.9152	18.8954	16.5829	16.0547	16.9476	17.4140	19.9472	21.8536	24.8810	(46)	
Water storage loss:													
Store volume												180.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4000	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												1.0920	(55)
Total storage loss													
33.8520	30.5760	33.8520	32.7600	33.8520	32.7600	33.8520	33.8520	32.7600	33.8520	32.7600	33.8520	(56)	
If cylinder contains dedicated solar storage													
33.8520	30.5760	33.8520	32.7600	33.8520	32.7600	33.8520	33.8520	32.7600	33.8520	32.7600	33.8520	(57)	
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
256.9261	228.1432	244.2273	218.6157	214.6791	165.8246	164.1456	170.0983	171.3656	221.6907	231.5387	254.5830	(62)	
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
256.9261	228.1432	244.2273	218.6157	214.6791	165.8246	164.1456	170.0983	171.3656	221.6907	231.5387	254.5830	(64)	
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	20.3089	18.0382	14.6696	11.1059	8.3018	7.0087	7.5731	9.8439	13.2124	16.7762	19.5803	20.8733	(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)

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Losses e.g. evaporation (negative values) (Table 5)	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281 (71)
Water heating gains (Table 5)	134.1641	132.2249	128.4888	120.2995	115.2835	76.0671	72.8465	75.5068	78.6260	118.4170	126.2674	133.1169 (72)
Total internal gains	450.1880	448.2182	435.4686	411.6979	388.7078	333.9406	321.7594	324.4503	336.5830	391.9555	417.7800	440.1803 (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					0.9000	22.3313	0.6300	0.7000			0.7700			6.1423 (76)
West					6.3400	22.3313	0.6300	0.7000			0.7700			43.2689 (80)
Solar gains	49.4111	86.9460	141.1850	211.5958	252.1253	275.9973	260.0006	228.7389	177.7903	110.0968	63.1166			40.2390 (83)
Total gains	499.5991	535.1643	576.6536	623.2937	640.8331	609.9379	581.7600	553.1892	514.3733	502.0523	480.8966	480.4193	(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	38.0142	38.1594	38.1594	38.3659	38.3659	38.6192	38.5583	38.6784	38.6192	38.4957	38.4957	38.2986
alpha	3.5343	3.5440	3.5440	3.5577	3.5577	3.5746	3.5706	3.5786	3.5746	3.5664	3.5664	3.5532
util living area	0.9250	0.9036	0.8494	0.7442	0.5863	0.4070	0.2702	0.2919	0.5382	0.7638	0.8872	0.9315 (86)
Living	20.0004	20.1269	20.3774	20.6456	20.8252	20.8968	20.9109	20.9102	20.8659	20.6670	20.3098	19.9774
Non living	18.8947	19.0525	19.3560	19.6706	19.8608	19.9297	19.9368	19.9394	19.9075	19.7050	19.2869	18.8719
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	20.4886	20.1269	20.3774	20.6456	20.8252	20.8968	20.9109	20.9102	20.8659	20.6670	20.3098	20.1204 (87)
Th 2	20.0360	20.0393	20.0393	20.0440	20.0440	20.0497	20.0483	20.0510	20.0497	20.0469	20.0469	20.0425 (88)
util rest of house	0.9124	0.8879	0.8252	0.7057	0.5295	0.3338	0.1882	0.2066	0.4619	0.7190	0.8662	0.9199 (89)
MIT 2	19.5810	19.0525	19.3560	19.6706	19.8608	19.9297	19.9368	19.9394	19.9075	19.7050	19.2869	19.0829 (90)
Living area fraction	20.0608	19.6204	19.8959	20.1859	20.3705	20.4409	20.4517	20.4526	20.4141	20.2135	19.8276	0.5286 (91)
MIT	20.0608	19.6204	19.8959	20.1859	20.3705	20.4409	20.4517	20.4526	20.4141	20.2135	19.8276	19.6313 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0608	19.6204	19.8959	20.1859	20.3705	20.4409	20.4517	20.4526	20.4141	20.2135	19.8276	19.6313 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	456.0248	471.0070	473.5925	443.6387	352.1592	222.2620	129.8237	134.3806	253.0899	365.2121	413.9143	439.1801 (94)
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	774.9407	723.4657	644.8005	527.9085	378.2811	226.4284	130.3082	135.0383	265.8494	440.5825	604.9832	747.1050 (97)
Space heating kWh	237.2734	169.6522	127.3788	60.6742	19.4348	0.0000	0.0000	0.0000	0.0000	56.0755	137.5696	229.0961 (98a)
Space heating requirement - total per year (kWh/year)												1037.1547
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	237.2734	169.6522	127.3788	60.6742	19.4348	0.0000	0.0000	0.0000	0.0000	56.0755	137.5696	229.0961 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1037.1547
Space heating per m ²										(98c) / (4) =		21.1664 (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 %)												316.8824 (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	237.2734	169.6522	127.3788	60.6742	19.4348	0.0000	0.0000	0.0000	0.0000	56.0755	137.5696	229.0961 (98)
Space heating efficiency (main heating system 1)	316.8824	316.8824	316.8824	316.8824	316.8824	0.0000	0.0000	0.0000	0.0000	316.8824	316.8824	316.8824 (210)
Space heating fuel (main heating system)	74.8774	53.5379	40.1975	19.1472	6.1331	0.0000	0.0000	0.0000	0.0000	17.6960	43.4135	72.2969 (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	183.7041	183.7041	183.7041	183.7041	183.7041	183.7041	183.7041	183.7041	183.7041	183.7041	183.7041	183.7041 (216)
Fuel for water heating, kWh/month	139.8586	124.1905	132.9460	119.0042	116.8613	90.2672	89.3532	92.5936	93.2835	120.6781	126.0389	138.5832 (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	17.7763	14.2608	12.8402	9.4073	7.2665	5.9368	6.6287	8.6163	11.1917	14.6841	16.5856	18.2703 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												

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(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												327.2995	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												183.7041	
Water heating fuel used												1383.6584	(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)												143.4646	(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												1854.4225	(238)

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

	Fuel kWh/year	Fuel price £/kWh	Fuel cost £/year	
Space heating - main system 1	327.2995	26.0600	85.2943	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1383.6584	26.0600	360.5814	(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	143.4646	26.0600	37.3869	(250)
Additional standing charges			0.0000	(251)
Total energy cost			483.2625	(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	327.2995	0.1565	51.2154	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1383.6584	0.1416	195.9860	(264)
Space and water heating			247.2014	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	143.4646	0.1443	20.7064	(268)
Total CO2, kg/year			267.9078	(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	327.2995	1.5793	516.9016	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1383.6584	1.5238	2108.4191	(278)
Space and water heating			2625.3207	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	143.4646	1.5338	220.0508	(282)
Total Primary energy kWh/year			2845.3714	(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

Total Savings £0 0.00 kg/m²

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Potential energy efficiency rating:
Potential environmental impact rating:

C 80
A 96

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

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

Electricity	Current £483	Potential £483	£0	Saving
Space heating	£85	£85	£0	
Water heating	£361	£361	£0	
Lighting	£37	£37	£0	
Total cost of fuels	£483	£483	£0	
Total cost of uses	£483	£483	£0	
Delivered energy	38 kWh/m ²	38 kWh/m ²	0 kWh/m ²	
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes	
CO2 emissions per m ²	5 kg/m ²	5 kg/m ²	0 kg/m ²	
Primary energy	58 kWh/m ²	58 kWh/m ²	0 kWh/m ²	

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

1. Overall dwelling characteristics

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

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1666 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50		4.0000 (17)
Infiltration rate		0.3666 (18)
Number of sides sheltered		2 (19)

Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3116 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3973	0.3895	0.3817	0.3428	0.3350	0.2960	0.2960	0.2882	0.3116	0.3350	0.3506	0.3661 (22b)
Effective ac	0.5789	0.5759	0.5729	0.5587	0.5561	0.5438	0.5438	0.5415	0.5485	0.5561	0.5614	0.5670 (25)

3. Heat losses and heat loss parameter

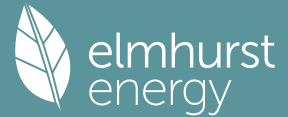
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.00)			7.2400	0.9615	6.9615		(27)
Doo to Hall			1.8000	1.4000	2.5200		(26)
Heatloss Floor 1			49.0000	0.1100	5.3900	75.0000	3675.0000 (28a)
External Wall 1	59.8635	7.2400	52.6235	0.1800	9.4722	14.0000	736.7290 (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) =	25.2302			(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) =	7088.6390 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		144.6661 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	3.9200	0.0060	0.0235
E3 Sill	0.9000	0.0120	0.0108
E4 Jamb	6.2000	0.0230	0.1426
E5 Ground floor (normal)	27.4300	0.0330	0.9052
E16 Corner (normal)	7.3500	0.0750	0.5512
E17 Corner (inverted - internal area greater than external area)	4.9000	-0.0450	-0.2205
P1 Party wall - Ground floor	4.5700	0.3200	1.4624

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E18 Party wall between dwellings 7.3500 0.2400 1.7640
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.6393 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 29.8694 (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 = 52.8044 52.6829 52.5639 52.0050 51.9004 51.4135 51.4135 51.3234 51.6010 51.9004 52.1119 52.3331 (39)
52.0045
HLP Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
HLP (average) 1.0776 1.0752 1.0727 1.0613 1.0592 1.0493 1.0493 1.0474 1.0531 1.0592 1.0635 1.0680 (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 51.8645 (42a)
Hot water usage for baths 22.4363 (42b)
Hot water usage for other uses 31.6372 (42c)
Average daily hot water use (litres/day) 97.6350 (43)
Daily hot water use Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Energy conte 106.2137 103.9465 101.1851 96.9850 93.5747 89.9082 88.4984 91.2479 94.1477 97.9970 102.2618 105.9381 (44)
Energy content (annual) 168.2165 148.0184 155.5177 132.7677 125.9695 110.5526 107.0312 112.9839 116.0936 132.9811 145.6907 165.8734 (45)
Distribution loss (46)m = 0.15 x (45)m Total = Sum(45)m = 1621.6962
Water storage loss: 25.2325 22.2028 23.3276 19.9152 18.8954 16.5829 16.0547 16.9476 17.4140 19.9472 21.8536 24.8810 (46)
Store volume 180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.4000 (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 22.5120 54.8576 53.0880 54.8576 (59)
Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)
Total heat required for water heating calculated for each month 256.9261 228.1432 244.2273 218.6157 214.6791 165.8246 164.1456 170.0983 171.3656 221.6907 231.5387 254.5830 (62)
WWHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 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 20.3089 18.0382 14.6696 11.1059 8.3018 7.0087 7.5731 9.8439 13.2124 16.7762 19.5803 20.8733 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 215.8761 218.1162 212.4712 200.4536 185.2835 171.0258 161.5008 159.2607 164.9057 176.9233 192.0934 206.3511 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 46.6249 46.6249 46.6249 46.6249 46.6249 46.6249 46.6249 46.6249 46.6249 46.6249 46.6249 46.6249 (69)
Pumps, fans 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5) -66.4281 -66.4281 -66.4281 -66.4281 -66.4281 -66.4281 -66.4281 -66.4281 -66.4281 -66.4281 -66.4281 -66.4281 (71)
Water heating gains (Table 5) 134.1641 132.2249 128.4888 120.2995 115.2835 76.0671 72.8465 75.5068 78.6260 118.4170 126.2674 133.1169 (72)
Total internal gains 450.1880 448.2182 435.4686 411.6979 388.7078 333.9406 321.7594 324.4503 336.5830 391.9555 417.7800 440.1803 (73)

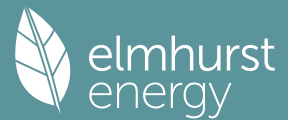
6. Solar gains

[Jan] Area Solar flux g Specific data FF Access Gains
m2 Table 6a W/m2 or Table 6b or Table 6c factor Table 6d W
East 0.9000 19.6403 0.6300 0.7000 0.7700 5.4021 (76)
West 6.3400 19.6403 0.6300 0.7000 0.7700 38.0547 (80)
Solar gains 43.4568 85.0107 140.0005 204.1824 250.2332 256.1582 243.8731 209.4834 162.8264 100.8724 54.1855 35.7368 (83)
Total gains 493.6448 533.2290 575.4691 615.8803 638.9410 590.0988 565.6324 533.9337 499.4095 492.8278 471.9655 475.9170 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

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tau	37.2898	37.3758	37.4604	37.8631	37.9394	38.2986	38.2986	38.3659	38.1594	37.9394	37.7853	37.6256
alpha	3.4860	3.4917	3.4974	3.5242	3.5293	3.5532	3.5532	3.5577	3.5440	3.5293	3.5190	3.5084
util living area	0.9371	0.9161	0.8722	0.7873	0.6600	0.5243	0.3905	0.4283	0.6344	0.8132	0.9098	0.9432 (86)
Living	19.8594	20.0084	20.2578	20.5485	20.7588	20.8636	20.8998	20.8947	20.8139	20.5621	20.1693	19.8293
Non living	18.7058	18.8916	19.1983	19.5503	19.7846	19.8964	19.9248	19.9233	19.8514	19.5763	19.1024	18.6746
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	20.4165	20.0084	20.2578	20.5485	20.7588	20.8636	20.8998	20.8947	20.8139	20.5621	20.1693	19.9930 (87)
Th 2	20.0191	20.0212	20.0232	20.0325	20.0343	20.0425	20.0425	20.0440	20.0393	20.0343	20.0307	20.0270 (88)
util rest of house	0.9266	0.9025	0.8517	0.7543	0.6104	0.4560	0.3094	0.3448	0.5665	0.7767	0.8930	0.9337 (89)
MIT 2	19.4955	18.8916	19.1983	19.5503	19.7846	19.8964	19.9248	19.9233	19.8514	19.5763	19.1024	18.9183 (90)
Living area fraction									fLA = Living area / (4) =			0.5286 (91)
MIT	19.9823	19.4819	19.7584	20.0779	20.2996	20.4076	20.4402	20.4368	20.3602	20.0974	19.6663	19.4864 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9823	19.4819	19.7584	20.0779	20.2996	20.4076	20.4402	20.4368	20.3602	20.0974	19.6663	19.4864 (93)

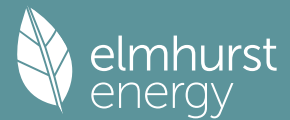
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9262	0.8939	0.8455	0.7559	0.6246	0.4827	0.3436	0.3797	0.5902	0.7793	0.8858	0.9275 (94)
Useful gains	457.2217	476.6777	486.5535	465.5688	399.0909	284.8631	194.3592	202.7520	294.7680	384.0533	418.0638	441.4268 (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	828.0961	768.2189	696.9116	581.3064	446.3203	298.5896	197.4381	207.1799	323.0310	492.9166	654.8557	799.9827 (97)
Space heating kWh	275.9305	195.9157	156.5065	83.3311	35.1387	0.0000	0.0000	0.0000	0.0000	80.9943	170.4901	266.7656 (98a)
Space heating requirement - total per year (kWh/year)												1265.0725
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	275.9305	195.9157	156.5065	83.3311	35.1387	0.0000	0.0000	0.0000	0.0000	80.9943	170.4901	266.7656 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1265.0725
Space heating per m2										(98c) / (4) =		25.8178 (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 %)												317.0693 (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	275.9305	195.9157	156.5065	83.3311	35.1387	0.0000	0.0000	0.0000	0.0000	80.9943	170.4901	266.7656 (98)
Space heating efficiency (main heating system 1)	317.0693	317.0693	317.0693	317.0693	317.0693	0.0000	0.0000	0.0000	0.0000	317.0693	317.0693	317.0693 (210)
Space heating fuel (main heating system)	87.0253	61.7896	49.3603	26.2817	11.0823	0.0000	0.0000	0.0000	0.0000	25.5447	53.7706	84.1348 (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	183.6105	183.6105	183.6105	183.6105	183.6105	183.6105	183.6105	183.6105	183.6105	183.6105	183.6105	183.6105 (216)
Fuel for water heating, kWh/month	139.9299	124.2539	133.0138	119.0649	116.9209	90.3132	89.3988	92.6409	93.3310	120.7396	126.1032	138.6538 (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	17.7763	14.2608	12.8402	9.4073	7.2665	5.9368	6.6287	8.6163	11.1917	14.6841	16.5856	18.2703 (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												398.9893 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												183.6105
Water heating fuel used												1384.3640 (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)												143.4646 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)

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Appendix Q - special features
 Energy saved or generated
 Energy used
 Total delivered energy for all uses

-0.0000 (236)
 0.0000 (237)
 1926.8179 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	398.9893	16.4900	65.7933 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1384.3640	16.4900	228.2816 (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	143.4646	16.4900	23.6573 (250)
Additional standing charges			0.0000 (251)
Total energy cost			317.7323 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.2168 (257)
SAP value		80.2749
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	398.9893	0.1558	62.1521 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1384.3640	0.1416	196.0859 (264)
Space and water heating			258.2381 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	143.4646	0.1443	20.7064 (268)
Total CO2, kg/year			278.9444 (272)
CO2 emissions per m2			5.6900 (273)
EI value			96.0236
EI rating			96 (274)
EI band			A

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

1. Overall dwelling characteristics

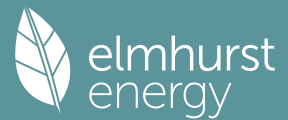
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	49.0000 (1b)	x 2.4500 (2b)	= 120.0500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	120.0500 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1666 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3666 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3116 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8500	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.3272	0.3116	0.3116	0.2882	0.2882	0.2571	0.2649	0.2493	0.2571	0.2727	0.2727	0.2960 (22b)
Effective ac	0.5535	0.5485	0.5485	0.5415	0.5415	0.5330	0.5351	0.5311	0.5330	0.5372	0.5372	0.5438 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Windows (Uw = 1.00)			7.2400	0.9615	6.9615			(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		52.6235	0.1800	9.4722	14.0000	736.7290	(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) =		25.2302			(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) = 7088.6390 (34)

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

144.6661 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	3.9200	0.0060	0.0235	
E3 Sill	0.9000	0.0120	0.0108	
E4 Jamb	6.2000	0.0230	0.1426	
E5 Ground floor (normal)	27.4300	0.0330	0.9052	
E16 Corner (normal)	7.3500	0.0750	0.5512	
E17 Corner (inverted - internal area greater than external area)	4.9000	-0.0450	-0.2205	
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)

4.6393 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 29.8694 (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	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)
Average = Sum(39)m / 12 =	51.7982	51.6010	51.6010	51.3234	51.3234	50.9868	51.0673	50.9086	50.9868	51.1503	51.1503	51.4135	(39)
												51.2759	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0571	1.0531	1.0531	1.0474	1.0474	1.0405	1.0422	1.0390	1.0405	1.0439	1.0439	1.0493	(40)
HLP (average)												1.0464	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

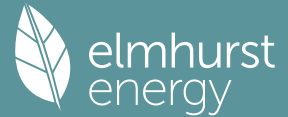
4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6607 (42)
Hot water usage for mixer showers													
52.0640	51.2816	50.1414	47.9600	46.3501	44.5548	43.5344	44.6659	45.9062	47.8338	50.0621	51.8645	42a)	
Hot water usage for baths													
22.5124	22.1781	21.7073	20.8392	20.1891	19.4684	19.0790	19.5466	20.0556	20.8269	21.7129	22.4363	42b)	
Hot water usage for other uses													
31.6372	30.4868	29.3364	28.1859	27.0355	25.8850	25.8850	27.0355	28.1859	29.3364	30.4868	31.6372	42c)	
Average daily hot water use (litres/day)													97.6350 (43)
Daily hot water use													
106.2137	103.9465	101.1851	96.9850	93.5747	89.9082	88.4984	91.2479	94.1477	97.9970	102.2618	105.9381	44)	
Energy content (annual)	168.2165	148.0184	155.5177	132.7677	125.9695	110.5526	107.0312	112.9839	116.0936	132.9811	145.6907	165.8734	45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1621.6962	
25.2325	22.2028	23.3276	19.9152	18.8954	16.5829	16.0547	16.9476	17.4140	19.9472	21.8536	24.8810	46)	
Water storage loss:													
Store volume													180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.4000 (48)
Temperature factor from Table 2b													0.7800 (49)
Enter (49) or (54) in (55)													1.0920 (55)
Total storage loss													
33.8520	30.5760	33.8520	32.7600	33.8520	32.7600	33.8520	33.8520	32.7600	33.8520	32.7600	33.8520	56)	
If cylinder contains dedicated solar storage													
33.8520	30.5760	33.8520	32.7600	33.8520	32.7600	33.8520	33.8520	32.7600	33.8520	32.7600	33.8520	57)	
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	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	20.3089	18.0382	14.6696	11.1059	8.3018	7.0087	7.5731	9.8439	13.2124	16.7762	19.5803	20.8733 (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)

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Water heating gains (Table 5)	134.1641	132.2249	128.4888	120.2995	115.2835	76.0671	72.8465	75.5068	78.6260	118.4170	126.2674	133.1169 (72)
Total internal gains	450.1880	448.2182	435.4686	411.6979	388.7078	333.9406	321.7594	324.4503	336.5830	391.9555	417.7800	440.1803 (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					0.9000	22.3313	0.6300	0.7000			0.7700	6.1423 (76)
West					6.3400	22.3313	0.6300	0.7000			0.7700	43.2689 (80)
Solar gains	49.4111	86.9460	141.1850	211.5958	252.1253	275.9973	260.0006	228.7389	177.7903	110.0968	63.1166	40.2390 (83)
Total gains	499.5991	535.1643	576.6536	623.2937	640.8331	609.9379	581.7600	553.1892	514.3733	502.0523	480.8966	480.4193 (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	38.0142	38.1594	38.1594	38.3659	38.3659	38.6192	38.5583	38.6784	38.6192	38.4957	38.4957	38.2986
alpha	3.5343	3.5440	3.5440	3.5577	3.5577	3.5746	3.5706	3.5786	3.5746	3.5664	3.5664	3.5532
util living area	0.9250	0.9036	0.8494	0.7442	0.5863	0.4070	0.2702	0.2919	0.5382	0.7638	0.8872	0.9315 (86)
Living	20.0004	20.1269	20.3774	20.6456	20.8252	20.8968	20.9109	20.9102	20.8659	20.6670	20.3098	19.9774
Non living	18.8947	19.0525	19.3560	19.6706	19.8608	19.9297	19.9368	19.9394	19.9075	19.7050	19.2869	18.8719
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	20.4886	20.1269	20.3774	20.6456	20.8252	20.8968	20.9109	20.9102	20.8659	20.6670	20.3098	20.1204 (87)
Th 2	20.0360	20.0393	20.0393	20.0440	20.0440	20.0497	20.0483	20.0510	20.0497	20.0469	20.0469	20.0425 (88)
util rest of house	0.9124	0.8879	0.8252	0.7057	0.5295	0.3338	0.1882	0.2066	0.4619	0.7190	0.8662	0.9199 (89)
MIT 2	19.5810	19.0525	19.3560	19.6706	19.8608	19.9297	19.9368	19.9394	19.9075	19.7050	19.2869	19.0829 (90)
Living area fraction												0.5286 (91)
MIT	20.0608	19.6204	19.8959	20.1859	20.3705	20.4409	20.4517	20.4526	20.4141	20.2135	19.8276	19.6313 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0608	19.6204	19.8959	20.1859	20.3705	20.4409	20.4517	20.4526	20.4141	20.2135	19.8276	19.6313 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9128	0.8801	0.8213	0.7118	0.5495	0.3644	0.2232	0.2429	0.4920	0.7274	0.8607	0.9142 (94)
Useful gains	456.0248	471.0070	473.5925	443.6387	352.1592	222.2620	129.8237	134.3806	253.0899	365.2121	413.9143	439.1801 (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	774.9407	723.4657	644.8005	527.9085	378.2811	226.4284	130.3082	135.0383	265.8494	440.5825	604.9832	747.1050 (97)
Space heating kWh	237.2734	169.6522	127.3788	60.6742	19.4348	0.0000	0.0000	0.0000	0.0000	56.0755	137.5696	229.0961 (98a)
Space heating requirement - total per year (kWh/year)												1037.1547
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	237.2734	169.6522	127.3788	60.6742	19.4348	0.0000	0.0000	0.0000	0.0000	56.0755	137.5696	229.0961 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1037.1547
Space heating per m ²										(98c) / (4) =		21.1664 (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 %)												316.8824 (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	237.2734	169.6522	127.3788	60.6742	19.4348	0.0000	0.0000	0.0000	0.0000	56.0755	137.5696	229.0961 (98)
Space heating efficiency (main heating system 1)	316.8824	316.8824	316.8824	316.8824	316.8824	0.0000	0.0000	0.0000	0.0000	316.8824	316.8824	316.8824 (210)
Space heating fuel (main heating system)	74.8774	53.5379	40.1975	19.1472	6.1331	0.0000	0.0000	0.0000	0.0000	17.6960	43.4135	72.2969 (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	183.7041	183.7041	183.7041	183.7041	183.7041	183.7041	183.7041	183.7041	183.7041	183.7041	183.7041	183.7041 (216)
Fuel for water heating, kWh/month	139.8586	124.1905	132.9460	119.0042	116.8613	90.2672	89.3532	92.5936	93.2835	120.6781	126.0389	138.5832 (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	17.7763	14.2608	12.8402	9.4073	7.2665	5.9368	6.6287	8.6163	11.1917	14.6841	16.5856	18.2703 (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)												

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(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												327.2995	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												183.7041	
Water heating fuel used												1383.6584	(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)												143.4646	(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												1854.4225	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	327.2995	26.0600	85.2943	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1383.6584	26.0600	360.5814	(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	143.4646	26.0600	37.3869	(250)
Additional standing charges			0.0000	(251)
Total energy cost			483.2625	(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	327.2995	0.1565	51.2154	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1383.6584	0.1416	195.9860	(264)
Space and water heating			247.2014	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	143.4646	0.1443	20.7064	(268)
Total CO2, kg/year			267.9078	(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	327.2995	1.5793	516.9016	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1383.6584	1.5238	2108.4191	(278)
Space and water heating			2625.3207	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	143.4646	1.5338	220.0508	(282)
Total Primary energy kWh/year			2845.3714	(286)

Predicted Energy Assessment



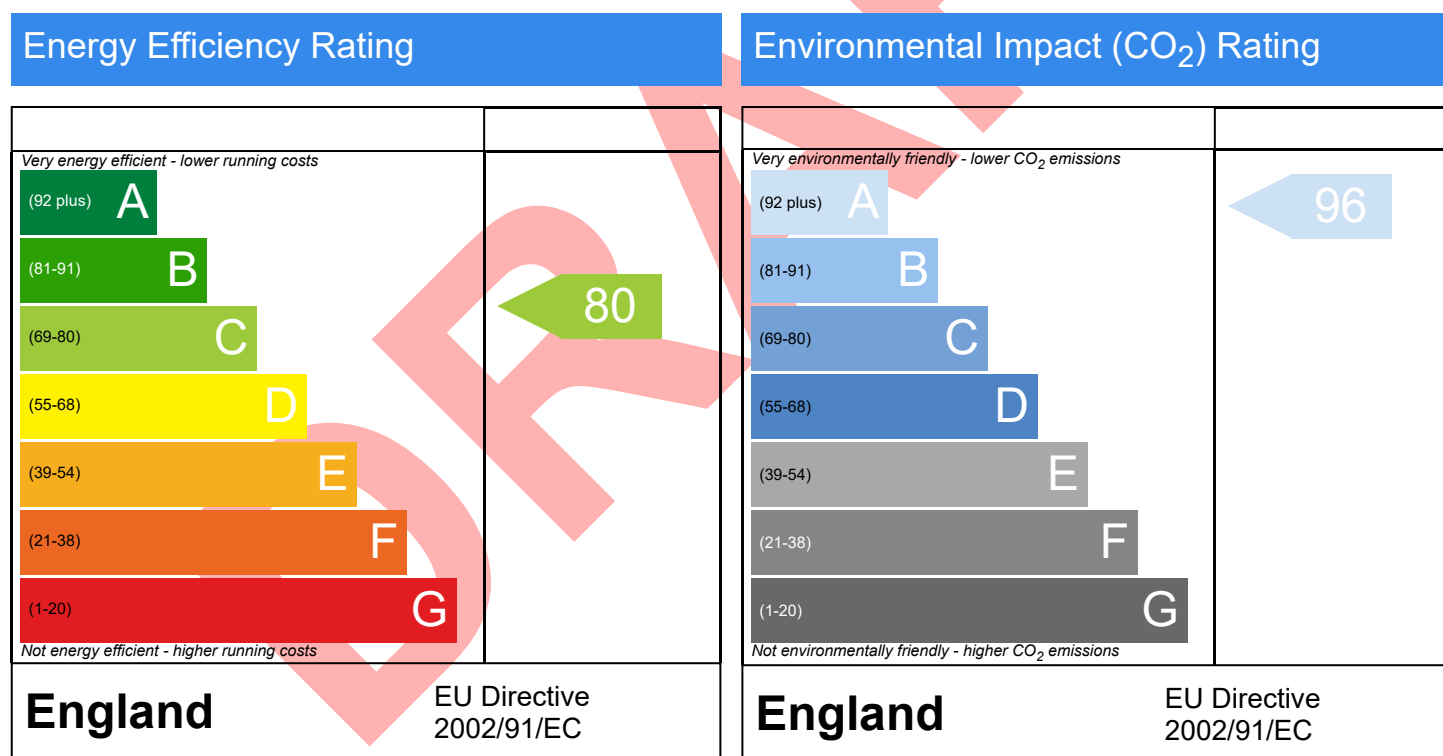
Zoar Chapel, Flat 1 , South Street, Reading

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	01107	Issued on Date	03/07/2024
Assessment Reference	00001	Prop Type Ref	Semi-Detached Flat
Property	Zoar Chapel, Flat 1 , South Street, Reading		

SAP Rating	80 C	DER	5.81	TER	15.70
Environmental	96 A	% DER < TER			62.99
CO ₂ Emissions (t/year)	0.27	DFEE	34.87	TFEE	38.88
Compliance Check	See BREL	% DFEE < TFEE			10.31
% DPER < TPER	26.09	DPER	61.59	TPER	83.32

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

	Junction details	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.006	3.92	0.02	TD5
External wall	E3 Sill	Independently assessed	0.012	0.90	0.01	TD5
External wall	E4 Jamb	Independently assessed	0.023	6.20	0.14	TD5
External wall	E5 Ground floor (normal)	Independently assessed	0.033	27.43	0.91	TD5
External wall	E16 Corner (normal)	Independently assessed	0.075	7.35	0.55	TD5
External wall	E17 Corner (inverted – internal area greater than external area)	Independently assessed	-0.045	4.90	-0.22	TD5
Party wall	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: 62.62 W/mK:
Y-Value: 0.04 W/m²K: