

Building Regulations England Part L (BREL) Compliance Report

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

Date: Wed 03 Jul 2024 11:34:21

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

Dwelling Details			
Assessment Type	As designed	Total Floor Area	77 m ²
Site Reference	01114	Plot Reference	00001
Address	Flat 8 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	12.4 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	4.88 kgCO ₂ /m ²		OK

1b Target primary energy rate and dwelling primary energy			
Target primary energy	65.15 kWh _{PE} /m ²		
Dwelling primary energy	51.57 kWh _{PE} /m ²		OK

1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	35.8 kWh/m ²		
Dwelling fabric energy efficiency	36.1 kWh/m ²		FAIL

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.18	Walls (1) (0.18)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	N/A	N/A	N/A
Roofs	0.16	0.1	Roof (1) (0.1)	OK
Windows, doors, and roof windows	1.6	1.03	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)	61.3406	0.18	
Sheltered wall: Walls (2)	15.28	0.16	
Party wall: Party Wall (1)	28.19	0 (!)	
Exposed roof: Roof (1)	42.48	0.1 (!)	

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
Opening, Windows	3.78	East	0.7	1 (!)
Opening, Windows	6.3	East	0.7	1 (!)
Opening, Windows	2.1538	West	0.7	1 (!)
Opening, Windows	2.1538	West	0.7	1 (!)
Opening, Windows	6.3	West	0.7	1 (!)
Opening, Doo to Hall	1.8	North	N/A	1.4
Opening, Windows	0.5	South	0.7	1 (!)
Opening, Windows	0.5	South	0.7	1 (!)
Opening, Windows	1.1918	South	0.7	1 (!)

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))	
Building part 1 - Main Dwelling: Thermal bridging calculated from linear thermal transmittances for each junction	

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.006 (!)	TD5
External wall	E3: Sill	Calculated by person with suitable expertise	0.012 (!)	TD5
External wall	E4: Jamb	Calculated by person with suitable expertise	0.023 (!)	TD5
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.075	TD5
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.045	TD5
External wall	E18: Party wall between dwellings	SAP table default	0.24	
External wall	E7: Party floor between dwellings (in blocks of flats)	Calculated by person with suitable expertise	0.022 (!)	TD5
External wall	E14: Flat roof	SAP table default	0.16	

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

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

4 Space heating

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

Efficiency	311.6%
Emitter type	Underfloor
Flow temperature	35°C
System type	Heat Pump
Manufacturer	Vaillant Group UK Ltd
Model	aroTHERM 5kW
Commissioning	

Secondary heating system: N/A

Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water

Cylinder/store - type: Cylinder

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

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

Efficiency	
Manufacturer	
Model	

6 Controls

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

Function	
Ecodesign class	
Manufacturer	
Model	

Water heating - type: N/A

Manufacturer	
Model	

7 Lighting

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

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

Summary for Input Data

Property Reference	01114	Issued on Date	03/07/2024
Assessment Reference	00001	Prop Type Ref	
Property	Zoar Chapel , Flat 8, South Street , Reading		

SAP Rating	80 C	DER	4.88	TER	12.40
Environmental	96 A	% DER < TER			60.65
CO ₂ Emissions (t/year)	0.35	DFEE	36.10	TFEE	35.82
Compliance Check	See BREL	% DFEE < TFEE			-0.78
% DPER < TPER	20.84	DPER	51.57	TPER	65.15

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	Top-floor flat	
Which Floor	3	
2.0 Number of Storeys	2	
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	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	No	
Smart gas meter fitted	No	

7.0 Measurements	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m ²	0.00 m
Ground floor:	27.33 m	48.70 m ²	2.34 m
1st Storey:	14.94 m	27.90 m ²	2.50 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	27.00	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	84.22	61.34	0.00	None	22.88	Calculate Wall Area
	Wall to Stairs	Steel Frame	Steel frame wall (warm frame or hybrid construction)	0.18	14.00	17.08	15.28	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	28.19	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	35.33

Summary for Input Data

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
External Roof 1	External Flat Roof	Plasterboard, insulated flat roof	0.10	9.00	42.48	42.48	None	0.00	Enter Gross Area	0.00

10.2 Internal Ceilings

Description	Storey	Construction	Area (m²)
Internal Ceiling 1	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	27.80

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Precast concrete planks floor, screed, carpeted	30.00	42.48

12.0 Opening Types

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

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Opening	Windows	External Wall 1	East	10.08	0
Opening	Windows	External Wall 1	West	10.61	0
Opening	Doo to Hall	Wall to Stairs	North	1.80	0
Opening	Windows	External Wall 1	South	2.19	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	11.19	0.01	0.01	TD5	No
E3 Sill	Independently assessed	4.60	0.01	0.01	TD5	No
E4 Jamb	Independently assessed	25.83	0.02	0.02	TD5	No
E16 Corner (normal)	Independently assessed	9.70	0.07	0.07	TD5	No
E17 Corner (inverted – internal area greater than external area)	Independently assessed	2.34	-0.04	-0.04	TD5	No
E18 Party wall between dwellings	Table K1 - Default	11.70	0.24	0.24		No
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	27.00	0.02	0.02	TD5	No
E14 Flat roof	Table K1 - Default	27.45	0.16	0.16		No

Y-value W/m²K

18.0 Pressure Testing

Designed AP₅₀ m³/(h.m²) @ 50 Pa

Property Tested?

Test Method

19.0 Mechanical Ventilation

Mechanical Ventilation System Present

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System

22.0 Lighting

No Fixed Lighting

Name	Efficacy	Power	Capacity	Count
Lighting 1	90.00	5	450	8

24.0 Main Heating 1

Database

Percentage of Heat %

Database Ref. No.

Fuel Type

SAP Code

In Winter

Summary for Input Data

In Summer	181.73
Model Name	aroTHERM 5kW
Manufacturer	Vaillant Group UK Ltd
System Type	Heat Pump
Controls SAP Code	2207
Delayed Start Stat	No
Burner Control	Modulating
HETAS approved System	No
Oil Pump Inside	No
FI Case	0.00
Flue Type	None or Unknown
Fan Assisted Flue	No
Is MHS Pumped	Pump in heated space
Heating Pump Age	2013 or later
Heat Emitter	Underfloor
Underfloor Heating	Yes - Pipes in thin screed
Flow Temperature	Enter value
Flow Temperature Value	35.00
Boiler Interlock	No
Combi boiler type	Standard Combi
Combi keep hot type	None

25.0 Main Heating 2	None
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26.0 Heat Networks	None
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	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

28.0 Water Heating	
Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Summer Immersion	No
Cold Water Source	From mains
Bath Count	1
Supplementary Immersion	No
Immersion Only Heating Hot Water	Yes

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

28.3 Waste Water Heat Recovery System	
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29.0 Hot Water Cylinder	Hot Water Cylinder
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Summary for Input Data

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

31.0 Thermal Store

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout



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% DPER < TPER	20.84	DPER	51.57
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	48.7000 (1b)	x 2.3400 (2b)	= 113.9580 (1b) - (3b)
First floor	27.9000 (1c)	x 2.5000 (2c)	= 69.7500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.7080 (5)

2. Ventilation rate

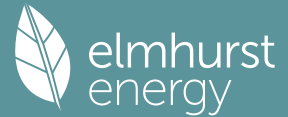
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1089 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3089 (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) = 0.2625 (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	0.3347	0.3282	0.3216	0.2888	0.2822	0.2494	0.2494	0.2428	0.2625	0.2822	0.2954	0.3085 (22b)
Effective ac	0.5560	0.5538	0.5517	0.5417	0.5398	0.5311	0.5311	0.5295	0.5345	0.5398	0.5436	0.5476 (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)			22.8800	0.9615	22.0000		(27)
Doo to Hall			1.8000	1.4000	2.5200		(26)
External Wall 1	84.2222	22.8800	61.3422	0.1800	11.0416	14.0000	858.7908 (29a)
Wall to Stairs	17.0800	1.8000	15.2800	0.1600	2.4448	14.0000	213.9200 (29a)
External Roof 1	42.4800		42.4800	0.1000	4.2480	9.0000	382.3200 (30)
Total net area of external elements Aum(A, m ²)			143.7822				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	42.2544			(33)
Party Wall 1			28.1900	0.0000	0.0000	20.0000	563.8000 (32)
Party Floor 1			42.4800			40.0000	1699.2000 (32d)
Internal Wall 1			35.3300			9.0000	317.9700 (32c)
Internal Ceiling 1			27.8000			9.0000	250.2000 (32e)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =	4286.2008			(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K				55.9556			(35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				11.1900	0.0060	0.0671	
E3 Sill				4.6000	0.0120	0.0552	
E4 Jamb				25.8300	0.0230	0.5941	

Full SAP Calculation Printout



E16 Corner (normal)									9.7000	0.0750	0.7275	
E17 Corner (inverted - internal area greater than external area)									2.3400	-0.0450	-0.1053	
E18 Party wall between dwellings									11.7000	0.2400	2.8080	
E7 Party floor between dwellings (in blocks of flats)									27.0000	0.0220	0.5940	
E14 Flat roof									27.4500	0.1600	4.3920	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												9.1326 (36)
Point Thermal bridges											(36a) =	0.0000
Total fabric heat loss											(33) + (36) + (36a) =	51.3870 (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	33.7082	33.5763	33.4470	32.8399	32.7262	32.1974	32.1974	32.0995	32.4011	32.7262	32.9561	33.1963 (38)
Average = Sum(39)m / 12 =	85.0952	84.9633	84.8341	84.2269	84.1133	83.5844	83.5844	83.4865	83.7881	84.1133	84.3431	84.5834 (39)
												84.2263
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1109	1.1092	1.1075	1.0996	1.0981	1.0912	1.0912	1.0899	1.0938	1.0981	1.1011	1.1042 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.3952 (42)
Hot water usage for mixer showers												
	64.3791	63.4116	62.0017	59.3043	57.3136	55.0937	53.8319	55.2310	56.7648	59.1483	61.9037	64.1324 (42a)
Hot water usage for baths												
	27.8083	27.3953	26.8138	25.7414	24.9385	24.0481	23.5672	24.1447	24.7735	25.7262	26.8206	27.7143 (42b)
Hot water usage for other uses												
	39.1591	37.7351	36.3111	34.8872	33.4632	32.0392	32.0392	33.4632	34.8872	36.3111	37.7351	39.1591 (42c)
Average daily hot water use (litres/day)												120.7372 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	131.3465	128.5420	125.1266	119.9329	115.7153	111.1811	109.4383	112.8390	116.4255	121.1857	126.4595	131.0058 (44)
Energy conte	208.0207	183.0421	192.3150	164.1821	155.7751	136.7101	132.3562	139.7182	143.5643	164.4478	180.1647	205.1234 (45)
Energy content (annual)										Total = Sum(45)m =		2005.4197
Distribution loss (46)m = 0.15 x (45)m												
	31.2031	27.4563	28.8472	24.6273	23.3663	20.5065	19.8534	20.9577	21.5346	24.6672	27.0247	30.7685 (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												
	296.7303	263.1669	281.0246	250.0301	244.4847	191.9821	189.4706	196.8326	198.8363	253.1574	266.0127	293.8330 (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												
	296.7303	263.1669	281.0246	250.0301	244.4847	191.9821	189.4706	196.8326	198.8363	253.1574	266.0127	293.8330 (64)
								Total per year (kWh/year) = Sum(64)m =				2925.5613 (64)
12Total per year (kWh/year)												2926 (64)
Electric shower(s)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												
Heat gains from water heating, kWh/month												
	113.0530	100.5005	107.8308	97.0610	95.6813	63.4657	62.6184	65.0662	65.7447	98.5650	102.3752	112.0896 (65)

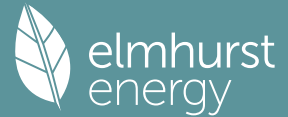
5. Internal gains (see Table 5 and 5a)												

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	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	107.0246	118.4915	107.0246	110.5921	107.0246	110.5921	107.0246	107.0246	110.5921	107.0246	110.5921	107.0246 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	212.1882	214.3901	208.8415	197.0292	182.1183	168.1042	158.7419	156.5400	162.0886	173.9009	188.8118	202.8259 (68)
Pumps, fans	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759 (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)
	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074 (71)
Water heating gains (Table 5)												
	151.9529	149.5544	144.9339	134.8069	128.6039	88.1468	84.1644	87.4546	91.3121	132.4798	142.1877	150.6581 (72)
Total internal gains												
	530.0935	541.3637	519.7277	501.3559	476.6746	425.7708	408.8587	409.9470	422.9205	472.3331	500.5193	519.4364 (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			10.0800	19.6403	0.6300	0.7000			0.7700		60.5034 (76)	
South			2.1900	46.7521	0.6300	0.7000			0.7700		31.2908 (78)	
West			10.6100	19.6403	0.6300	0.7000			0.7700		63.6846 (80)	
Solar gains	155.4788	294.1843	465.3631	657.2783	791.9826	806.0211	769.2162	668.8531	533.5060	343.5404	191.9381	129.1643 (83)
Total gains	685.5723	835.5481	985.0908	1158.6342	1268.6571	1231.7920	1178.0748	1078.8000	956.4265	815.8735	692.4575	648.6007 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)

21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	13.9915	14.0132	14.0346	14.1358	14.1549	14.2444	14.2444	14.2611	14.2098	14.1549	14.1163	14.0762
alpha	1.9328	1.9342	1.9356	1.9424	1.9437	1.9496	1.9496	1.9507	1.9473	1.9437	1.9411	1.9384
util living area	0.8566	0.8038	0.7295	0.6171	0.4949	0.3814	0.2893	0.3239	0.4885	0.6830	0.8129	0.8680 (86)
Living	18.5410	18.9193	19.4289	19.9993	20.4152	20.6631	20.7693	20.7480	20.5354	19.9617	19.1528	18.4666
Non living	17.1529	17.6141	18.2313	18.9109	19.3874	19.6605	19.7628	19.7473	19.5368	18.8893	17.9148	17.0642
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	19.7442	18.9193	19.4289	19.9993	20.4152	20.6631	20.7693	20.7480	20.5354	19.9617	19.1528	18.8217 (87)
Th 2	19.9919	19.9933	19.9947	20.0012	20.0024	20.0080	20.0080	20.0091	20.0059	20.0024	19.9999	19.9974 (88)
util rest of house	0.8437	0.7873	0.7076	0.5875	0.4567	0.3323	0.2301	0.2622	0.4366	0.6500	0.7943	0.8560 (89)
MIT 2	18.8447	17.6141	18.2313	18.9109	19.3874	19.6605	19.7628	19.7473	19.5368	18.8893	17.9148	17.5872 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	19.1618	18.0742	18.6535	19.2945	19.7497	20.0139	20.1176	20.1001	19.8888	19.2673	18.3511	0.3525 (91)
Temperature adjustment												18.0223 (92)
adjusted MIT	19.1618	18.0742	18.6535	19.2945	19.7497	20.0139	20.1176	20.1001	19.8888	19.2673	18.3511	0.0000 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8319	0.7500	0.6743	0.5648	0.4465	0.3326	0.2368	0.2681	0.4301	0.6226	0.7573	0.8273 (94)
Useful gains	570.3083	626.6278	664.2199	654.4134	566.4992	409.6485	279.0250	289.1886	411.3511	507.9257	524.4123	536.6127 (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	1264.6668	1119.3205	1031.0275	875.4981	677.0835	452.5182	294.0124	308.9045	485.0297	729.0372	948.9561	1169.1401 (97)
Space heating kWh	516.6028	331.0895	272.9048	159.1810	82.2747	0.0000	0.0000	0.0000	0.0000	164.5070	305.6716	470.6004 (98a)
Space heating requirement - total per year (kWh/year)												2302.8316
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	516.6028	331.0895	272.9048	159.1810	82.2747	0.0000	0.0000	0.0000	0.0000	164.5070	305.6716	470.6004 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2302.8316
Space heating per m2										(98c) / (4) =		30.0631 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)

0.0000 (201)

Fraction of space heat from main system(s)

1.0000 (202)

Efficiency of main space heating system 1 (in %)

311.6022 (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	516.6028	331.0895	272.9048	159.1810	82.2747	0.0000	0.0000	0.0000	0.0000	164.5070	305.6716	470.6004 (98)
Space heating efficiency (main heating system 1)	311.6022	311.6022	311.6022	311.6022	311.6022	0.0000	0.0000	0.0000	0.0000	311.6022	311.6022	311.6022 (210)
Space heating fuel (main heating system)	165.7892	106.2539	87.5812	51.0847	26.4038	0.0000	0.0000	0.0000	0.0000	52.7939	98.0967	151.0260 (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	296.7303	263.1669	281.0246	250.0301	244.4847	191.9821	189.4706	196.8326	198.8363	253.1574	266.0127	293.8330 (64)
Efficiency of water heater	181.7325	181.7325	181.7325	181.7325	181.7325	181.7325	181.7325	181.7325	181.7325	181.7325	181.7325	181.7325 (216)
Fuel for water heating, kWh/month	163.2786	144.8101	154.6364	137.5814	134.5300	105.6399	104.2580	108.3090	109.4115	139.3022	146.3760	161.6844 (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	26.9197	21.5960	19.4448	14.2461	11.0041	8.9904	10.0383	13.0482	16.9483	22.2371	25.1167	27.6679 (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												739.0293 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												181.7325
Water heating fuel used												1609.8174 (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)

217.2575 (232)

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

PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	2566.1043 (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	739.0293	0.1554	114.8244 (261)
Total CO2 associated with community systems			0.0000 (273)
Water heating (other fuel)	1609.8174	0.1416	228.0062 (264)
Space and water heating			342.8306 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	217.2575	0.1443	31.3570 (268)
Total CO2, kg/year			374.1875 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.8800 (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	739.0293	1.5752	1164.0884 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1609.8174	1.5238	2452.9851 (278)
Space and water heating			3617.0735 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	217.2575	1.5338	333.2368 (282)
Total Primary energy kWh/year			3950.3103 (286)
Dwelling Primary energy Rate (DPER)			51.5700 (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	48.7000 (1b)	x 2.3400 (2b)	= 113.9580 (1b) - (3b)
First floor	27.9000 (1c)	x 2.5000 (2c)	= 69.7500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	183.7080 (5)

2. Ventilation rate

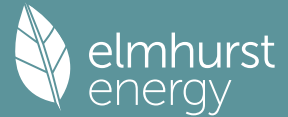
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (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) =	30.0000 / (5) = 0.1633 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4133 (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) = 0.3513 (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	0.4479	0.4391	0.4304	0.3864	0.3777	0.3337	0.3337	0.3250	0.3513	0.3777	0.3952	0.4128 (22b)
Effective ac	0.6003	0.5964	0.5926	0.5747	0.5713	0.5557	0.5557	0.5528	0.5617	0.5713	0.5781	0.5852 (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
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TER Opaque door			1.8000	1.0000	1.8000	(26)
TER Opening Type (Uw = 1.20)			17.3600	1.1450	19.8779	(27)
External Wall 1	84.2222	17.3600	66.8622	0.1800	12.0352	(29a)
Wall to Stairs	17.0800	1.8000	15.2800	0.1800	2.7504	(29a)
External Roof 1	42.4800		42.4800	0.1100	4.6728	(30)
Total net area of external elements Aum(A, m2)			143.7822			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.1363	(33)
Party Wall 1			28.1900	0.0000	0.0000	(32)

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

55.9556 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.1900	0.0500	0.5595
E3 Sill	4.6000	0.0500	0.2300
E4 Jamb	25.8300	0.0500	1.2915
E16 Corner (normal)	9.7000	0.0900	0.8730
E17 Corner (inverted - internal area greater than external area)	2.3400	-0.0900	-0.2106
E18 Party wall between dwellings	11.7000	0.0600	0.7020
E7 Party floor between dwellings (in blocks of flats)	27.0000	0.0700	1.8900
E14 Flat roof	27.4500	0.0800	2.1960

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

7.5314 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 48.6677 (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	36.3933	36.1571	35.9256	34.8384	34.6350	33.6881	33.6881	33.5127	34.0528	34.6350	35.0465	35.4767
Heat transfer coeff	85.0609	84.8248	84.5933	83.5061	83.3027	82.3557	82.3557	82.1804	82.7205	83.3027	83.7142	84.1444
Average = Sum(39)m / 12 =												83.5051

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1105	1.1074	1.1044	1.0902	1.0875	1.0751	1.0751	1.0729	1.0799	1.0875	1.0929	1.0985
HLP (average)												1.0901
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy

2.3952 (42)

Hot water usage for mixer showers

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage for mixer showers	64.3791	63.4116	62.0017	59.3043	57.3136	55.0937	53.8319	55.2310	56.7648	59.1483	61.9037	64.1324
Hot water usage for baths	27.8083	27.3953	26.8138	25.7414	24.9385	24.0481	23.5672	24.1447	24.7735	25.7262	26.8206	27.7143
Hot water usage for other uses	39.1591	37.7351	36.3111	34.8872	33.4632	32.0392	32.0392	33.4632	34.8872	36.3111	37.7351	39.1591
Average daily hot water use (litres/day)												120.7372

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	131.3465	128.5420	125.1266	119.9329	115.7153	111.1811	109.4383	112.8390	116.4255	121.1857	126.4595	131.0058
Energy conte	208.0207	183.0421	192.3150	164.1821	155.7751	136.7101	132.3562	139.7182	143.5643	164.4478	180.1647	205.1234
Energy content (annual)										Total = Sum(45)m =		2005.4197
Distribution loss (46)m = 0.15 x (45)m	31.2031	27.4563	28.8472	24.6273	23.3663	20.5065	19.8534	20.9577	21.5346	24.6672	27.0247	30.7685

Water storage loss:

180.0000 (47)

Store volume

1.5520 (48)

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

0.5400 (49)

Temperature factor from Table 2b

0.8381 (55)

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

Total storage loss

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803
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
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
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
Total heat required for water heating calculated for each month	257.2634	227.5194	241.5577	211.8363	205.0178	184.3643	181.5989	188.9609	191.2185	213.6905	227.8189	254.3661
WWHRS	-29.4314	-26.0294	-27.2565	-22.5694	-21.0339	-17.9989	-16.8711	-17.9407	-18.6223	-21.9537	-24.8708	-28.8864
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
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
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
Output from w/h	227.8319	201.4900	214.3012	189.2669	183.9838	166.3654	164.7278	171.0202	172.5961	191.7369	202.9481	225.4797
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2311.7480
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
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000

Heat gains from water heating, kWh/month	108.5610	96.4433	103.3389	92.7139	91.1894	83.5795	83.4026	85.8504	85.8585	94.0730	98.0281	107.5977
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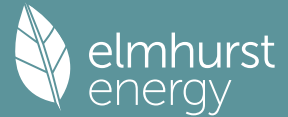
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.0036	118.4682	107.0036	110.5703	107.0036	110.5703	107.0036	107.0036	110.5703	107.0036	110.5703	107.0036
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	212.1882	214.3901	208.8415	197.0292	182.1183	168.1042	158.7419	156.5400	162.0886	173.9009	188.8118	202.8259
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000
Losses e.g. evaporation (negative values) (Table 5)	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074
Water heating gains (Table 5)	145.9153	143.5168	138.8963	128.7693	122.5663	116.0826	112.1002	115.3904	119.2479	126.4423	136.1502	144.6205
Total internal gains	527.0349	538.3029	516.6691	498.2966	473.6160	453.6849	436.7734	437.8617	450.8346	469.2745	497.4600	516.3778

6. Solar gains

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[Jan]					Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d		Gains W
East					7.6500	19.6403	0.6300		0.7000	0.7700		45.9177 (76)
South					1.6600	46.7521	0.6300		0.7000	0.7700		23.7181 (78)
West					8.0500	19.6403	0.6300		0.7000	0.7700		48.3187 (80)
Solar gains	117.9546	223.1906	353.0730	498.6952	600.9090	611.5641	583.6372	507.4813	404.7788	260.6397	145.6158	97.9901 (83)
Total gains	644.9895	761.4935	869.7421	996.9918	1074.5249	1065.2490	1020.4106	945.3430	855.6134	729.9142	643.0759	614.3679 (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	13.9972	14.0361	14.0745	14.2578	14.2926	14.4569	14.4569	14.4878	14.3932	14.2926	14.2223	14.1496
alpha	1.9331	1.9357	1.9383	1.9505	1.9528	1.9638	1.9638	1.9659	1.9595	1.9528	1.9482	1.9433
util living area	0.8684	0.8258	0.7650	0.6655	0.5495	0.4231	0.3237	0.3575	0.5232	0.7162	0.8294	0.8775 (86)
MIT	17.8316	18.2826	18.9269	19.7092	20.3136	20.7137	20.8797	20.8496	20.5396	19.7200	18.6583	17.7601 (87)
Th 2	19.9923	19.9948	19.9973	20.0089	20.0111	20.0212	20.0212	20.0231	20.0173	20.0111	20.0067	20.0021 (88)
util rest of house	0.8563	0.8106	0.7446	0.6370	0.5107	0.3714	0.2598	0.2919	0.4707	0.6847	0.8120	0.8662 (89)
MIT 2	16.3507	16.9032	17.6896	18.6314	19.3340	19.7796	19.9421	19.9196	19.6066	18.6710	17.3822	16.2654 (90)
Living area fraction	fLA = Living area / (4) = 0.3525 (91)											
MIT	16.8727	17.3894	18.1257	19.0113	19.6793	20.1088	20.2726	20.2474	19.9354	19.0407	17.8320	16.7922 (92)
Temperature adjustment	0.0000											
adjusted MIT	16.8727	17.3894	18.1257	19.0113	19.6793	20.1088	20.2726	20.2474	19.9354	19.0407	17.8320	16.7922 (93)
8. Space heating requirement												
Utilisation	0.8068	0.7609	0.6993	0.6050	0.4967	0.3762	0.2767	0.3076	0.4660	0.6489	0.7636	0.8176 (94)
Useful gains	520.4028	579.4156	608.2298	603.1409	533.7593	400.7388	282.3726	290.7575	398.7511	473.6499	491.0785	502.3314 (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	1069.4418	1059.4092	983.4572	844.3568	664.6995	453.6845	302.4573	316.1820	482.7104	703.1335	898.4190	1059.5639 (97)
Space heating kWh	408.4850	322.5557	279.1692	173.6755	97.4195	0.0000	0.0000	0.0000	0.0000	170.7357	293.2852	414.5809 (98a)
Space heating requirement - total per year (kWh/year)	2159.9067											
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	408.4850	322.5557	279.1692	173.6755	97.4195	0.0000	0.0000	0.0000	0.0000	170.7357	293.2852	414.5809 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2159.9067											
Space heating per m2	(98c) / (4) =											28.1972 (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	408.4850	322.5557	279.1692	173.6755	97.4195	0.0000	0.0000	0.0000	0.0000	170.7357	293.2852	414.5809 (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)	442.5623	349.4645	302.4585	188.1641	105.5465	0.0000	0.0000	0.0000	0.0000	184.9791	317.7521	449.1668 (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	227.8319	201.4900	214.3012	189.2669	183.9838	166.3654	164.7278	171.0202	172.5961	191.7369	202.9481	225.4797 (64)
Efficiency of water heater (217)m	85.3533	85.1094	84.6538	83.8675	82.7018	79.8000	79.8000	79.8000	79.8000	83.8006	84.8847	79.8000 (216)
Fuel for water heating, kWh/month	266.9280	236.7424	253.1501	225.6738	222.4667	208.4780	206.4258	214.3110	216.2859	228.8013	239.0868	264.0069 (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	22.2332	17.8363	16.0596	11.7660	9.0884	7.4253	8.2907	10.7766	13.9977	18.3658	20.7441	22.8512 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-25.9427	-37.6949	-55.8265	-64.7381	-71.5095	-67.3622	-66.5303	-61.9640	-54.1987	-43.9725	-28.9143	-22.2995 (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	-11.4431	-24.3777	-49.0233	-74.4704	-99.2918	-100.0684	-98.8973	-83.3661	-60.6141	-35.1471	-15.3696	-9.0268 (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												

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Space heating fuel - main system 1	2340.0939 (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	2782.3567 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	179.4349 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1262.0490 (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	4125.8365 (238)

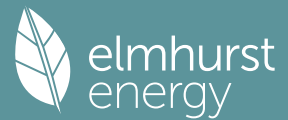
----- 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP -----

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2340.0939	0.2100	491.4197 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2782.3567	0.2100	584.2949 (264)
Space and water heating			1075.7146 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	179.4349	0.1443	25.8980 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-600.9533	0.1340	-80.4998
PV Unit electricity exported	-661.0957	0.1256	-83.0087
Total			-163.5085 (269)
Total CO2, kg/year			950.0334 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.4000 (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	2340.0939	1.1300	2644.3061 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2782.3567	1.1300	3144.0631 (278)
Space and water heating			5788.3692 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	179.4349	1.5338	275.2232 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-600.9533	1.4950	-898.4454
PV Unit electricity exported	-661.0957	0.4609	-304.6887
Total			-1203.1341 (283)
Total Primary energy kWh/year			4990.5591 (286)
Target Primary Energy Rate (TPER)			65.1500 (287)

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Property Reference	01114			Issued on Date	03/07/2024
Assessment Reference	00001	Prop Type Ref			
Property	Zoar Chapel , Flat 8, South Street , Reading				
SAP Rating	80 C	DER	4.88	TER	12.40
Environmental	96 A	% DER < TER			60.65
CO ₂ Emissions (t/year)	0.35	DFEE	36.10	TFEE	35.82
Compliance Check	See BREL	% DFEE < TFEE			-0.78
% DPER < TPER	20.84	DPER	51.57	TPER	65.15
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	48.7000 (1b)	x 2.3400 (2b)	= 113.9580 (1b) - (3b)
First floor	27.9000 (1c)	x 2.5000 (2c)	= 69.7500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.7080 (5)

2. Ventilation rate

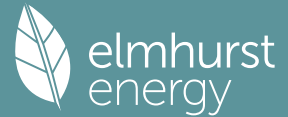
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (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) =	30.0000 / (5) = 0.1633 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3633 (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) = 0.3088 (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	0.3937	0.3860	0.3783	0.3397	0.3320	0.2934	0.2934	0.2856	0.3088	0.3320	0.3474	0.3628 (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	0.5775	0.5745	0.5716	0.5577	0.5551	0.5430	0.5430	0.5408	0.5477	0.5551	0.5603	0.5658 (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)			22.8800	0.9615	22.0000		(27)
Doo to Hall			1.8000	1.4000	2.5200		(26)
External Wall 1	84.2222	22.8800	61.3422	0.1800	11.0416	14.0000	858.7908 (29a)
Wall to Stairs	17.0800	1.8000	15.2800	0.1600	2.4448	14.0000	213.9200 (29a)
External Roof 1	42.4800		42.4800	0.1000	4.2480	9.0000	382.3200 (30)
Total net area of external elements Aum(A, m ²)			143.7822				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.2544		(33)
Party Wall 1			28.1900	0.0000	0.0000	20.0000	563.8000 (32)
Party Floor 1			42.4800			40.0000	1699.2000 (32a)
Internal Wall 1			35.3300			9.0000	317.9700 (32c)
Internal Ceiling 1			27.8000			9.0000	250.2000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	4286.2008 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							55.9556 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				11.1900	0.0060	0.0671	

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E3 Sill	4.6000	0.0120	0.0552
E4 Jamb	25.8300	0.0230	0.5941
E16 Corner (normal)	9.7000	0.0750	0.7275
E17 Corner (inverted - internal area greater than external area)	2.3400	-0.0450	-0.1053
E18 Party wall between dwellings	11.7000	0.2400	2.8080
E7 Party floor between dwellings (in blocks of flats)	27.0000	0.0220	0.5940
E14 Flat roof	27.4500	0.1600	4.3920
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.1326 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	51.3870 (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	35.0108	34.8284	34.6495	33.8094	33.6523	32.9206	32.9206	32.7851	33.2024	33.6523	33.9702	34.3026 (38)
Average = Sum(39)m / 12 =	86.3979	86.2154	86.0365	85.1965	85.0393	84.3076	84.3076	84.1721	84.5894	85.0393	85.3573	85.6897 (39)
												85.1957
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1279	1.1255	1.1232	1.1122	1.1102	1.1006	1.1006	1.0989	1.1043	1.1102	1.1143	1.1187 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3952 (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	27.8083	27.3953	26.8138	25.7414	24.9385	24.0481	23.5672	24.1447	24.7735	25.7262	26.8206	27.7143 (42b)
Hot water usage for other uses	39.1591	37.7351	36.3111	34.8872	33.4632	32.0392	32.0392	33.4632	34.8872	36.3111	37.7351	39.1591 (42c)
Average daily hot water use (litres/day)												61.3819 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	66.9674	65.1304	63.1249	60.6286	58.4017	56.0874	55.6065	57.6079	59.6607	62.0374	64.5558	66.8734 (44)
Energy content (annual)	106.0600	92.7449	97.0206	82.9975	78.6199	68.9660	67.2512	71.3307	73.5676	84.1841	91.9715	104.7076 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	90.1510	78.8332	82.4675	70.5479	66.8269	58.6211	57.1635	60.6311	62.5325	71.5565	78.1758	89.0014 (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	90.1510	78.8332	82.4675	70.5479	66.8269	58.6211	57.1635	60.6311	62.5325	71.5565	78.1758	89.0014 (64)
12Total per year (kWh/year)												866.5084 (64)
Electric shower(s)	51.5569	45.9376	50.1621	47.8691	48.7673	46.5193	48.0700	48.7673	47.8691	50.1621	49.2189	51.5569 (64a)
Heat gains from water heating, kWh/month	35.4270	31.1927	33.1574	29.6042	28.8986	26.2851	26.3084	27.3496	27.6004	30.4297	31.8487	35.1396 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												586.4567 (64a)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.0246	118.4915	107.0246	110.5921	107.0246	110.5921	107.0246	107.0246	110.5921	107.0246	110.5921	107.0246 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	212.1882	214.3901	208.8415	197.0292	182.1183	168.1042	158.7419	156.5400	162.0886	173.9009	188.8118	202.8259 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759 (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)	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074 (71)
Water heating gains (Table 5)	47.6169	46.4177	44.5664	41.1170	38.8422	36.5071	35.3607	36.7602	38.3339	40.9001	44.2343	47.2306 (72)
Total internal gains	425.7575	438.2271	419.3603	407.6661	386.9128	374.1311	360.0549	359.2526	369.9423	380.7533	402.5659	416.0089 (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	10.0800	19.6403	0.6300	0.7000	0.7700	60.5034 (76)
South	2.1900	46.7521	0.6300	0.7000	0.7700	31.2908 (78)
West	10.6100	19.6403	0.6300	0.7000	0.7700	63.6846 (80)
Solar gains	155.4788	294.1843	465.3631	657.2783	791.9826	806.0211
Total gains	581.2363	732.4114	884.7233	1064.9444	1178.8954	1180.1522
						769.2162
						668.8531
						533.5060
						343.5404
						191.9381
						129.1643 (83)
						545.1732 (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	13.7806	13.8097	13.8384	13.9749	14.0007	14.1222	14.1222	14.1450	14.0752	14.0007	13.9486	13.8945
alpha	1.9187	1.9206	1.9226	1.9317	1.9334	1.9415	1.9415	1.9430	1.9383	1.9334	1.9299	1.9263
util living area	0.8878	0.8364	0.7630	0.6481	0.5229	0.3969	0.3021	0.3393	0.5104	0.7225	0.8485	0.8984 (86)
MIT	17.6171	18.1661	18.9054	19.7467	20.3578	20.7364	20.8897	20.8579	20.5474	19.6700	18.4935	17.5170 (87)
Th 2	19.9781	19.9800	19.9819	19.9909	19.9925	20.0003	20.0003	20.0018	19.9973	19.9925	19.9892	19.9856 (88)
util rest of house	0.8770	0.8216	0.7422	0.6189	0.4839	0.3461	0.2404	0.2749	0.4574	0.6908	0.8322	0.8885 (89)
MIT 2	16.8946	17.4279	18.1407	18.9392	19.4962	19.8269	19.9441	19.9259	19.6811	18.8936	17.7642	16.8017 (90)
Living area fraction									fLA = Living area /	(4) =		0.3525 (91)
MIT	17.1493	17.6881	18.4103	19.2238	19.7999	20.1475	20.2774	20.2544	19.9865	19.1673	18.0213	17.0538 (92)
Temperature adjustment												0.0000
adjusted MIT	17.1493	17.6881	18.4103	19.2238	19.7999	20.1475	20.2774	20.2544	19.9865	19.1673	18.0213	17.0538 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8378	0.7805	0.7049	0.5944	0.4759	0.3538	0.2580	0.2918	0.4568	0.6610	0.7924	0.8506 (94)
Useful gains	486.9660	571.6482	623.6409	633.0013	561.0846	417.5937	291.3277	299.9976	412.6993	478.7781	471.0640	463.7297 (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	1110.1524	1102.5322	1024.7171	879.5547	688.8086	467.6986	310.0294	324.4324	497.9342	728.5542	932.2085	1101.4372 (97)
Space heating kWh	463.6507	356.7541	298.4007	177.5184	95.0267	0.0000	0.0000	0.0000	0.0000	185.8334	332.0240	474.4544 (98a)
Space heating requirement - total per year (kWh/year)												2383.6623
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	463.6507	356.7541	298.4007	177.5184	95.0267	0.0000	0.0000	0.0000	0.0000	185.8334	332.0240	474.4544 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2383.6623
Space heating per m2										(98c) / (4) =		31.1183 (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	792.4915	623.8763	639.7080	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8124	0.8557	0.8302	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	643.8240	533.8727	531.1101	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1338.5456	1281.1611	1165.0006	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	500.1996	555.9825	471.6145	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	125.0499	138.9956	117.9036	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												381.9491 (107)
Energy for space heating												31.1183 (99)
Energy for space cooling												4.9863 (108)
Total												36.1046 (109)
Fabric Energy Efficiency (DFEE)												36.1 (109)

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

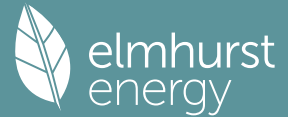
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	48.7000 (1b)	x 2.3400 (2b)	= 113.9580 (1b) - (3b)
First floor	27.9000 (1c)	x 2.5000 (2c)	= 69.7500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	183.7080 (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	3 * 10 = 30.0000 (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) =	Air changes per hour 30.0000 / (5) = 0.1633 (8)

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Pressure test												Yes
Pressure Test Method												Blower Door
Measured/design AP50												5.0000 (17)
Infiltration rate												0.4133 (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) = 0.3513 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.4479	0.4391	0.4304	0.3864	0.3777	0.3337	0.3337	0.3250	0.3513	0.3777	0.3952	0.4128 (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	0.6003	0.5964	0.5926	0.5747	0.5713	0.5557	0.5557	0.5528	0.5617	0.5713	0.5781	0.5852 (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)			17.3600	1.1450	19.8779		(27)
External Wall 1	84.2222	17.3600	66.8622	0.1800	12.0352		(29a)
Wall to Stairs	17.0800	1.8000	15.2800	0.1800	2.7504		(29a)
External Roof 1	42.4800		42.4800	0.1100	4.6728		(30)
Total net area of external elements Aum(A, m2)			143.7822				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.1363		(33)
Party Wall 1			28.1900	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 55.9556 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.1900	0.0500	0.5595
E3 Sill	4.6000	0.0500	0.2300
E4 Jamb	25.8300	0.0500	1.2915
E16 Corner (normal)	9.7000	0.0900	0.8730
E17 Corner (inverted - internal area greater than external area)	2.3400	-0.0900	-0.2106
E18 Party wall between dwellings	11.7000	0.0600	0.7020
E17 Party floor between dwellings (in blocks of flats)	27.0000	0.0700	1.8900
E14 Flat roof	27.4500	0.0800	2.1960

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.5314 (36)

Point Thermal Bridges

Total fabric heat loss (33) + (36) + (36a) = 48.6677 (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	36.3933	36.1571	35.9256	34.8384	34.6350	33.6881	33.6881	33.5127	34.0528	34.6350	35.0465	35.4767 (38)
Average = Sum(39)m / 12 =	85.0609	84.8248	84.5933	83.5061	83.3027	82.3557	82.3557	82.1804	82.7205	83.3027	83.7142	84.1444 (39)
												83.5051

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1105	1.1074	1.1044	1.0902	1.0875	1.0751	1.0751	1.0729	1.0799	1.0875	1.0929	1.0985 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3952 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses	27.8083	27.3953	26.8138	25.7414	24.9385	24.0481	23.5672	24.1447	24.7735	25.7262	26.8206	27.7143 (42c)
Average daily hot water use (litres/day)	39.1591	37.7351	36.3111	34.8872	33.4632	32.0392	32.0392	33.4632	34.8872	36.3111	37.7351	39.1591 (42c)
												61.3819 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	66.9674	65.1304	63.1249	60.6286	58.4017	56.0874	55.6065	57.6079	59.6607	62.0374	64.5558	66.8734 (44)
Energy content (annual)	106.0600	92.7449	97.0206	82.9975	78.6199	68.9660	67.2512	71.3307	73.5676	84.1841	91.9715	104.7076 (45)
Distribution loss (46)m = 0.15 x (45)m												1019.4217
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)

Total storage loss 0.0000 (56)

If cylinder contains dedicated solar storage 0.0000 (57)

Primary loss 0.0000 (59)

Combi loss 0.0000 (61)

Total heat required for water heating calculated for each month

WWHRS	90.1510	78.8332	82.4675	70.5479	66.8269	58.6211	57.1635	60.6311	62.5325	71.5565	78.1758	89.0014 (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	90.1510	78.8332	82.4675	70.5479	66.8269	58.6211	57.1635	60.6311	62.5325	71.5565	78.1758	89.0014 (64)
												866.5084 (64)
												867 (64)

12Total per year (kWh/year) 866.5084 (64)

Electric shower(s) 867 (64)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 586.4567 (64a)

Heat gains from water heating, kWh/month 35.4270 (65)

35.4270 31.1927 33.1574 29.6042 28.8986 26.2851 26.3084 27.3496 27.6004 30.4297 31.8487 35.1396 (65)

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

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Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.0036	118.4682	107.0036	110.5703	107.0036	110.5703	107.0036	107.0036	110.5703	107.0036	110.5703	107.0036 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	212.1882	214.3901	208.8415	197.0292	182.1183	168.1042	158.7419	156.5400	162.0886	173.9009	188.8118	202.8259 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759 (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)	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074 (71)
Water heating gains (Table 5)	47.6169	46.4177	44.5664	41.1170	38.8422	36.5071	35.3607	36.7602	38.3339	40.9001	44.2343	47.2306 (72)
Total internal gains	425.7365	438.2038	419.3392	407.6443	386.8918	374.1093	360.0339	359.2315	369.9206	380.7323	402.5441	415.9879 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
East					7.6500	19.6403	0.6300	0.7000			0.7700	45.9177 (76)
South					1.6600	46.7521	0.6300	0.7000			0.7700	23.7181 (78)
West					8.0500	19.6403	0.6300	0.7000			0.7700	48.3187 (80)
Solar gains	117.9546	223.1906	353.0730	498.6952	600.9090	611.5641	583.6372	507.4813	404.7788	260.6397	145.6158	97.9901 (83)
Total gains	543.6910	661.3944	772.4122	906.3395	987.8007	985.6735	943.6710	866.7128	774.6994	641.3720	548.1600	513.9780 (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	13.9972	14.0361	14.0745	14.2578	14.2926	14.4569	14.4569	14.4878	14.3932	14.2926	14.2223	14.1496
alpha	1.9331	1.9357	1.9383	1.9505	1.9528	1.9638	1.9638	1.9659	1.9595	1.9528	1.9482	1.9433
util living area	0.8974	0.8562	0.7967	0.6963	0.5787	0.4485	0.3456	0.3835	0.5577	0.7547	0.8631	0.9061 (86)
MIT	17.5659	18.0517	18.7422	19.5887	20.2434	20.6812	20.8643	20.8288	20.4810	19.5756	18.4344	17.4882 (87)
Th 2	19.9923	19.9948	19.9973	20.0089	20.0111	20.0212	20.0212	20.0231	20.0173	20.0111	20.0067	20.0021 (88)
util rest of house	0.8875	0.8428	0.7779	0.6687	0.5397	0.3951	0.2785	0.3147	0.5045	0.7252	0.8481	0.8970 (89)
MIT 2	16.8540	17.3284	17.9992	18.8125	19.4180	19.8074	19.9502	19.9293	19.6484	18.8232	17.7195	16.7840 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	17.1049	17.5833	18.2611	19.0861	19.7089	20.1154	20.2724	20.2464	19.9419	19.0884	17.9715	17.0322 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.1049	17.5833	18.2611	19.0861	19.7089	20.1154	20.2724	20.2464	19.9419	19.0884	17.9715	17.0322 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8497	0.8024	0.7391	0.6399	0.5269	0.4005	0.2964	0.3311	0.5001	0.6931	0.8091	0.8605 (94)
Useful gains	461.9696	530.7162	570.8530	579.9664	520.5009	394.7511	279.6644	286.9882	387.4360	444.5081	443.4894	442.2634 (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	1089.1982	1075.8589	994.9113	850.6003	667.1663	454.2249	302.4433	316.0962	483.2419	707.1058	910.0993	1079.7574 (97)
Space heating kWh	466.6581	366.3359	315.4993	194.8564	109.1190	0.0000	0.0000	0.0000	0.0000	195.3727	335.9592	474.2955 (98a)
Space heating requirement - total per year (kWh/year)	2458.0962											
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	466.6581	366.3359	315.4993	194.8564	109.1190	0.0000	0.0000	0.0000	0.0000	195.3727	335.9592	474.2955 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2458.0962											
Space heating per m ²	(98c) / (4) = 32.0900 (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	774.1438	609.4323	624.5707	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7731	0.8231	0.7961	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	598.5097	501.6303	497.2229	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1111.2564	1064.2485	976.3816	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	369.1776	418.5879	356.4940	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	92.2944	104.6470	89.1235	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	286.0649 (107)											
Energy for space heating	32.0900 (99)											
Energy for space cooling	3.7345 (108)											
Total	35.8246 (109)											
Fabric Energy Efficiency (TFEE)	35.8 (109)											

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Property Reference	01114				Issued on Date	03/07/2024	
Assessment Reference	00001			Prop Type Ref			
Property	Zoar Chapel , Flat 8, South Street , Reading						
SAP Rating	80 C	DER	4.88	TER	12.40		
Environmental	96 A	% DER < TER				60.65	
CO ₂ Emissions (t/year)	0.35	DFEE	36.10	TFEE	35.82		
Compliance Check	See BREL	% DFEE < TFEE				-0.78	
% DPER < TPER	20.84	DPER	51.57	TPER	65.15		
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	48.7000 (1b)	x 2.3400 (2b)	= 113.9580 (1b) - (3b)
First floor	27.9000 (1c)	x 2.5000 (2c)	= 69.7500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.7080 (5)

2. Ventilation rate

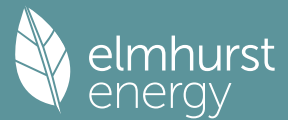
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1089 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3089 (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) = 0.2625 (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	0.3347	0.3282	0.3216	0.2888	0.2822	0.2494	0.2494	0.2428	0.2625	0.2822	0.2954	0.3085 (22b)
Effective ac	0.5560	0.5538	0.5517	0.5417	0.5398	0.5311	0.5311	0.5295	0.5345	0.5398	0.5436	0.5476 (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)			22.8800	0.9615	22.0000		(27)
Doo to Hall			1.8000	1.4000	2.5200		(26)
External Wall 1	84.2222	22.8800	61.3422	0.1800	11.0416	14.0000	858.7908 (29a)
Wall to Stairs	17.0800	1.8000	15.2800	0.1600	2.4448	14.0000	213.9200 (29a)
External Roof 1	42.4800		42.4800	0.1000	4.2480	9.0000	382.3200 (30)
Total net area of external elements Aum(A, m ²)			143.7822				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	42.2544			(33)
Party Wall 1			28.1900	0.0000	0.0000	20.0000	563.8000 (32)
Party Floor 1			42.4800			40.0000	1699.2000 (32d)
Internal Wall 1			35.3300			9.0000	317.9700 (32c)
Internal Ceiling 1			27.8000			9.0000	250.2000 (32e)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =	4286.2008			(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K				55.9556			(35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				11.1900	0.0060	0.0671	
E3 Sill				4.6000	0.0120	0.0552	
E4 Jamb				25.8300	0.0230	0.5941	

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E16 Corner (normal)									9.7000	0.0750	0.7275	
E17 Corner (inverted - internal area greater than external area)									2.3400	-0.0450	-0.1053	
E18 Party wall between dwellings									11.7000	0.2400	2.8080	
E7 Party floor between dwellings (in blocks of flats)									27.0000	0.0220	0.5940	
E14 Flat roof									27.4500	0.1600	4.3920	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												9.1326 (36)
Point Thermal bridges											(36a) =	0.0000
Total fabric heat loss											(33) + (36) + (36a) =	51.3870 (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	33.7082	33.5763	33.4470	32.8399	32.7262	32.1974	32.1974	32.0995	32.4011	32.7262	32.9561	33.1963 (38)
Average = Sum(39)m / 12 =	85.0952	84.9633	84.8341	84.2269	84.1133	83.5844	83.5844	83.4865	83.7881	84.1133	84.3431	84.5834 (39)
												84.2263
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1109	1.1092	1.1075	1.0996	1.0981	1.0912	1.0912	1.0899	1.0938	1.0981	1.1011	1.1042 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.3952 (42)
Hot water usage for mixer showers												
	64.3791	63.4116	62.0017	59.3043	57.3136	55.0937	53.8319	55.2310	56.7648	59.1483	61.9037	64.1324 (42a)
Hot water usage for baths												
	27.8083	27.3953	26.8138	25.7414	24.9385	24.0481	23.5672	24.1447	24.7735	25.7262	26.8206	27.7143 (42b)
Hot water usage for other uses												
	39.1591	37.7351	36.3111	34.8872	33.4632	32.0392	32.0392	33.4632	34.8872	36.3111	37.7351	39.1591 (42c)
Average daily hot water use (litres/day)												120.7372 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	131.3465	128.5420	125.1266	119.9329	115.7153	111.1811	109.4383	112.8390	116.4255	121.1857	126.4595	131.0058 (44)
Energy conte	208.0207	183.0421	192.3150	164.1821	155.7751	136.7101	132.3562	139.7182	143.5643	164.4478	180.1647	205.1234 (45)
Energy content (annual)										Total = Sum(45)m =		2005.4197
Distribution loss (46)m = 0.15 x (45)m												
	31.2031	27.4563	28.8472	24.6273	23.3663	20.5065	19.8534	20.9577	21.5346	24.6672	27.0247	30.7685 (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												
	296.7303	263.1669	281.0246	250.0301	244.4847	191.9821	189.4706	196.8326	198.8363	253.1574	266.0127	293.8330 (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												
	296.7303	263.1669	281.0246	250.0301	244.4847	191.9821	189.4706	196.8326	198.8363	253.1574	266.0127	293.8330 (64)
								Total per year (kWh/year) = Sum(64)m =				2925.5613 (64)
12Total per year (kWh/year)												2926 (64)
Electric shower(s)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												
Heat gains from water heating, kWh/month												
	113.0530	100.5005	107.8308	97.0610	95.6813	63.4657	62.6184	65.0662	65.7447	98.5650	102.3752	112.0896 (65)

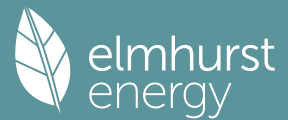
5. Internal gains (see Table 5 and 5a)												

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	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	107.0246	118.4915	107.0246	110.5921	107.0246	110.5921	107.0246	107.0246	110.5921	107.0246	110.5921	107.0246 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	212.1882	214.3901	208.8415	197.0292	182.1183	168.1042	158.7419	156.5400	162.0886	173.9009	188.8118	202.8259 (68)
Pumps, fans	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759 (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)
	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074 (71)
Water heating gains (Table 5)												
	151.9529	149.5544	144.9339	134.8069	128.6039	88.1468	84.1644	87.4546	91.3121	132.4798	142.1877	150.6581 (72)
Total internal gains												
	530.0935	541.3637	519.7277	501.3559	476.6746	425.7708	408.8587	409.9470	422.9205	472.3331	500.5193	519.4364 (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			10.0800	19.6403	0.6300	0.7000	0.7700	60.5034 (76)				
South			2.1900	46.7521	0.6300	0.7000	0.7700	31.2908 (78)				
West			10.6100	19.6403	0.6300	0.7000	0.7700	63.6846 (80)				
Solar gains	155.4788	294.1843	465.3631	657.2783	791.9826	806.0211	769.2162	668.8531	533.5060	343.5404	191.9381	129.1643 (83)
Total gains	685.5723	835.5481	985.0908	1158.6342	1268.6571	1231.7920	1178.0748	1078.8000	956.4265	815.8735	692.4575	648.6007 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	13.9915	14.0132	14.0346	14.1358	14.1549	14.2444	14.2444	14.2611	14.2098	14.1549	14.1163	14.0762
alpha	1.9328	1.9342	1.9356	1.9424	1.9437	1.9496	1.9496	1.9507	1.9473	1.9437	1.9411	1.9384
util living area	0.8566	0.8038	0.7295	0.6171	0.4949	0.3814	0.2893	0.3239	0.4885	0.6830	0.8129	0.8680 (86)
Living	18.5410	18.9193	19.4289	19.9993	20.4152	20.6631	20.7693	20.7480	20.5354	19.9617	19.1528	18.4666
Non living	17.1529	17.6141	18.2313	18.9109	19.3874	19.6605	19.7628	19.7473	19.5368	18.8893	17.9148	17.0642
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	19.7442	18.9193	19.4289	19.9993	20.4152	20.6631	20.7693	20.7480	20.5354	19.9617	19.1528	18.8217 (87)
Th 2	19.9919	19.9933	19.9947	20.0012	20.0024	20.0080	20.0080	20.0091	20.0059	20.0024	19.9999	19.9974 (88)
util rest of house	0.8437	0.7873	0.7076	0.5875	0.4567	0.3323	0.2301	0.2622	0.4366	0.6500	0.7943	0.8560 (89)
MIT 2	18.8447	17.6141	18.2313	18.9109	19.3874	19.6605	19.7628	19.7473	19.5368	18.8893	17.9148	17.5872 (90)
Living area fraction									fLA = Living area / (4) =			0.3525 (91)
MIT	19.1618	18.0742	18.6535	19.2945	19.7497	20.0139	20.1176	20.1001	19.8888	19.2673	18.3511	18.0223 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1618	18.0742	18.6535	19.2945	19.7497	20.0139	20.1176	20.1001	19.8888	19.2673	18.3511	18.0223 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8319	0.7500	0.6743	0.5648	0.4465	0.3326	0.2368	0.2681	0.4301	0.6226	0.7573	0.8273 (94)
Useful gains	570.3083	626.6278	664.2199	654.4134	566.4992	409.6485	279.0250	289.1886	411.3511	507.9257	524.4123	536.6127 (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	1264.6668	1119.3205	1031.0275	875.4981	677.0835	452.5182	294.0124	308.9045	485.0297	729.0372	948.9561	1169.1401 (97)
Space heating kWh	516.6028	331.0895	272.9048	159.1810	82.2747	0.0000	0.0000	0.0000	0.0000	164.5070	305.6716	470.6004 (98a)
Space heating requirement - total per year (kWh/year)												2302.8316
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	516.6028	331.0895	272.9048	159.1810	82.2747	0.0000	0.0000	0.0000	0.0000	164.5070	305.6716	470.6004 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2302.8316
Space heating per m2										(98c) / (4) =		30.0631 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												311.6022 (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	516.6028	331.0895	272.9048	159.1810	82.2747	0.0000	0.0000	0.0000	0.0000	164.5070	305.6716	470.6004 (98)
Space heating efficiency (main heating system 1)	311.6022	311.6022	311.6022	311.6022	311.6022	0.0000	0.0000	0.0000	0.0000	311.6022	311.6022	311.6022 (210)
Space heating fuel (main heating system)	165.7892	106.2539	87.5812	51.0847	26.4038	0.0000	0.0000	0.0000	0.0000	52.7939	98.0967	151.0260 (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	296.7303	263.1669	281.0246	250.0301	244.4847	191.9821	189.4706	196.8326	198.8363	253.1574	266.0127	293.8330 (64)
Efficiency of water heater	181.7325	181.7325	181.7325	181.7325	181.7325	181.7325	181.7325	181.7325	181.7325	181.7325	181.7325	181.7325 (216)
Fuel for water heating, kWh/month	163.2786	144.8101	154.6364	137.5814	134.5300	105.6399	104.2580	108.3090	109.4115	139.3022	146.3760	161.6844 (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	26.9197	21.5960	19.4448	14.2461	11.0041	8.9904	10.0383	13.0482	16.9483	22.2371	25.1167	27.6679 (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												739.0293 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												181.7325
Water heating fuel used												1609.8174 (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)												217.2575 (232)

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

PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	2566.1043 (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	739.0293	0.1554	114.8244 (261)
Total CO2 associated with community systems			0.0000 (263)
Water heating (other fuel)	1609.8174	0.1416	228.0062 (264)
Space and water heating			342.8306 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	217.2575	0.1443	31.3570 (268)
Total CO2, kg/year			374.1875 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.8800 (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	739.0293	1.5752	1164.0884 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1609.8174	1.5238	2452.9851 (278)
Space and water heating			3617.0735 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	217.2575	1.5338	333.2368 (282)
Total Primary energy kWh/year			3950.3103 (286)
Dwelling Primary energy Rate (DPER)			51.5700 (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	48.7000 (1b)	x 2.3400 (2b)	= 113.9580 (1b) - (3b)
First floor	27.9000 (1c)	x 2.5000 (2c)	= 69.7500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	183.7080 (5)

2. Ventilation rate

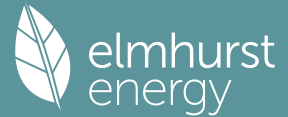
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (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) =	30.0000 / (5) = 0.1633 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4133 (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) = 0.3513 (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	0.4479	0.4391	0.4304	0.3864	0.3777	0.3337	0.3337	0.3250	0.3513	0.3777	0.3952	0.4128 (22b)
Effective ac	0.6003	0.5964	0.5926	0.5747	0.5713	0.5557	0.5557	0.5528	0.5617	0.5713	0.5781	0.5852 (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
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TER Opaque door			1.8000	1.0000	1.8000	(26)
TER Opening Type (Uw = 1.20)			17.3600	1.1450	19.8779	(27)
External Wall 1	84.2222	17.3600	66.8622	0.1800	12.0352	(29a)
Wall to Stairs	17.0800	1.8000	15.2800	0.1800	2.7504	(29a)
External Roof 1	42.4800		42.4800	0.1100	4.6728	(30)
Total net area of external elements Aum(A, m2)			143.7822			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	41.1363		(33)
Party Wall 1			28.1900	0.0000	0.0000	(32)

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

55.9556 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.1900	0.0500	0.5595
E3 Sill	4.6000	0.0500	0.2300
E4 Jamb	25.8300	0.0500	1.2915
E16 Corner (normal)	9.7000	0.0900	0.8730
E17 Corner (inverted - internal area greater than external area)	2.3400	-0.0900	-0.2106
E18 Party wall between dwellings	11.7000	0.0600	0.7020
E7 Party floor between dwellings (in blocks of flats)	27.0000	0.0700	1.8900
E14 Flat roof	27.4500	0.0800	2.1960

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

7.5314 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 48.6677 (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	36.3933	36.1571	35.9256	34.8384	34.6350	33.6881	33.6881	33.5127	34.0528	34.6350	35.0465	35.4767
Average = Sum(39)m / 12 =	85.0609	84.8248	84.5933	83.5061	83.3027	82.3557	82.3557	82.1804	82.7205	83.3027	83.7142	84.1444
												83.5051

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1105	1.1074	1.1044	1.0902	1.0875	1.0751	1.0751	1.0729	1.0799	1.0875	1.0929	1.0985
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

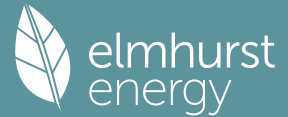
Assumed occupancy													2.3952 (42)
Hot water usage for mixer showers													
	64.3791	63.4116	62.0017	59.3043	57.3136	55.0937	53.8319	55.2310	56.7648	59.1483	61.9037	64.1324	(42a)
Hot water usage for baths													
	27.8083	27.3953	26.8138	25.7414	24.9385	24.0481	23.5672	24.1447	24.7735	25.7262	26.8206	27.7143	(42b)
Hot water usage for other uses													
	39.1591	37.7351	36.3111	34.8872	33.4632	32.0392	32.0392	33.4632	34.8872	36.3111	37.7351	39.1591	(42c)
Average daily hot water use (litres/day)													120.7372 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	131.3465	128.5420	125.1266	119.9329	115.7153	111.1811	109.4383	112.8390	116.4255	121.1857	126.4595	131.0058	(44)
Energy content	208.0207	183.0421	192.3150	164.1821	155.7751	136.7101	132.3562	139.7182	143.5643	164.4478	180.1647	205.1234	(45)
Energy content (annual)													
										Total = Sum(45)m =		2005.4197	
Distribution loss (46)m = 0.15 x (45)m													
	31.2031	27.4563	28.8472	24.6273	23.3663	20.5065	19.8534	20.9577	21.5346	24.6672	27.0247	30.7685	(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													
	257.2634	227.5194	241.5577	211.8363	205.0178	184.3643	181.5989	188.9609	191.2185	213.6905	227.8189	254.3661	(62)
WWHRS	-29.4314	-26.0294	-27.2565	-22.5694	-21.0339	-17.9989	-16.8711	-17.9407	-18.6223	-21.9537	-24.8708	-28.8864	(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													
	227.8319	201.4900	214.3012	189.2669	183.9838	166.3654	164.7278	171.0202	172.5961	191.7369	202.9481	225.4797	(64)
										Total per year (kWh/year) = Sum(64)m =		2311.7480	(64)
12Total per year (kWh/year)													2312 (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													
	108.5610	96.4433	103.3389	92.7139	91.1894	83.5795	83.4026	85.8504	85.8585	94.0730	98.0281	107.5977	(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	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592	119.7592	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.0036	118.4682	107.0036	110.5703	107.0036	110.5703	107.0036	107.0036	110.5703	107.0036	110.5703	107.0036	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	212.1882	214.3901	208.8415	197.0292	182.1183	168.1042	158.7419	156.5400	162.0886	173.9009	188.8118	202.8259	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759	34.9759	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	(71)
Water heating gains (Table 5)	145.9153	143.5168	138.8963	128.7693	122.5663	116.0826	112.1002	115.3904	119.2479	126.4423	136.1502	144.6205	(72)
Total internal gains	527.0349	538.3029	516.6691	498.2966	473.6160	453.6849	436.7734	437.8617	450.8346	469.2745	497.4600	516.3778	(73)

6. Solar gains

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[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d			Gains W
East				7.6500	19.6403	0.6300		0.7000	0.7700		45.9177 (76)	
South				1.6600	46.7521	0.6300		0.7000	0.7700		23.7181 (78)	
West				8.0500	19.6403	0.6300		0.7000	0.7700		48.3187 (80)	
Solar gains	117.9546	223.1906	353.0730	498.6952	600.9090	611.5641	583.6372	507.4813	404.7788	260.6397	145.6158	97.9901 (83)
Total gains	644.9895	761.4935	869.7421	996.9918	1074.5249	1065.2490	1020.4106	945.3430	855.6134	729.9142	643.0759	614.3679 (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	13.9972	14.0361	14.0745	14.2578	14.2926	14.4569	14.4569	14.4878	14.3932	14.2926	14.2223	14.1496
alpha	1.9331	1.9357	1.9383	1.9505	1.9528	1.9638	1.9638	1.9659	1.9595	1.9528	1.9482	1.9433
util living area	0.8684	0.8258	0.7650	0.6655	0.5495	0.4231	0.3237	0.3575	0.5232	0.7162	0.8294	0.8775 (86)
MIT	17.8316	18.2826	18.9269	19.7092	20.3136	20.7137	20.8797	20.8496	20.5396	19.7200	18.6583	17.7601 (87)
Th 2	19.9923	19.9948	19.9973	20.0089	20.0111	20.0212	20.0212	20.0231	20.0173	20.0111	20.0067	20.0021 (88)
util rest of house	0.8563	0.8106	0.7446	0.6370	0.5107	0.3714	0.2598	0.2919	0.4707	0.6847	0.8120	0.8662 (89)
MIT 2	16.3507	16.9032	17.6896	18.6314	19.3340	19.7796	19.9421	19.9196	19.6066	18.6710	17.3822	16.2654 (90)
Living area fraction	fLA = Living area / (4) =											0.3525 (91)
MIT	16.8727	17.3894	18.1257	19.0113	19.6793	20.1088	20.2726	20.2474	19.9354	19.0407	17.8320	16.7922 (92)
Temperature adjustment												0.0000
adjusted MIT	16.8727	17.3894	18.1257	19.0113	19.6793	20.1088	20.2726	20.2474	19.9354	19.0407	17.8320	16.7922 (93)
8. Space heating requirement												
Utilisation	0.8068	0.7609	0.6993	0.6050	0.4967	0.3762	0.2767	0.3076	0.4660	0.6489	0.7636	0.8176 (94)
Useful gains	520.4028	579.4156	608.2298	603.1409	533.7593	400.7388	282.3726	290.7575	398.7511	473.6499	491.0785	502.3314 (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	1069.4418	1059.4092	983.4572	844.3568	664.6995	453.6845	302.4573	316.1820	482.7104	703.1335	898.4190	1059.5639 (97)
Space heating kWh	408.4850	322.5557	279.1692	173.6755	97.4195	0.0000	0.0000	0.0000	0.0000	170.7357	293.2852	414.5809 (98a)
Space heating requirement - total per year (kWh/year)												2159.9067
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	408.4850	322.5557	279.1692	173.6755	97.4195	0.0000	0.0000	0.0000	0.0000	170.7357	293.2852	414.5809 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2159.9067
Space heating per m2	(98c) / (4) =											28.1972 (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	408.4850	322.5557	279.1692	173.6755	97.4195	0.0000	0.0000	0.0000	0.0000	170.7357	293.2852	414.5809 (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)	442.5623	349.4645	302.4585	188.1641	105.5465	0.0000	0.0000	0.0000	0.0000	184.9791	317.7521	449.1668 (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	227.8319	201.4900	214.3012	189.2669	183.9838	166.3654	164.7278	171.0202	172.5961	191.7369	202.9481	225.4797 (64)
Water heating requirement	85.3533	85.1094	84.6538	83.8675	82.7018	79.8000	79.8000	79.8000	79.8000	83.8006	84.8847	79.8000 (216)
Efficiency of water heater (217)m	266.9280	236.7424	253.1501	225.6738	222.4667	208.4780	206.4258	214.3110	216.2859	228.8013	239.0868	264.0069 (219)
Fuel for water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Space cooling fuel requirement (221)m	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)
Pumps and Fa	22.2332	17.8363	16.0596	11.7660	9.0884	7.4253	8.2907	10.7766	13.9977	18.3658	20.7441	22.8512 (232)
Lighting	Electricity generated by PVs (Appendix M) (negative quantity)											
Electricity generated by PVs (Appendix M) (negative quantity)	(233a)m	-25.9427	-37.6949	-55.8265	-64.7381	-71.5095	-67.3622	-66.5303	-61.9640	-54.1987	-43.9725	-28.9143 -22.2995 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	(233b)m	-11.4431	-24.3777	-49.0233	-74.4704	-99.2918	-100.0684	-98.8973	-83.3661	-60.6141	-35.1471	-15.3696 -9.0268 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												

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Space heating fuel - main system 1	2340.0939 (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	2782.3567 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	179.4349 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1262.0490 (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	4125.8365 (238)

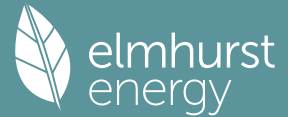
----- 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP -----

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2340.0939	0.2100	491.4197 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2782.3567	0.2100	584.2949 (264)
Space and water heating			1075.7146 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	179.4349	0.1443	25.8980 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-600.9533	0.1340	-80.4998
PV Unit electricity exported	-661.0957	0.1256	-83.0087
Total			-163.5085 (269)
Total CO2, kg/year			950.0334 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.4000 (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	2340.0939	1.1300	2644.3061 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2782.3567	1.1300	3144.0631 (278)
Space and water heating			5788.3692 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	179.4349	1.5338	275.2232 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-600.9533	1.4950	-898.4454
PV Unit electricity exported	-661.0957	0.4609	-304.6887
Total			-1203.1341 (283)
Total Primary energy kWh/year			4990.5591 (286)
Target Primary Energy Rate (TPER)			65.1500 (287)

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Property Reference	01114	Issued on Date	03/07/2024
Assessment Reference	00001	Prop Type Ref	
Property	Zoar Chapel , Flat 8, South Street , Reading		
SAP Rating	80 C	DER	4.88
Environmental	96 A	% DER < TER	60.65
CO ₂ Emissions (t/year)	0.35	DFEE	36.10
Compliance Check	See BREL	% DFEE < TFEE	-0.78
% DPER < TPER	20.84	DPER	51.57
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	48.7000 (1b)	x 2.3400 (2b)	= 113.9580 (1b) - (3b)
First floor	27.9000 (1c)	x 2.5000 (2c)	= 69.7500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.7080 (5)

2. Ventilation rate

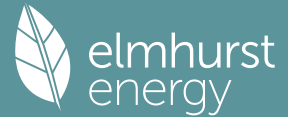
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1089 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3089 (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) = 0.2625 (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	0.3347	0.3282	0.3216	0.2888	0.2822	0.2494	0.2494	0.2428	0.2625	0.2822	0.2954	0.3085 (22b)
Effective ac	0.5560	0.5538	0.5517	0.5417	0.5398	0.5311	0.5311	0.5295	0.5345	0.5398	0.5436	0.5476 (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)			22.8800	0.9615	22.0000		(27)
Doo to Hall			1.8000	1.4000	2.5200		(26)
External Wall 1	84.2222	22.8800	61.3422	0.1800	11.0416	14.0000	858.7908 (29a)
Wall to Stairs	17.0800	1.8000	15.2800	0.1600	2.4448	14.0000	213.9200 (29a)
External Roof 1	42.4800		42.4800	0.1000	4.2480	9.0000	382.3200 (30)
Total net area of external elements Aum(A, m ²)			143.7822				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	42.2544			(33)
Party Wall 1			28.1900	0.0000	0.0000	20.0000	563.8000 (32)
Party Floor 1			42.4800			40.0000	1699.2000 (32d)
Internal Wall 1			35.3300			9.0000	317.9700 (32c)
Internal Ceiling 1			27.8000			9.0000	250.2000 (32e)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =	4286.2008			(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K				55.9556			(35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				11.1900	0.0060	0.0671	
E3 Sill				4.6000	0.0120	0.0552	
E4 Jamb				25.8300	0.0230	0.5941	

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E16 Corner (normal)	9.7000	0.0750	0.7275
E17 Corner (inverted - internal area greater than external area)	2.3400	-0.0450	-0.1053
E18 Party wall between dwellings	11.7000	0.2400	2.8080
E7 Party floor between dwellings (in blocks of flats)	27.0000	0.0220	0.5940
E14 Flat roof	27.4500	0.1600	4.3920
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.1326 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	51.3870 (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	33.7082	33.5763	33.4470	32.8399	32.7262	32.1974	32.1974	32.0995	32.4011	32.7262	32.9561	33.1963 (38)
Heat transfer coeff	85.0952	84.9633	84.8341	84.2269	84.1133	83.5844	83.5844	83.4865	83.7881	84.1133	84.3431	84.5834 (39)
Average = Sum(39)m / 12 =												84.2263
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1109	1.1092	1.1075	1.0996	1.0981	1.0912	1.0912	1.0899	1.0938	1.0981	1.1011	1.1042 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3952 (42)
Hot water usage for mixer showers												
Hot water usage for baths	64.3791	63.4116	62.0017	59.3043	57.3136	55.0937	53.8319	55.2310	56.7648	59.1483	61.9037	64.1324 (42a)
Hot water usage for other uses	27.8083	27.3953	26.8138	25.7414	24.9385	24.0481	23.5672	24.1447	24.7735	25.7262	26.8206	27.7143 (42b)
Hot water usage for other uses	39.1591	37.7351	36.3111	34.8872	33.4632	32.0392	32.0392	33.4632	34.8872	36.3111	37.7351	39.1591 (42c)
Average daily hot water use (litres/day)												120.7372 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	131.3465	128.5420	125.1266	119.9329	115.7153	111.1811	109.4383	112.8390	116.4255	121.1857	126.4595	131.0058 (44)
Energy content (annual)	208.0207	183.0421	192.3150	164.1821	155.7751	136.7101	132.3562	139.7182	143.5643	164.4478	180.1647	205.1234 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 2005.4197
Distribution loss	31.2031	27.4563	28.8472	24.6273	23.3663	20.5065	19.8534	20.9577	21.5346	24.6672	27.0247	30.7685 (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												
If cylinder contains dedicated solar storage	33.8520	30.5760	33.8520	32.7600	33.8520	32.7600	33.8520	33.8520	32.7600	33.8520	32.7600	33.8520 (56)
Primary loss	33.8520	30.5760	33.8520	32.7600	33.8520	32.7600	33.8520	33.8520	32.7600	33.8520	32.7600	33.8520 (57)
Combi loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576 (59)
Total heat required for water heating calculated for each month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
WWHRS	296.7303	263.1669	281.0246	250.0301	244.4847	191.9821	189.4706	196.8326	198.8363	253.1574	266.0127	293.8330 (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	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)
Electric shower(s)	296.7303	263.1669	281.0246	250.0301	244.4847	191.9821	189.4706	196.8326	198.8363	253.1574	266.0127	293.8330 (64)
Total per year (kWh/year) = Sum(64)m =												2925.5613 (64)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	113.0530	100.5005	107.8308	97.0610	95.6813	63.4657	62.6184	65.0662	65.7447	98.5650	102.3752	112.0896 (65)

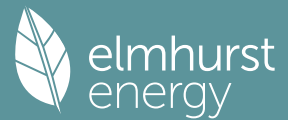
5. Internal gains (see Table 5 and 5a)

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	143.7111	143.7111	143.7111	143.7111	143.7111	143.7111	143.7111	143.7111	143.7111	143.7111	143.7111	143.7111 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	30.7551	27.3164	22.2152	16.8183	12.5719	10.6137	11.4685	14.9072	20.0084	25.4052	29.6517	31.6098 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	316.6989	319.9852	311.7037	294.0734	271.8184	250.9017	236.9281	233.6418	241.9233	259.5536	281.8086	302.7253 (68)
Pumps, fans	51.7663	51.7663	51.7663	51.7663	51.7663	51.7663	51.7663	51.7663	51.7663	51.7663	51.7663	51.7663 (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)	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074 (71)
Total internal gains	151.9529	149.5544	144.9339	134.8069	128.6039	88.1468	84.1644	87.4546	91.3121	132.4798	142.1877	150.6581 (72)
	599.0768	596.5259	578.5227	545.3686	512.6641	449.3322	432.2311	435.6736	452.9137	517.1086	553.3180	584.6631 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
East	10.0800	19.6403	0.6300	0.7000	0.7700	60.5034 (76)
South	2.1900	46.7521	0.6300	0.7000	0.7700	31.2908 (78)
West	10.6100	19.6403	0.6300	0.7000	0.7700	63.6846 (80)
Solar gains	155.4788	294.1843	465.3631	657.2783	791.9826	806.0211
Total gains	754.5556	890.7103	1043.8858	1202.6469	1304.6467	1255.3534
						1201.4472
						1104.5266
						533.5060
						343.5404
						191.9381
						129.1643 (83)
						713.8275 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	13.9915	14.0132	14.0346	14.1358	14.1549	14.2444	14.2444	14.2611	14.2098	14.1549	14.1163	14.0762
alpha	1.9328	1.9342	1.9356	1.9424	1.9437	1.9496	1.9496	1.9507	1.9473	1.9437	1.9411	1.9384
util living area												
	0.8365	0.7875	0.7119	0.6043	0.4854	0.3757	0.2843	0.3175	0.4780	0.6656	0.7946	0.8490 (86)
Living	18.6623	19.0017	19.4966	20.0322	20.4302	20.6680	20.7716	20.7515	20.5474	20.0052	19.2340	18.5859
Non living	17.2998	17.7125	18.3102	18.9474	19.4028	19.6649	19.7644	19.7498	19.5481	18.9374	18.0111	17.2093
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	19.8062	19.0017	19.4966	20.0322	20.4302	20.6680	20.7716	20.7515	20.5474	20.0052	19.2340	18.9243 (87)
Th 2	19.9919	19.9933	19.9947	20.0012	20.0024	20.0080	20.0080	20.0091	20.0059	20.0024	19.9999	19.9974 (88)
util rest of house												
	0.8224	0.7702	0.6893	0.5747	0.4475	0.3270	0.2260	0.2567	0.4266	0.6320	0.7749	0.8358 (89)
MIT 2	18.9041	17.7125	18.3102	18.9474	19.4028	19.6649	19.7644	19.7498	19.5481	18.9374	18.0111	17.7064 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	19.2220	18.1669	18.7284	19.3297	19.7649	20.0185	20.1194	20.1029	19.9004	19.3138	18.4422	18.1357 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2220	18.1669	18.7284	19.3297	19.7649	20.0185	20.1194	20.1029	19.9004	19.3138	18.4422	18.1357 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8104	0.7333	0.6573	0.5531	0.4380	0.3275	0.2328	0.2627	0.4208	0.6061	0.7384	0.8065 (94)
Useful gains	611.5059	653.1674	686.1421	665.1713	571.4238	411.1687	279.6423	290.1285	415.0726	521.6807	550.2877	575.6954 (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												
	1269.7947	1127.2001	1037.3816	878.4637	678.3675	452.8984	294.1663	309.1399	486.0015	732.9420	956.6339	1178.7288 (97)
Space heating kWh												
	489.7669	318.5500	261.3222	153.5705	79.5661	0.0000	0.0000	0.0000	0.0000	157.1785	292.5692	448.6568 (98a)
Space heating requirement - total per year (kWh/year)												2201.1803
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												
	489.7669	318.5500	261.3222	153.5705	79.5661	0.0000	0.0000	0.0000	0.0000	157.1785	292.5692	448.6568 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2201.1803
Space heating per m2										(98c) / (4) =		28.7360 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												311.6022 (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	489.7669	318.5500	261.3222	153.5705	79.5661	0.0000	0.0000	0.0000	0.0000	157.1785	292.5692	448.6568 (98)
Space heating efficiency (main heating system 1)												
	311.6022	311.6022	311.6022	311.6022	311.6022	0.0000	0.0000	0.0000	0.0000	311.6022	311.6022	311.6022 (210)
Space heating fuel (main heating system)												
	157.1770	102.2297	83.8640	49.2842	25.5345	0.0000	0.0000	0.0000	0.0000	50.4420	93.8919	143.9838 (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												
	296.7303	263.1669	281.0246	250.0301	244.4847	191.9821	189.4706	196.8326	198.8363	253.1574	266.0127	293.8330 (64)
Efficiency of water heater												
	181.7325	181.7325	181.7325	181.7325	181.7325	181.7325	181.7325	181.7325	181.7325	181.7325	181.7325	181.7325 (216)
Fuel for water heating, kWh/month												
	163.2786	144.8101	154.6364	137.5814	134.5300	105.6399	104.2580	108.3090	109.4115	139.3022	146.3760	161.6844 (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)
(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	26.9197	21.5960	19.4448	14.2461	11.0041	8.9904	10.0383	13.0482	16.9483	22.2371	25.1167	27.6679 (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												706.4072 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												181.7325
Water heating fuel used												1609.8174 (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)												217.2575 (232)

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

PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	2533.4821 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	706.4072	16.4900	116.4865 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1609.8174	16.4900	265.4589 (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	217.2575	16.4900	35.8258 (250)
Additional standing charges			0.0000 (251)
Total energy cost			417.7712 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	1.2368 (257)
SAP value	79.9511
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	706.4072	0.1553	109.7331 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1609.8174	0.1416	228.0062 (264)
Space and water heating			337.7393 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	217.2575	0.1443	31.3570 (268)
Total CO2, kg/year			369.0963 (272)
CO2 emissions per m2			4.8200 (273)
EI value			95.9327
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	48.7000 (1b)	x 2.3400 (2b)	= 113.9580 (1b) - (3b)
First floor	27.9000 (1c)	x 2.5000 (2c)	= 69.7500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	183.7080 (5)

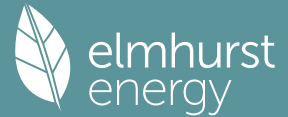
2. Ventilation rate

	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) =	0.1089 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000 (17)	
Infiltration rate		0.3089 (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) =	0.2625 (21)	

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

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Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate												
Effective ac	0.2757	0.2625	0.2625	0.2428	0.2428	0.2166	0.2232	0.2100	0.2166	0.2297	0.2297	0.2494 (22b)
	0.5380	0.5345	0.5345	0.5295	0.5295	0.5235	0.5249	0.5221	0.5235	0.5264	0.5264	0.5311 (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)			22.8800	0.9615	22.0000			(27)
Doo to Hall			1.8000	1.4000	2.5200			(26)
External Wall 1	84.2222	22.8800	61.3422	0.1800	11.0416	14.0000	858.7908	(29a)
Wall to Stairs	17.0800	1.8000	15.2800	0.1600	2.4448	14.0000	213.9200	(29a)
External Roof 1	42.4800		42.4800	0.1000	4.2480	9.0000	382.3200	(30)
Total net area of external elements Aum(A, m2)			143.7822					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		42.2544			(33)
Party Wall 1			28.1900	0.0000	0.0000	20.0000	563.8000	(32)
Party Floor 1			42.4800			40.0000	1699.2000	(32d)
Internal Wall 1			35.3300			9.0000	317.9700	(32c)
Internal Ceiling 1			27.8000			9.0000	250.2000	(32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	4286.2008	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							55.9556	(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		
E2 Other lintels (including other steel lintels)				11.1900	0.0060	0.0671		
E3 Sill				4.6000	0.0120	0.0552		
E4 Jamb				25.8300	0.0230	0.5941		
E16 Corner (normal)				9.7000	0.0750	0.7275		
E17 Corner (inverted - internal area greater than external area)				2.3400	-0.0450	-0.1053		
E18 Party wall between dwellings				11.7000	0.2400	2.8080		
E7 Party floor between dwellings (in blocks of flats)				27.0000	0.0220	0.5940		
E14 Flat roof				27.4500	0.1600	4.3920		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.1326	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss						(33) + (36) + (36a) =	51.3870	(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	32.6153	32.4011	32.4011	32.0995	32.0995	31.7338	31.8213	31.6490	31.7338	31.9114	31.9114	32.1974 (38)
Average = Sum(39)m / 12 =	84.0023	83.7881	83.7881	83.4865	83.4865	83.1209	83.2084	83.0360	83.1209	83.2985	83.2985	83.5844 (39)
												83.4349
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0966	1.0938	1.0938	1.0899	1.0899	1.0851	1.0863	1.0840	1.0851	1.0874	1.0874	1.0912 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

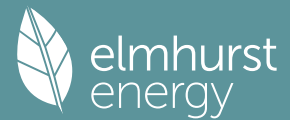
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3952 (42)
Hot water usage for mixer showers												64.1324 (42a)
Hot water usage for baths												27.7143 (42b)
Hot water usage for other uses												39.1591 (42c)
Average daily hot water use (litres/day)												120.7372 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	131.3465	128.5420	125.1266	119.9329	115.7153	111.1811	109.4383	112.8390	116.4255	121.1857	126.4595	131.0058 (44)
Energy content (annual)	208.0207	183.0421	192.3150	164.1821	155.7751	136.7101	132.3562	139.7182	143.5643	164.4478	180.1647	205.1234 (45)
Distribution loss (46)m = 0.15 x (45)m												2005.4197
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												
If cylinder contains dedicated solar storage												
Primary loss	33.8520	30.5760	33.8520	32.7600	33.8520	32.7600	33.8520	33.8520	32.7600	33.8520	32.7600	33.8520 (56)
Combi loss	33.8520	30.5760	33.8520	32.7600	33.8520	32.7600	33.8520	33.8520	32.7600	33.8520	32.7600	33.8520 (57)
Total heat required for water heating calculated for each month	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)
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 (61)
PV diverter	296.7303	263.1669	281.0246	250.0301	244.4847	191.9821	189.4706	196.8326	198.8363	253.1574	266.0127	293.8330 (62)
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 (63a)
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 (63b)
Output from w/h	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)
Electric shower(s)	296.7303	263.1669	281.0246	250.0301	244.4847	191.9821	189.4706	196.8326	198.8363	253.1574	266.0127	293.8330 (64)
Heat gains from water heating, kWh/month												2925.5613 (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)
	113.0530	100.5005	107.8308	97.0610	95.6813	63.4657	62.6184	65.0662	65.7447	98.5650	102.3752	112.0896 (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	143.7111	143.7111	143.7111	143.7111	143.7111	143.7111	143.7111	143.7111	143.7111	143.7111	143.7111	143.7111 (66)
	30.7551	27.3164	22.2152	16.8183	12.5719	10.6137	11.4685	14.9072	20.0084	25.4052	29.6517	31.6098 (67)

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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	316.6989	319.9852	311.7037	294.0734	271.8184	250.9017	236.9281	233.6418	241.9233	259.5536	281.8086	302.7253 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.7663	51.7663	51.7663	51.7663	51.7663	51.7663	51.7663	51.7663	51.7663	51.7663	51.7663	51.7663 (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)	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074 (71)
Water heating gains (Table 5)	151.9529	149.5544	144.9339	134.8069	128.6039	88.1468	84.1644	87.4546	91.3121	132.4798	142.1877	150.6581 (72)
Total internal gains	599.0768	596.5259	578.5227	545.3686	512.6641	449.3322	432.2311	435.6736	452.9137	517.1086	553.3180	584.6631 (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						10.0800	22.3313	0.6300	0.7000	0.7700	68.7934 (76)	
South						2.1900	50.9848	0.6300	0.7000	0.7700	34.1238 (78)	
West						10.6100	22.3313	0.6300	0.7000	0.7700	72.4105 (80)	
Solar gains	175.3276	298.6229	466.4756	678.3251	795.7840	866.5730	818.1114	727.7701	579.4654	372.3280	221.7740	144.2194 (83)
Total gains	774.4044	895.1488	1044.9983	1223.6937	1308.4481	1315.9052	1250.3425	1163.4437	1032.3791	889.4366	775.0920	728.8825 (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	14.1736	14.2098	14.2098	14.2611	14.2611	14.3239	14.3088	14.3385	14.3239	14.2933	14.2933	14.2444
alpha	1.9449	1.9473	1.9473	1.9507	1.9507	1.9549	1.9539	1.9559	1.9549	1.9529	1.9529	1.9496
util living area	0.8178	0.7722	0.6889	0.5664	0.4324	0.2923	0.1987	0.2184	0.4042	0.6185	0.7642	0.8313 (86)
Living	18.8910	19.1758	19.6757	20.1926	20.5597	20.7585	20.8185	20.8127	20.6636	20.1940	19.4742	18.8280
Non living	17.5873	17.9325	18.5331	19.1396	19.5504	19.7554	19.8042	19.8028	19.6720	19.1620	18.3090	17.5138
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	19.9226	19.1758	19.6757	20.1926	20.5597	20.7585	20.8185	20.8127	20.6636	20.1940	19.4742	19.1323 (87)
Th 2	20.0036	20.0059	20.0059	20.0091	20.0091	20.0130	20.0121	20.0139	20.0130	20.0111	20.0111	20.0080 (88)
util rest of house	0.8020	0.7535	0.6642	0.5340	0.3905	0.2403	0.1379	0.1544	0.3479	0.5802	0.7415	0.8163 (89)
MIT 2	19.0277	17.9325	18.5331	19.1396	19.5504	19.7554	19.8042	19.8028	19.6720	19.1620	18.3090	17.9587 (90)
Living area fraction	19.3432	18.3708	18.9359	19.5108	19.9062	20.1090	20.1617	20.1588	20.0215	19.5258	18.7197	0.3525 (91)
MIT	19.3432	18.3708	18.9359	19.5108	19.9062	20.1090	20.1617	20.1588	20.0215	19.5258	18.7197	18.3724 (92)
Temperature adjustment	19.3432	18.3708	18.9359	19.5108	19.9062	20.1090	20.1617	20.1588	20.0215	19.5258	18.7197	0.0000
adjusted MIT	19.3432	18.3708	18.9359	19.5108	19.9062	20.1090	20.1617	20.1588	20.0215	19.5258	18.7197	18.3724 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.7904	0.7177	0.6346	0.5165	0.3859	0.2455	0.1473	0.1640	0.3484	0.5596	0.7070	0.7871 (94)
Ext temp.	612.1163	642.4597	663.2010	632.0897	504.9942	323.0962	184.2239	190.8442	359.7014	497.7524	547.9514	573.7059 (95)
Heat loss rate W	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Space heating kWh	1196.4595	1070.0391	966.5680	802.3716	576.5733	341.5436	188.1904	195.8640	400.7685	660.2034	892.9336	1109.3654 (97)
Space heating requirement - total per year (kWh/year)	434.7513	287.3334	225.7051	122.6030	53.2548	0.0000	0.0000	0.0000	0.0000	120.8635	248.3871	398.5307 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Space heating kWh	434.7513	287.3334	225.7051	122.6030	53.2548	0.0000	0.0000	0.0000	0.0000	120.8635	248.3871	398.5307 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	434.7513	287.3334	225.7051	122.6030	53.2548	0.0000	0.0000	0.0000	0.0000	120.8635	248.3871	398.5307 (98c)
Space heating per m2	(98c) / (4) = 24.6923 (99)											

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)											
Fraction of space heat from main system(s)	1.0000 (202)											
Efficiency of main space heating system 1 (in %)	311.9829 (206)											
Efficiency of main space heating system 2 (in %)	0.0000 (207)											
Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
434.7513	287.3334	225.7051	122.6030	53.2548	0.0000	0.0000	0.0000	0.0000	0.0000	120.8635	248.3871	398.5307 (98)
Space heating efficiency (main heating system 1)	311.9829	311.9829	311.9829	311.9829	311.9829	0.0000	0.0000	0.0000	0.0000	311.9829	311.9829	311.9829 (210)
Space heating fuel (main heating system)	139.3510	92.0991	72.3453	39.2980	17.0698	0.0000	0.0000	0.0000	0.0000	38.7404	79.6156	127.7412 (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	296.7303	263.1669	281.0246	250.0301	244.4847	191.9821	189.4706	196.8326	198.8363	253.1574	266.0127	293.8330 (64)
Water heating requirement	181.8015	181.8015	181.8015	181.8015	181.8015	181.8015	181.8015	181.8015	181.8015	181.8015	181.8015	181.8015 (216)
Efficiency of water heater	181.8015	181.8015	181.8015	181.8015	181.8015	181.8015	181.8015	181.8015	181.8015	181.8015	181.8015	181.8015 (217)
Fuel for water heating, kWh/month												

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	163.2166	144.7551	154.5777	137.5292	134.4789	105.5998	104.2184	108.2679	109.3700	139.2494	146.3204	161.6230	(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	26.9197	21.5960	19.4448	14.2461	11.0041	8.9904	10.0383	13.0482	16.9483	22.2371	25.1167	27.6679	(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												606.2603	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												181.8015	
Water heating fuel used												1609.2062	(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)												217.2575	(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												2432.7241	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	606.2603	26.0600	157.9914	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1609.2062	26.0600	419.3591	(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	217.2575	26.0600	56.6173	(250)
Additional standing charges			0.0000	(251)
Total energy cost			633.9679	(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	606.2603	0.1559	94.5042	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1609.2062	0.1416	227.9196	(264)
Space and water heating			322.4238	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	217.2575	0.1443	31.3570	(268)
Total CO2, kg/year			353.7807	(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	606.2603	1.5771	956.1038	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1609.2062	1.5238	2452.0537	(278)
Space and water heating			3408.1575	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	217.2575	1.5338	333.2368	(282)
Total Primary energy kWh/year			3741.3944	(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)

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Recommended measures (none) Typical annual savings £0 0.00 kg/m² Energy efficiency C 80 Environmental impact A 96

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

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

Typical heating and lighting costs of this home (per year, Thames Valley):			
	Current £634	Potential £634	Saving £0
Electricity			
Space heating	£158	£158	£0
Water heating	£419	£419	£0
Lighting	£57	£57	£0
Total cost of fuels	£634	£634	£0
Total cost of uses	£634	£634	£0
Delivered energy	32 kWh/m²	32 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.4 tonnes	0.4 tonnes	0.0 tonnes
CO2 emissions per m²	5 kg/m²	5 kg/m²	0 kg/m²
Primary energy	49 kWh/m²	49 kWh/m²	0 kWh/m²

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	48.7000 (1b)	x 2.3400 (2b)	= 113.9580 (1b) - (3b)
First floor	27.9000 (1c)	x 2.5000 (2c)	= 69.7500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.7080 (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) =		Air changes per hour 20.0000 / (5) =	
Pressure test		Yes	0.1089 (8)
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.3089	(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) =	0.2625	(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	0.3347	0.3282	0.3216	0.2888	0.2822	0.2494	0.2494	0.2428	0.2625	0.2822	0.2954	0.3085 (22b)
Effective ac	0.5560	0.5538	0.5517	0.5417	0.5398	0.5311	0.5311	0.5295	0.5345	0.5398	0.5436	0.5476 (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)			22.9800	0.9615	22.0000		(27)
Door to Hall			1.8000	1.4000	2.5200		(26)
External Wall 1	84.2222	22.9800	61.3422	0.1800	11.0416	14.0000	858.7908 (29a)
Wall to Stairs	17.0800	1.8000	15.2800	0.1600	2.4448	14.0000	213.9200 (29a)
External Roof 1	42.4800		42.4800	0.1000	4.2480	9.0000	382.3200 (30)
Total net area of external elements Aum(A, m2)			143.7822				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		42.2544		(33)
Party Wall 1			28.1900	0.0000	0.0000	20.0000	563.8000 (32)
Party Floor 1			42.4800			40.0000	1699.2000 (32d)
Internal Wall 1			35.3300			9.0000	317.9700 (32c)
Internal Ceiling 1			27.8000			9.0000	250.2000 (32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		4286.2008 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							55.9556 (35)
List of Thermal Bridges							

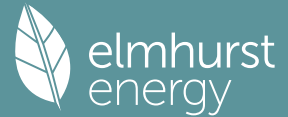
Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)m \times (5)$												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	33.7082	33.5763	33.4470	32.8399	32.7262	32.1974	32.1974	32.0995	32.4011	32.7262	32.9561	33.1963 (38)
Heat transfer coeff												
	85.0952	84.9633	84.8341	84.2269	84.1133	83.5844	83.5844	83.4865	83.7881	84.1133	84.3431	84.5834 (39)
Average = Sum(39)m / 12 =												84.2263
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1.1109	1.1092	1.1075	1.0996	1.0981	1.0912	1.0912	1.0899	1.0938	1.0981	1.1011	1.1042 (40)
HLP (average)												1.0996
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

Assumed occupancy												2.3952 (42)
Hot water usage for mixer showers	64.3791	63.4116	62.0017	59.3043	57.3136	55.0937	53.8319	55.2310	56.7648	59.1483	61.9037	64.1324 (42a)
Hot water usage for baths	27.8083	27.3953	26.8138	25.7414	24.9385	24.0481	23.5672	24.1447	24.7735	25.7262	26.8206	27.7143 (42b)
Hot water usage for other uses	39.1591	37.7351	36.3111	34.8872	33.4632	32.0392	32.0392	33.4632	34.8872	36.3111	37.7351	39.1591 (42c)
Average daily hot water use (litres/day)												120.7372 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	131.3465	128.5420	125.1266	119.9329	115.7153	111.1811	109.4383	112.8390	116.4255	121.1857	126.4595	131.0058 (44)
Energy content (annual)	208.0207	183.0421	192.3150	164.1821	155.7751	136.7101	132.3562	139.7182	143.5643	164.4478	180.1647	205.1234 (45)
Distribution loss (46)m = 0.15 x (45)m	31.2031	27.4563	28.8472	24.6273	23.3663	20.5065	19.8534	20.9577	21.5346	24.6672	27.0247	30.7685 (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)
Combustion 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	296.7303	263.1669	281.0246	250.0301	244.4847	191.9821	189.4706	196.8326	198.8363	253.1574	266.0127	293.8330 (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	296.7303	263.1669	281.0246	250.0301	244.4847	191.9821	189.4706	196.8326	198.8363	253.1574	266.0127	293.8330 (64)
	Total per year (kWh/year) = Sum(64)m =											2925.5613 (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	113.0530	100.5005	107.8308	97.0610	95.6813	63.4657	62.6184	65.0662	65.7447	98.5650	102.3752	112.0896 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	143.7111	143.7111	143.7111	143.7111	143.7111	143.7111	143.7111	143.7111	143.7111	143.7111	143.7111	143.7111 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.7551	27.3164	22.2152	16.8183	12.5719	10.6137	11.4685	14.9072	20.0084	25.4052	29.6517	31.6098 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	316.6989	319.9852	311.7037	294.0734	271.8184	250.9017	236.9281	233.6418	241.9233	259.5536	281.8086	302.7253 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.7663	51.7663	51.7663	51.7663	51.7663	51.7663	51.7663	51.7663	51.7663	51.7663	51.7663	51.7663 (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)	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074 (71)
Water heating gains (Table 5)	151.9529	149.5544	144.9339	134.8069	128.6039	88.1468	84.1644	87.4546	91.3121	132.4798	142.1877	150.6581 (72)
Total internal gains	599.0768	596.5259	578.5227	545.3686	512.6641	449.3322	432.2311	435.6736	452.9137	517.1086	553.3180	584.6631 (73)

[Jan					Area	Solar flux		g	FF	Access		Gains
					m2	Table 6a	Specific data	or Table 6b	Specific data	or Table 6c	factor	W
						W/m2					Table 6d	
East					10.0800	19.6403	0.6300		0.7000	0.7700		60.5034 (76)
South					2.1900	46.7521	0.6300		0.7000	0.7700		31.2908 (78)
West					10.6100	19.6403	0.6300		0.7000	0.7700		63.6846 (80)
Solar gains	155.4788	294.1843	465.3631	657.2783	791.9826	806.0211	769.2162	668.8531	533.5060	343.5404	191.9381	129.1643 (83)
Total gains	754.5556	890.7103	1043.8858	1202.6469	1304.6467	1255.3534	1201.4472	1104.5266	986.4197	860.6490	745.2561	713.8275 (84)

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7. Mean internal temperature (heating season)												
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	13.9915	14.0132	14.0346	14.1358	14.1549	14.2444	14.2444	14.2611	14.2098	14.1549	14.1163	14.0762
alpha	1.9328	1.9342	1.9356	1.9424	1.9437	1.9496	1.9496	1.9507	1.9473	1.9437	1.9411	1.9384
util living area	0.8365	0.7875	0.7119	0.6043	0.4854	0.3757	0.2843	0.3175	0.4780	0.6656	0.7946	0.8490 (86)
Living	18.6623	19.0017	19.4966	20.0322	20.4302	20.6680	20.7716	20.7515	20.5474	20.0052	19.2340	18.5859
Non living	17.2998	17.7125	18.3102	18.9474	19.4028	19.6649	19.7644	19.7498	19.5481	18.9374	18.0111	17.2093
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	19.8062	19.0017	19.4966	20.0322	20.4302	20.6680	20.7716	20.7515	20.5474	20.0052	19.2340	18.9243 (87)
Th 2	19.9919	19.9933	19.9947	20.0012	20.0024	20.0080	20.0080	20.0091	20.0059	20.0024	19.9999	19.9974 (88)
util rest of house	0.8224	0.7702	0.6893	0.5747	0.4475	0.3270	0.2260	0.2567	0.4266	0.6320	0.7749	0.8358 (89)
MIT 2	18.9041	17.7125	18.3102	18.9474	19.4028	19.6649	19.7644	19.7498	19.5481	18.9374	18.0111	17.7064 (90)
Living area fraction									fLA = Living area / (4) =			0.3525 (91)
MIT	19.2220	18.1669	18.7284	19.3297	19.7649	20.0185	20.1194	20.1029	19.9004	19.3138	18.4422	18.1357 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2220	18.1669	18.7284	19.3297	19.7649	20.0185	20.1194	20.1029	19.9004	19.3138	18.4422	18.1357 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8104	0.7333	0.6573	0.5531	0.4380	0.3275	0.2328	0.2627	0.4208	0.6061	0.7384	0.8065 (94)
Useful gains	611.5059	653.1674	686.1421	665.1713	571.4238	411.1687	279.6423	290.1285	415.0726	521.6807	550.2877	575.6954 (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	1269.7947	1127.2001	1037.3816	878.4637	678.3675	452.8984	294.1663	309.1399	486.0015	732.9420	956.6339	1178.7288 (97)
Space heating kWh	489.7669	318.5500	261.3222	153.5705	79.5661	0.0000	0.0000	0.0000	0.0000	157.1785	292.5692	448.6568 (98a)
Space heating requirement - total per year (kWh/year)												2201.1803
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	489.7669	318.5500	261.3222	153.5705	79.5661	0.0000	0.0000	0.0000	0.0000	157.1785	292.5692	448.6568 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2201.1803
Space heating per m2										(98c) / (4) =		28.7360 (99)
9a. Energy requirements - Individual heating systems, including micro-CHP												
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												311.6022 (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	489.7669	318.5500	261.3222	153.5705	79.5661	0.0000	0.0000	0.0000	0.0000	157.1785	292.5692	448.6568 (98)
Space heating efficiency (main heating system 1)	311.6022	311.6022	311.6022	311.6022	311.6022	0.0000	0.0000	0.0000	0.0000	311.6022	311.6022	311.6022 (210)
Space heating fuel (main heating system)	157.1770	102.2297	83.8640	49.2842	25.5345	0.0000	0.0000	0.0000	0.0000	50.4420	93.8919	143.9838 (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	296.7303	263.1669	281.0246	250.0301	244.4847	191.9821	189.4706	196.8326	198.8363	253.1574	266.0127	293.8330 (64)
Efficiency of water heater (217)m	181.7325	181.7325	181.7325	181.7325	181.7325	181.7325	181.7325	181.7325	181.7325	181.7325	181.7325	181.7325 (216)
Fuel for water heating, kWh/month	163.2786	144.8101	154.6364	137.5814	134.5300	105.6399	104.2580	108.3090	109.4115	139.3022	146.3760	161.6844 (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	26.9197	21.5960	19.4448	14.2461	11.0041	8.9904	10.0383	13.0482	16.9483	22.2371	25.1167	27.6679 (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												706.4072 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												181.7325
Water heating fuel used												1609.8174 (219)
Space cooling fuel												0.0000 (221)

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Electricity for pumps and fans:
 Total electricity for the above, kWh/year 0.0000 (231)
 Electricity for lighting (calculated in Appendix L) 217.2575 (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 2533.4821 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	706.4072	16.4900	116.4865 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1609.8174	16.4900	265.4589 (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	217.2575	16.4900	35.8258 (250)
Additional standing charges			0.0000 (251)
Total energy cost			417.7712 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12): 0.3600 (256)
 Energy cost factor (ECF) 1.2368 (257)

$$[(255) \times (256)] / [(4) + 45.0] = 79.9511$$

 SAP value 80 (258)
 SAP rating (Section 12) C
 SAP band

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	706.4072	0.1553	109.7331 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1609.8174	0.1416	228.0062 (264)
Space and water heating			337.7393 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	217.2575	0.1443	31.3570 (268)
Total CO2, kg/year			369.0963 (272)
CO2 emissions per m2			4.8200 (273)
EI value			95.9327
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

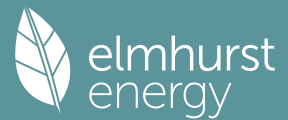
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	48.7000 (1b)	x 2.3400 (2b)	= 113.9580 (1b) - (3b)
First floor	27.9000 (1c)	x 2.5000 (2c)	= 69.7500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.7080 (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) = 0.1089 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3089 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)

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Infiltration rate adjusted to include shelter factor

(21) = (18) x (20) = 0.2625 (21)

Wind speed	Jan 4.2000	Feb 4.0000	Mar 4.0000	Apr 3.7000	May 3.7000	Jun 3.3000	Jul 3.4000	Aug 3.2000	Sep 3.3000	Oct 3.5000	Nov 3.5000	Dec 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	0.2757	0.2625	0.2625	0.2428	0.2428	0.2166	0.2232	0.2100	0.2166	0.2297	0.2297	0.2494 (22b)
Effective ac	0.5380	0.5345	0.5345	0.5295	0.5295	0.5235	0.5249	0.5221	0.5235	0.5264	0.5264	0.5311 (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)			22.8800	0.9615	22.0000		(27)
Doo to Hall			1.8000	1.4000	2.5200		(26)
External Wall 1	84.2222	22.8800	61.3422	0.1800	11.0416	14.0000	858.7908 (29a)
Wall to Stairs	17.0800	1.8000	15.2800	0.1600	2.4448	14.0000	213.9200 (29a)
External Roof 1	42.4800		42.4800	0.1000	4.2480	9.0000	382.3200 (30)
Total net area of external elements Aum(A, m2)			143.7822				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.2544		(33)
Party Wall 1			28.1900	0.0000	0.0000	20.0000	563.8000 (32)
Party Floor 1			42.4800			40.0000	1699.2000 (32d)
Internal Wall 1			35.3300			9.0000	317.9700 (32c)
Internal Ceiling 1			27.8000			9.0000	250.2000 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 4286.2008 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							55.9556 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				11.1900	0.0060	0.0671	
E3 Sill				4.6000	0.0120	0.0552	
E4 Jamb				25.8300	0.0230	0.5941	
E16 Corner (normal)				9.7000	0.0750	0.7275	
E17 Corner (inverted - internal area greater than external area)				2.3400	-0.0450	-0.1053	
E18 Party wall between dwellings				11.7000	0.2400	2.8080	
E7 Party floor between dwellings (in blocks of flats)				27.0000	0.0220	0.5940	
E14 Flat roof				27.4500	0.1600	4.3920	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.1326 (36)
Point Thermal bridges							(36a) = 0.0000
Total fabric heat loss							(33) + (36) + (36a) = 51.3870 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 32.6153	Feb 32.4011	Mar 32.4011	Apr 32.0995	May 32.0995	Jun 31.7338	Jul 31.8213	Aug 31.6490	Sep 31.7338	Oct 31.9114	Nov 31.9114	Dec 32.1974 (38)
Heat transfer coeff	84.0023	83.7881	83.7881	83.4865	83.4865	83.1209	83.2084	83.0360	83.1209	83.2985	83.2985	83.5844 (39)
Average = Sum(39)m / 12 =												83.4349
HLP	Jan 1.0966	Feb 1.0938	Mar 1.0938	Apr 1.0899	May 1.0899	Jun 1.0851	Jul 1.0863	Aug 1.0840	Sep 1.0851	Oct 1.0874	Nov 1.0874	Dec 1.0912 (40)
HLP (average)												1.0892
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

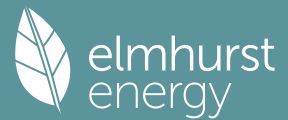
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3952 (42)
Hot water usage for mixer showers												64.1324 (42a)
Hot water usage for baths												27.7143 (42b)
Hot water usage for other uses												39.1591 (42c)
Average daily hot water use (litres/day)												120.7372 (43)
Daily hot water use	Jan 131.3465	Feb 128.5420	Mar 125.1266	Apr 119.9329	May 115.7153	Jun 111.1811	Jul 109.4383	Aug 112.8390	Sep 116.4255	Oct 121.1857	Nov 126.4595	Dec 131.0058 (44)
Energy conte	208.0207	183.0421	192.3150	164.1821	155.7751	136.7101	132.3562	139.7182	143.5643	164.4478	180.1647	205.1234 (45)
Energy content (annual)										Total = Sum(45)m =		2005.4197
Distribution loss (46)m = 0.15 x (45)m	31.2031	27.4563	28.8472	24.6273	23.3663	20.5065	19.8534	20.9577	21.5346	24.6672	27.0247	30.7685 (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	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	296.7303	263.1669	281.0246	250.0301	244.4847	191.9821	189.4706	196.8326	198.8363	253.1574	266.0127	293.8330 (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	296.7303	263.1669	281.0246	250.0301	244.4847	191.9821	189.4706	196.8326	198.8363	253.1574	266.0127	293.8330 (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	113.0530	100.5005	107.8308	97.0610	95.6813	63.4657	62.6184	65.0662	65.7447	98.5650	102.3752	112.0896 (65)

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

Metabolic gains (Table 5), Watts

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.7111	143.7111	143.7111	143.7111	143.7111	143.7111	143.7111	143.7111	143.7111	143.7111	143.7111	143.7111	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.7551	27.3164	22.2152	16.8183	12.5719	10.6137	11.4685	14.9072	20.0084	25.4052	29.6517	31.6098	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	316.6989	319.9852	311.7037	294.0734	271.8184	250.9017	236.9281	233.6418	241.9233	259.5536	281.8086	302.7253	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.7663	51.7663	51.7663	51.7663	51.7663	51.7663	51.7663	51.7663	51.7663	51.7663	51.7663	51.7663	(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)	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	-95.8074	(71)
Water heating gains (Table 5)	151.9529	149.5544	144.9339	134.8069	128.6039	88.1468	84.1644	87.4546	91.3121	132.4798	142.1877	150.6581	(72)
Total internal gains	599.0768	596.5259	578.5227	545.3686	512.6641	449.3322	432.2311	435.6736	452.9137	517.1086	553.3180	584.6631	(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					10.0800	22.3313	0.6300	0.7000			0.7700	68.7934 (76)	
South					2.1900	50.9848	0.6300	0.7000			0.7700	34.1238 (78)	
West					10.6100	22.3313	0.6300	0.7000			0.7700	72.4105 (80)	
Solar gains	175.3276	298.6229	466.4756	678.3251	795.7840	866.5730	818.1114	727.7701	579.4654	372.3280	221.7740	144.2194	(83)
Total gains	774.4044	895.1488	1044.9983	1223.6937	1308.4481	1315.9052	1250.3425	1163.4437	1032.3791	889.4366	775.0920	728.8825	(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	14.1736	14.2098	14.2098	14.2611	14.2611	14.3239	14.3088	14.3385	14.3239	14.2933	14.2933	14.2444
alpha	1.9449	1.9473	1.9473	1.9507	1.9507	1.9549	1.9539	1.9559	1.9549	1.9529	1.9529	1.9496
util living area	0.8178	0.7722	0.6889	0.5664	0.4324	0.2923	0.1987	0.2184	0.4042	0.6185	0.7642	0.8313 (86)
Living	18.8910	19.1758	19.6757	20.1926	20.5597	20.7585	20.8185	20.8127	20.6636	20.1940	19.4742	18.8280
Non living	17.5873	17.9325	18.5331	19.1396	19.5504	19.7554	19.8042	19.8028	19.6720	19.1620	18.3090	17.5138
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	19.9226	19.1758	19.6757	20.1926	20.5597	20.7585	20.8185	20.8127	20.6636	20.1940	19.4742	19.1323 (87)
Th 2	20.0036	20.0059	20.0059	20.0091	20.0091	20.0130	20.0121	20.0139	20.0130	20.0111	20.0111	20.0080 (88)
util rest of house	0.8020	0.7535	0.6642	0.5340	0.3905	0.2403	0.1379	0.1544	0.3479	0.5802	0.7415	0.8163 (89)
MIT 2	19.0277	17.9325	18.5331	19.1396	19.5504	19.7554	19.8042	19.8028	19.6720	19.1620	18.3090	17.9587 (90)
Living area fraction									fLA = Living area / (4) =			0.3525 (91)
MIT	19.3432	18.3708	18.9359	19.5108	19.9062	20.1090	20.1617	20.1588	20.0215	19.5258	18.7197	18.3724 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3432	18.3708	18.9359	19.5108	19.9062	20.1090	20.1617	20.1588	20.0215	19.5258	18.7197	18.3724 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.7904	0.7177	0.6346	0.5165	0.3859	0.2455	0.1473	0.1640	0.3484	0.5596	0.7070	0.7871 (94)
Useful gains	612.1163	642.4597	663.2010	632.0897	504.9942	323.0962	184.2239	190.8442	359.7014	497.7524	547.9514	573.7059 (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	1196.4595	1070.0391	966.5680	802.3716	576.5733	341.5436	188.1904	195.8640	400.7685	660.2034	892.9336	1109.3654 (97)
Space heating kWh	434.7513	287.3334	225.7051	122.6030	53.2548	0.0000	0.0000	0.0000	0.0000	120.8635	248.3871	398.5307 (98a)
Space heating requirement - total per year (kWh/year)												1891.4289
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	434.7513	287.3334	225.7051	122.6030	53.2548	0.0000	0.0000	0.0000	0.0000	120.8635	248.3871	398.5307 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1891.4289
Space heating per m ²										(98c) / (4) =		24.6923 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												311.9829 (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	434.7513	287.3334	225.7051	122.6030	53.2548	0.0000	0.0000	0.0000	0.0000	120.8635	248.3871	398.5307 (98)
Space heating efficiency (main heating system 1)	311.9829	311.9829	311.9829	311.9829	311.9829	0.0000	0.0000	0.0000	0.0000	311.9829	311.9829	311.9829 (210)
Space heating fuel (main heating system)	139.3510	92.0991	72.3453	39.2980	17.0698	0.0000	0.0000	0.0000	0.0000	38.7404	79.6156	127.7412 (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

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Efficiency of water heater	296.7303	263.1669	281.0246	250.0301	244.4847	191.9821	189.4706	196.8326	198.8363	253.1574	266.0127	293.8330 (64)
(217)m	181.8015	181.8015	181.8015	181.8015	181.8015	181.8015	181.8015	181.8015	181.8015	181.8015	181.8015	181.8015 (216)
Fuel for water heating, kWh/month	163.2166	144.7551	154.5777	137.5292	134.4789	105.5998	104.2184	108.2679	109.3700	139.2494	146.3204	161.6230 (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	26.9197	21.5960	19.4448	14.2461	11.0041	8.9904	10.0383	13.0482	16.9483	22.2371	25.1167	27.6679 (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												606.2603 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												181.8015
Water heating fuel used												1609.2062 (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)												217.2575 (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												2432.7241 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	606.2603	26.0600	157.9914 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1609.2062	26.0600	419.3591 (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	217.2575	26.0600	56.6173 (250)
Additional standing charges			0.0000 (251)
Total energy cost			633.9679 (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	606.2603	0.1559	94.5042 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1609.2062	0.1416	227.9196 (264)
Space and water heating			322.4238 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	217.2575	0.1443	31.3570 (268)
Total CO2, kg/year			353.7807 (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	606.2603	1.5771	956.1038 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1609.2062	1.5238	2452.0537 (278)
Space and water heating			3408.1575 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	217.2575	1.5338	333.2368 (282)
Total Primary energy kWh/year			3741.3944 (286)

Predicted Energy Assessment



Zoar Chapel , Flat 8, South Street , Reading

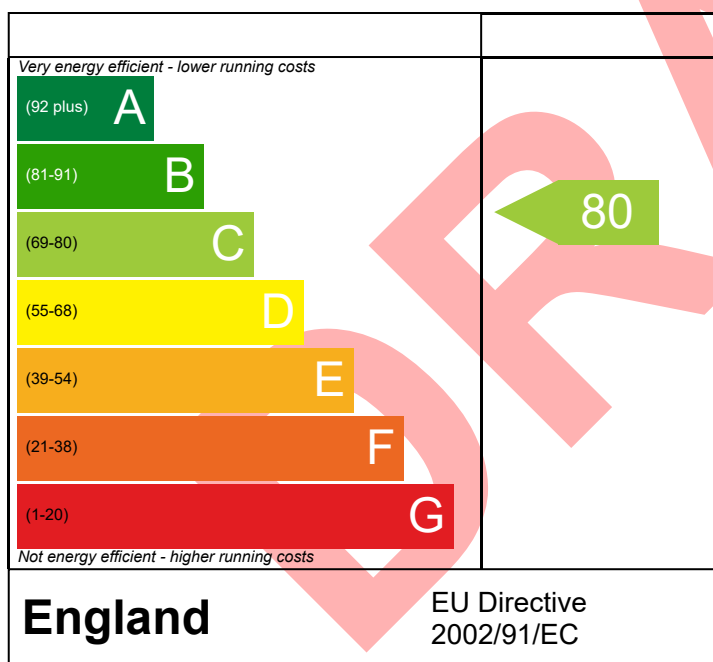
Dwelling type:
Date of assessment:
Produced by:
Total floor area:
DRRN:

Flat, Semi-Detached
03/07/2024
Matthew Carter
76.6 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.

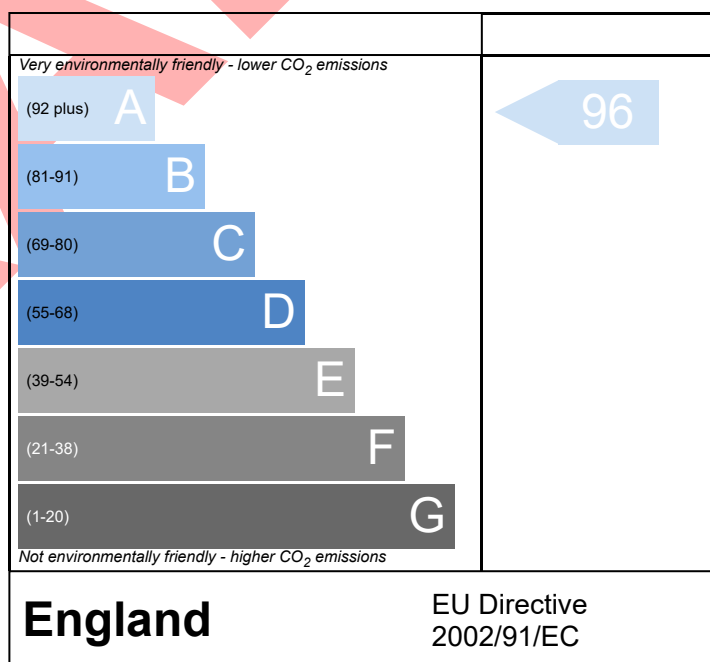
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.

Energy Efficiency Rating



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.

Environmental Impact (CO₂) Rating



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	01114	Issued on Date	03/07/2024
Assessment Reference	00001	Prop Type Ref	Semi-Detached Flat
Property	Zoar Chapel , Flat 8, South Street , Reading		

SAP Rating	80 C	DER	4.88	TER	12.40
Environmental	96 A	% DER < TER			60.65
CO ₂ Emissions (t/year)	0.35	DFEE	36.10	TFEE	35.82
Compliance Check	See BREL	% DFEE < TFEE			-0.78
% DPER < TPER	20.84	DPER	51.57	TPER	65.15

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	11.19	0.07	TD5
External wall	E3 Sill	Independently assessed	0.012	4.60	0.06	TD5
External wall	E4 Jamb	Independently assessed	0.023	25.83	0.59	TD5
External wall	E16 Corner (normal)	Independently assessed	0.075	9.70	0.73	TD5
External wall	E17 Corner (inverted – internal area greater than external area)	Independently assessed	-0.045	2.34	-0.11	TD5
External wall	E18 Party wall between dwellings	Table K1 - Default	0.240	11.70	2.81	
External wall	E7 Party floor between dwellings (in blocks of flats)	Independently assessed	0.022	27.00	0.59	TD5
External wall	E14 Flat roof	Table K1 - Default	0.160	27.45	4.39	

Total: 119.81 W/mK:
Y-Value: 0.06 W/m²K: