

Building Regulations England Part L (BREL) Compliance Report

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

Date: Wed 03 Jul 2024 11:34:20

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

Dwelling Details			
Assessment Type	As designed	Total Floor Area	49 m ²
Site Reference	01109	Plot Reference	00001
Address	Flat 3 Zoar Chapel South Street, Reading		

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

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate			
Fuel for main heating system	Electricity		
Target carbon dioxide emission rate	13.71 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	5.57 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	72.67 kWh _{PE} /m ²		
Dwelling primary energy	59.19 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	28.9 kWh/m ²		
Dwelling fabric energy efficiency	27.3 kWh/m ²		OK

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.18	Walls (1) (0.18)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	N/A	N/A	N/A
Roofs	0.16	N/A	N/A	N/A
Windows, doors, and roof windows	1.6	1.09	Opening (1.4)	OK
Rooflights	2.2	N/A	N/A	N/A

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))			
Name	Net area [m ²]	U-Value [W/m ² K]	
Exposed wall: Walls (1)	53.6624	0.18	
Sheltered wall: Walls (2)	5.54	0.16	
Party wall: Party Wall (1)	11.2	0 (!)	

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
Opening, Windows	2.1538	West	0.7	1 (!)
Opening, Windows	2.1538	West	0.7	1 (!)
Opening, Windows	1.89	East	0.7	1 (!)
Opening, Doo to Hall	1.8	South	N/A	1.4

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

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

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	
Air permeability test certificate reference		OK	

4 Space heating	
Main heating system 1: Heat pump with radiators or underfloor heating - Electricity	
Efficiency	311.0%
Emitter type	Underfloor
Flow temperature	35°C
System type	Heat Pump
Manufacturer	Vaillant Group UK Ltd
Model	aroTHERM 5kW
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

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

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

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

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

Summary for Input Data

Property Reference	01109	Issued on Date	03/07/2024
Assessment Reference	00001	Prop Type Ref	
Property	Zoar Chapel, Flat 3, South Street, Reading		

SAP Rating	81 B	DER	5.57	TER	13.71
Environmental	96 A	% DER < TER			59.37
CO ₂ Emissions (t/year)	0.26	DFEE	27.28	TFEE	28.91
Compliance Check	See BREL	% DFEE < TFEE			5.65
% DPER < TPER	18.55	DPER	59.19	TPER	72.67

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

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

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

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

8.0 Living Area	25.90	m ²
-----------------	-------	----------------

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

9.1 Party Walls	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)	Shelter Res	Shelter
	Party Wall 1	Filled Cavity with Edge Sealing	Steel frame	0.00	20.00	11.20	0.00	None

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

Summary for Input Data

10.1 Party Ceilings

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

11.1 Party Floors

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

12.0 Opening Types

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

13.0 Openings

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

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

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

Y-value W/m²K

18.0 Pressure Testing

Designed AP₅₀ m³/(h.m²) @ 50 Pa

Property Tested?

Test Method

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System

22.0 Lighting

No Fixed Lighting

Name	Efficacy	Power	Capacity	Count
Lighting 1	90.00	5	450	8

24.0 Main Heating 1

Percentage of Heat %

Database Ref. No.

Fuel Type

SAP Code

In Winter

In Summer

Model Name

Manufacturer

Summary for Input Data

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

26.0 Heat Networks

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

28.0 Water Heating

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

28.1 Showers

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

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder

Hot Water Cylinder	Hot Water Cylinder
Cylinder Stat	No
Cylinder In Heated Space	No
Independent Time Control	No

Summary for Input Data

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

31.0 Thermal Store

None

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout



Property Reference	01109	Issued on Date	03/07/2024
Assessment Reference	00001	Prop Type Ref	
Property	Zoar Chapel, Flat 3, South Street, Reading		
SAP Rating	81 B	DER	5.57
Environmental	96 A	% DER < TER	59.37
CO ₂ Emissions (t/year)	0.26	DFEE	27.28
Compliance Check	See BREL	% DFEE < TFEE	5.65
% DPER < TPER	18.55	DPER	59.19
Assessor Details	Mr. Matthew Carter	Assessor ID	7869-0001
Client			

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

1. Overall dwelling characteristics

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

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1666 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3666 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3116 (21)

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

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.00)			6.2000	0.9615	5.9615		(27)
Doo to Hall			1.8000	1.4000	2.5200		(26)
External Wall 1	59.8635	6.2000	53.6635	0.1800	9.6594	14.0000	751.2890 (29a)
Wall to Stairs	7.3400	1.8000	5.5400	0.1600	0.8864	14.0000	77.5600 (29a)
Total net area of external elements Aum(A, m ²)			67.2035				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	19.0274			(33)
Party Wall 1			11.2000	0.0000	0.0000	20.0000	224.0000 (32)
Party Floor 1			49.0000			40.0000	1960.0000 (32d)
Party Ceiling 1			49.0000			30.0000	1470.0000 (32b)
Internal Wall 1			46.1500			9.0000	415.3500 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =	4898.1990 (34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							99.9632 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				3.9200	0.0060	0.0235	
E3 Sill				0.9000	0.0120	0.0108	
E4 Jamb				6.2000	0.0230	0.1426	
E7 Party floor between dwellings (in blocks of flats)				27.4300	0.0210	0.5760	
E16 Corner (normal)				7.3500	0.0750	0.5512	

elmhurst
energy

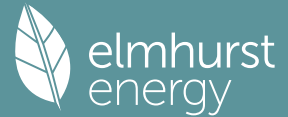
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												1.6607 (42)
Hot water usage for mixer showers	52.0640	51.2816	50.1414	47.9600	46.3501	44.5548	43.5344	44.6659	45.9062	47.8338	50.0621	51.8645 (42a)
Hot water usage for baths	22.5124	22.1781	21.7073	20.8392	20.1891	19.4684	19.0790	19.5466	20.0556	20.8269	21.7129	22.4363 (42b)
Hot water usage for other uses	31.6372	30.4868	29.3364	28.1859	27.0355	25.8850	25.8850	27.0355	28.1859	29.3364	30.4868	31.6372 (42c)
Average daily hot water use (litres/day)												97.6350 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	106.2137	103.9465	101.1851	96.9850	93.5747	89.9082	88.4984	91.2479	94.1477	97.9970	102.2618	105.9381 (44)
Energy content (annual)	168.2165	148.0184	155.5177	132.7677	125.9695	110.5526	107.0312	112.9839	116.0936	132.9811	145.6907	165.8734 (45)
Distribution loss (46)m = 0.15 x (45)m												1621.6962
Water storage loss:	25.2325	22.2028	23.3276	19.9152	18.8954	16.5829	16.0547	16.9476	17.4140	19.9472	21.8536	24.8810 (46)
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4000 (48)
Temperature factor from Table 2b												0.7800 (49)
Enter (49) or (54) in (55)												1.0920 (55)
Total storage loss	33.8520	30.5760	33.8520	32.7600	33.8520	32.7600	33.8520	33.8520	32.7600	33.8520	32.7600	33.8520 (56)
If cylinder contains dedicated solar storage	33.8520	30.5760	33.8520	32.7600	33.8520	32.7600	33.8520	33.8520	32.7600	33.8520	32.7600	33.8520 (57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	256.9261	228.1432	244.2273	218.6157	214.6791	165.8246	164.1456	170.0983	171.3656	221.6907	231.5387	254.5830 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	256.9261	228.1432	244.2273	218.6157	214.6791	165.8246	164.1456	170.0983	171.3656	221.6907	231.5387	254.5830 (64)
12Total per year (kWh/year)												2541.8378 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												0.0000 (64a)
Heat gains from water heating, kWh/month	99.8181	88.8551	95.5957	86.6157	85.7710	54.7683	54.1978	56.1771	56.6107	88.1023	90.9125	99.0390 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.0290	88.6035	80.0290	82.6966	80.0290	82.6966	80.0290	80.0290	82.6966	80.0290	82.6966	80.0290 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	144.6370	146.1379	142.3557	134.3039	124.1400	114.5873	108.2055	106.7047	110.4868	118.5386	128.7025	138.2552 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281 (71)
Water heating gains (Table 5)	134.1641	132.2249	128.4888	120.2995	115.2835	76.0671	72.8465	75.5068	78.6260	118.4170	126.2674	133.1169 (72)
Total internal gains	406.7405	414.8768	398.7840	385.2105	367.3630	321.2615	308.9915	310.1510	319.7199	364.8951	385.5771	399.3116 (73)

[Jan]				Area	Solar flux	g		FF		Access	Gains	
				m2	Table 6a	or Table 6b		Specific data or Table 6c		factor	W	
					W/m2					Table 6d		
East				1.8900	19.6403	0.6300		0.7000		0.7700	11.3444 (76)	
West				4.3100	19.6403	0.6300		0.7000		0.7700	25.8700 (80)	
Solar gains	37.2144	72.7992	119.8900	174.8524	214.2881	219.3620	208.8416	179.3918	139.4370	86.3824	46.4020	30.6033 (83)
Total gains	443.9549	487.6760	518.6740	560.0629	581.6511	540.6236	517.8331	489.5428	459.1569	451.2776	431.9790	429.9149 (84)

Page 2 of 7

Full SAP Calculation Printout



Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	30.3640	30.4465	30.5278	30.9155	30.9892	31.3366	31.3366	31.4019	31.2019	30.9892	30.8406	30.6867
alpha	3.0243	3.0298	3.0352	3.0610	3.0659	3.0891	3.0891	3.0935	3.0801	3.0659	3.0560	3.0458
util living area	0.9045	0.8747	0.8279	0.7344	0.6093	0.4798	0.3580	0.3918	0.5805	0.7585	0.8664	0.9111 (86)
Living	19.7196	19.9019	20.1602	20.4851	20.7152	20.8370	20.8812	20.8748	20.7824	20.5084	20.0828	19.6941
Non living	18.6560	18.8831	19.2023	19.5995	19.8638	20.0004	20.0400	20.0370	19.9466	19.6367	19.1194	18.6307
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.3450	19.9019	20.1602	20.4851	20.7152	20.8370	20.8812	20.8748	20.7824	20.5084	20.0828	19.8768 (87)
Th 2	20.1552	20.1573	20.1594	20.1691	20.1709	20.1793	20.1793	20.1809	20.1761	20.1709	20.1672	20.1634 (88)
util rest of house												
	0.8934	0.8608	0.8088	0.7062	0.5696	0.4266	0.2950	0.3270	0.5268	0.7265	0.8496	0.9008 (89)
MIT 2	19.5575	18.8831	19.2023	19.5995	19.8638	20.0004	20.0400	20.0370	19.9466	19.6367	19.1194	18.9069 (90)
Living area fraction									fLA = Living area / (4) =			0.5286 (91)
MIT	19.9737	19.4216	19.7086	20.0676	20.3138	20.4426	20.4846	20.4798	20.3884	20.0974	19.6287	19.4196 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9737	19.4216	19.7086	20.0676	20.3138	20.4426	20.4846	20.4798	20.3884	20.0974	19.6287	19.4196 (93)

8. Space heating requirement												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8909	0.8471	0.7976	0.7026	0.5767	0.4440	0.3188	0.3511	0.5412	0.7235	0.8373	0.8904 (94)
Useful gains	395.5125	413.0939	413.6869	393.4758	335.4181	240.0585	165.0735	171.8640	248.5026	326.5015	361.6818	382.7907 (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	702.3405	648.9496	588.7024	491.4921	378.1990	253.6799	168.6662	176.7750	274.2160	416.9942	552.7347	674.8165 (97)
Space heating kWh	228.2800	158.4950	130.2115	70.5718	31.8290	0.0000	0.0000	0.0000	0.0000	67.3266	137.5581	217.2673 (98a)
Space heating requirement - total per year (kWh/year)												1041.5392
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	228.2800	158.4950	130.2115	70.5718	31.8290	0.0000	0.0000	0.0000	0.0000	67.3266	137.5581	217.2673 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1041.5392
Space heating per m2										(98c) / (4) =		21.2559 (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 %)												310.9707 (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	228.2800	158.4950	130.2115	70.5718	31.8290	0.0000	0.0000	0.0000	0.0000	67.3266	137.5581	217.2673 (98)
Space heating efficiency (main heating system 1)	310.9707	310.9707	310.9707	310.9707	310.9707	0.0000	0.0000	0.0000	0.0000	310.9707	310.9707	310.9707 (210)
Space heating fuel (main heating system)	73.4088	50.9678	41.8726	22.6940	10.2354	0.0000	0.0000	0.0000	0.0000	21.6505	44.2351	69.8674 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	256.9261	228.1432	244.2273	218.6157	214.6791	165.8246	164.1456	170.0983	171.3656	221.6907	231.5387	254.5830 (64)
Efficiency of water heater (217)m	180.5920	180.5920	180.5920	180.5920	180.5920	180.5920	180.5920	180.5920	180.5920	180.5920	180.5920	180.5920 (216)
Fuel for water heating, kWh/month	142.2688	126.3307	135.2370	121.0550	118.8752	91.8228	90.8930	94.1893	94.8910	122.7578	128.2109	140.9714 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	18.3887	14.7521	13.2826	9.7314	7.5168	6.1413	6.8571	8.9131	11.5773	15.1900	17.1571	18.8998 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												334.9316 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												180.5920
Water heating fuel used												1407.5031 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												148.4076 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)

Full SAP Calculation Printout



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	1890.8423 (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	334.9316	0.1557	52.1357 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1407.5031	0.1416	199.3634 (264)
Space and water heating			251.4991 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	148.4076	0.1443	21.4198 (268)
Total CO2, kg/year			272.9189 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.5700 (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	334.9316	1.5763	527.9386 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1407.5031	1.5238	2144.7537 (278)
Space and water heating			2672.6923 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	148.4076	1.5338	227.6325 (282)
Total Primary energy kWh/year			2900.3248 (286)
Dwelling Primary energy Rate (DPER)			59.1900 (287)

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

1. Overall dwelling characteristics

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

2. Ventilation rate

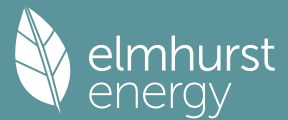
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number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

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

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			1.8000	1.0000	1.8000		(26)
TER Opening Type (Uw = 1.20)			6.2000	1.1450	7.0992		(27)
External Wall 1	59.8635	6.2000	53.6635	0.1800	9.6594		(29a)
Wall to Stairs	7.3400	1.8000	5.5400	0.1800	0.9972		(29a)

Full SAP Calculation Printout



Total net area of external elements Aum(A, m2)	67.2035		(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	19.5559	(33)
Party Wall 1	11.2000	0.0000	0.0000 (32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 109.9632 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	3.9200	0.0500	0.1960
E2 Other lintels (including other steel lintels)	0.9000	0.0500	0.0450
E3 Sill	6.2000	0.0500	0.3100
E4 Jamb	27.4300	0.0700	1.9201
E7 Party floor between dwellings (in blocks of flats)	7.3500	0.0900	0.6615
E16 Corner (normal)	4.9000	-0.0900	-0.4410
E17 Corner (inverted - internal area greater than external area)	4.5700	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.3500	0.0600	0.4410
E18 Party wall between dwellings			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			3.1326 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	22.6885 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.8460	23.6892	23.5355	22.8136	22.6786	22.0499	22.0499	21.9335	22.2921	22.6786	22.9518	23.2374	(38)
Heat transfer coeff	46.5344	46.3777	46.2240	45.5021	45.3671	44.7383	44.7383	44.6219	44.9805	45.3671	45.6403	45.9259	(39)
Average = Sum(39)m / 12 =												45.5015	
HLP	0.9497	0.9465	0.9433	0.9286	0.9259	0.9130	0.9130	0.9107	0.9180	0.9259	0.9314	0.9373	(40)
HLP (average)												0.9286	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

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

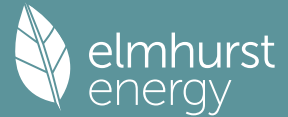
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.0290	88.6035	80.0290	82.6966	80.0290	82.6966	80.0290	80.0290	82.6966	80.0290	82.6966	80.0290	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	144.6370	146.1379	142.3557	134.3039	124.1400	114.5873	108.2055	106.7047	110.4868	118.5386	128.7025	138.2552	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	(71)
Water heating gains (Table 5)	128.1265	126.1874	122.4513	114.2620	109.2460	104.0029	100.7822	103.4426	106.5618	112.3795	120.2299	127.0794	(72)
Total internal gains	403.7030	411.8392	395.7464	382.1730	364.3254	349.1973	336.9273	338.0867	347.6557	361.8576	382.5395	396.2741	(73)

6. Solar gains

[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
-------	------------	--------------------------------	-----------------------------------	------------------------------------	------------------------------	------------

Full SAP Calculation Printout



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

Solar gains	37.2144	72.7992	119.8900	174.8524	214.2881	219.3620	208.8416	179.3918	139.4370	86.3824	46.4020	30.6033 (83)
Total gains	440.9173	484.6385	515.6364	557.0253	578.6136	568.5594	545.7689	517.4786	487.0927	448.2400	428.9415	426.8774 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	32.1637	32.2725	32.3798	32.8935	32.9914	33.4550	33.4550	33.5423	33.2749	32.9914	32.7939	32.5899	
alpha	3.1442	3.1515	3.1587	3.1929	3.1994	3.2303	3.2303	3.2362	3.2183	3.1994	3.1863	3.1727	
util living area	0.9195	0.8922	0.8483	0.7570	0.6313	0.4748	0.3520	0.3844	0.5735	0.7810	0.8845	0.9254 (86)	
MIT	19.4383	19.6781	20.0195	20.4545	20.7601	20.9302	20.9799	20.9730	20.8681	20.4842	19.9217	19.4111 (87)	
Th 2	20.1255	20.1282	20.1308	20.1432	20.1456	20.1564	20.1564	20.1585	20.1523	20.1456	20.1409	20.1359 (88)	
util rest of house	0.9092	0.8789	0.8295	0.7282	0.5895	0.4197	0.2877	0.3183	0.5174	0.7486	0.8682	0.9158 (89)	
MIT 2	18.3164	18.6152	19.0374	19.5676	19.9169	20.1020	20.1449	20.1422	20.0421	19.6155	18.9320	18.2898 (90)	
Living area fraction									fLA = Living area / (4) =				0.5286 (91)
MIT	18.9094	19.1770	19.5565	20.0364	20.3626	20.5398	20.5862	20.5813	20.4787	20.0747	19.4551	18.8825 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.9094	19.1770	19.5565	20.0364	20.3626	20.5398	20.5862	20.5813	20.4787	20.0747	19.4551	18.8825 (93)	

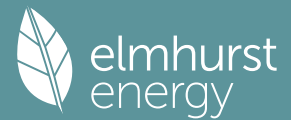
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8920	0.8619	0.8156	0.7243	0.6005	0.4452	0.3208	0.3519	0.5397	0.7457	0.8532	0.8990 (94)	
Useful gains	393.2875	417.7335	420.5392	403.4611	347.4542	253.1012	175.0711	182.1242	262.8704	334.2371	365.9634	383.7525 (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	679.8405	662.1336	603.5231	506.7292	392.9952	265.7355	178.3375	186.5783	286.9187	429.8379	563.8922	674.3062 (97)	
Space heating kWh	213.1955	164.2369	136.1400	74.3530	33.8825	0.0000	0.0000	0.0000	0.0000	71.1270	142.5088	216.1720 (98a)	
Space heating requirement - total per year (kWh/year)												1051.6156	
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	213.1955	164.2369	136.1400	74.3530	33.8825	0.0000	0.0000	0.0000	0.0000	71.1270	142.5088	216.1720 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1051.6156	
Space heating per m2										(98c) / (4) =		21.4615 (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	213.1955	164.2369	136.1400	74.3530	33.8825	0.0000	0.0000	0.0000	0.0000	71.1270	142.5088	216.1720 (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)	230.9810	177.9381	147.4973	80.5558	36.7091	0.0000	0.0000	0.0000	0.0000	77.0607	154.3974	234.2058 (211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)	
Water heating													
Water heating requirement	193.6577	171.4454	182.7177	162.1697	158.2019	143.6509	142.6300	147.7178	148.6877	164.4696	173.2316	191.7554 (64)	
Efficiency of water heater (217)m	84.2758	83.9635	83.4094	82.4262	81.2526	79.8000	79.8000	79.8000	79.8000	82.3188	83.6254	79.8000 (216)	
Fuel for water heating, kWh/month	229.7903	204.1903	219.0614	196.7455	194.7038	180.0137	178.7344	185.1100	186.3255	199.7959	207.1518	227.3890 (219)	
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)	
Lighting	16.6284	13.3399	12.0111	8.7999	6.7973	5.5534	6.2007	8.0599	10.4690	13.7359	15.5147	17.0906 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-16.9067	-24.7279	-36.8671	-43.0624	-47.8618	-45.2293	-44.7162	-41.5339	-36.1202	-29.0308	-18.9160	-14.5174 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.0085	-14.9791	-30.2039	-45.9874	-61.3975	-61.8738	-61.1056	-51.4318	-37.3240	-21.5809	-9.4118	-5.5217 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1												1139.3452 (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												2409.0115 (219)	
Space cooling fuel												0.0000 (221)	

Full SAP Calculation Printout



Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	134.2010 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-807.3159 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	2961.2418 (238)

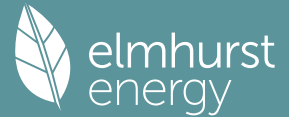
----- 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP -----

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1139.3452	0.2100	239.2625 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2409.0115	0.2100	505.8924 (264)
Space and water heating			745.1549 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	134.2010	0.1443	19.3694 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-399.4898	0.1338	-53.4489
PV Unit electricity exported	-407.8261	0.1255	-51.1874
Total			-104.6363 (269)
Total CO2, kg/year			671.8172 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.7100 (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	1139.3452	1.1300	1287.4601 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2409.0115	1.1300	2722.1831 (278)
Space and water heating			4009.6431 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	134.2010	1.5338	205.8420 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-399.4898	1.4944	-597.0100
PV Unit electricity exported	-407.8261	0.4607	-187.8861
Total			-784.8962 (283)
Total Primary energy kWh/year			3560.6897 (286)
Target Primary Energy Rate (TPER)			72.6700 (287)

Full SAP Calculation Printout



Property Reference	01109				Issued on Date	03/07/2024	
Assessment Reference	00001			Prop Type Ref			
Property	Zoar Chapel, Flat 3, South Street, Reading						
SAP Rating	81 B	DER	5.57	TER	13.71		
Environmental	96 A	% DER < TER				59.37	
CO ₂ Emissions (t/year)	0.26	DFEE	27.28	TFEE	28.91		
Compliance Check	See BREL	% DFEE < TFEE				5.65	
% DPER < TPER	18.55	DPER	59.19	TPER	72.67		
Assessor Details	Mr. Matthew Carter				Assessor ID	7869-0001	
Client							

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

1. Overall dwelling characteristics

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

2. Ventilation rate

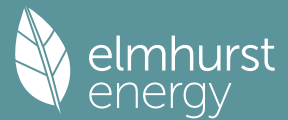
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1666 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3666 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3116 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3973	0.3895	0.3817	0.3428	0.3350	0.2960	0.2960	0.2882	0.3116	0.3350	0.3506	0.3661 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5789	0.5759	0.5729	0.5587	0.5561	0.5438	0.5438	0.5415	0.5485	0.5561	0.5614	0.5670 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.00)			6.2000	0.9615	5.9615		(27)
Doo to Hall			1.8000	1.4000	2.5200		(26)
External Wall 1	59.8635	6.2000	53.6635	0.1800	9.6594	14.0000	751.2890 (29a)
Wall to Stairs	7.3400	1.8000	5.5400	0.1600	0.8864	14.0000	77.5600 (29a)
Total net area of external elements Aum(A, m ²)			67.2035				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.0274		(33)
Party Wall 1			11.2000	0.0000	0.0000	20.0000	224.0000 (32)
Party Floor 1			49.0000			40.0000	1960.0000 (32d)
Party Ceiling 1			49.0000			40.0000	1960.0000 (32b)
Internal Wall 1			46.1500			9.0000	415.3500 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	5388.1990 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							109.9632 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				3.9200	0.0060	0.0235	
E3 Sill				0.9000	0.0120	0.0108	
E4 Jamb				6.2000	0.0230	0.1426	

Full SAP Calculation Printout



E7 Party floor between dwellings (in blocks of flats)	27.4300	0.0210	0.5760										
E16 Corner (normal)	7.3500	0.0750	0.5512										
E17 Corner (inverted - internal area greater than external area)	4.9000	-0.0450	-0.2205										
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	4.5700	0.0000	0.0000										
E18 Party wall between dwellings	7.3500	0.2400	1.7640										
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				2.8477 (36)									
Point Thermal Bridges			(36a) =	0.0000									
Total fabric heat loss		(33) + (36) + (36a) =		21.8751 (37)									
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	22.9349	22.8135	22.6945	22.1355	22.0309	21.5441	21.5441	21.4539	21.7316	22.0309	22.2425	22.4637	(38)
Average = Sum(39)m / 12 =	44.8100	44.6886	44.5696	44.0106	43.9060	43.4192	43.4192	43.3290	43.6067	43.9060	44.1176	44.3388	(39)
												44.0101	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9145	0.9120	0.9096	0.8982	0.8960	0.8861	0.8861	0.8843	0.8899	0.8960	0.9004	0.9049	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
												0.8982	
												31	

4. Water heating energy requirements (kWh/year)													

Assumed occupancy													1.6607 (42)
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	22.5124	22.1781	21.7073	20.8392	20.1891	19.4684	19.0790	19.5466	20.0556	20.8269	21.7129	22.4363	(42b)
Hot water usage for other uses													
	31.6372	30.4868	29.3364	28.1859	27.0355	25.8850	25.8850	27.0355	28.1859	29.3364	30.4868	31.6372	(42c)
Average daily hot water use (litres/day)												49.6337	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	54.1497	52.6649	51.0436	49.0251	47.2246	45.3534	44.9640	46.5820	48.2415	50.1632	52.1997	54.0736	(44)
Energy conte	85.7599	74.9941	78.4522	67.1129	63.5734	55.7673	54.3801	57.6783	59.4866	68.0710	74.3680	84.6662	(45)
Energy content (annual)										Total = Sum(45)m =		824.3098	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	72.8959	63.7450	66.6843	57.0459	54.0374	47.4022	46.2231	49.0265	50.5636	57.8604	63.2128	71.9662	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	72.8959	63.7450	66.6843	57.0459	54.0374	47.4022	46.2231	49.0265	50.5636	57.8604	63.2128	71.9662	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		700.6633	(64)
Electric shower(s)												701	(64)
	41.6946	37.1502	40.5666	38.7122	39.4386	37.6206	38.8746	39.4386	38.7122	40.5666	39.8038	41.6946	(64a)
												474.2733	(64a)
Heat gains from water heating, kWh/month													
	28.6476	25.2238	26.8127	23.9395	23.3690	21.2557	21.2744	22.1163	22.3190	24.6067	25.7541	28.4152	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	80.0290	88.6035	80.0290	82.6966	80.0290	82.6966	80.0290	80.0290	82.6966	80.0290	82.6966	80.0290	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	144.6370	146.1379	142.3557	134.3039	124.1400	114.5873	108.2055	106.7047	110.4868	118.5386	128.7025	138.2552	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	(71)
Water heating gains (Table 5)													
	38.5049	37.5354	36.0386	33.2494	31.4099	29.5218	28.5947	29.7262	30.9986	33.0736	35.7696	38.1925	(72)
Total internal gains													
	311.0813	320.1873	306.3338	298.1604	283.4894	274.7162	264.7397	264.3703	272.0925	279.5517	295.0793	304.3872	(73)

6. Solar gains													

[Jan]			Area		Solar flux		g		FF		Access		Gains
			m2		Table 6a		Specific data		Specific data		factor		W
					W/m2		or Table 6b		or Table 6c		Table 6d		
East			1.8900		19.6403		0.6300		0.7000		0.7700		11.3444 (76)
West			4.3100		19.6403		0.6300		0.7000		0.7700		25.8700 (80)
Solar gains	37.2144	72.7992	119.8900	174.8524	214.2881	219.3620	208.8416	179.3918	139.4370	86.3824	46.4020	30.6033	(83)
Total gains	348.2957	392.9865	426.2237	473.0127	497.7775	494.0782	473.5813	443.7622	411.5295	365.9341	341.4813	334.9905	(84)

7. Mean internal temperature (heating season)													

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

Full SAP Calculation Printout



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	33.4015	33.4923	33.5817	34.0082	34.0892	34.4715	34.4715	34.5432	34.3232	34.0892	33.9257	33.7565
alpha	3.2268	3.2328	3.2388	3.2672	3.2726	3.2981	3.2981	3.3029	3.2882	3.2726	3.2617	3.2504
util living area	0.9528	0.9304	0.8933	0.8088	0.6853	0.5222	0.3911	0.4310	0.6361	0.8427	0.9284	0.9576 (86)
MIT	19.2284	19.4934	19.8686	20.3585	20.7123	20.9145	20.9750	20.9653	20.8322	20.3652	19.7337	19.1898 (87)
Th 2	20.1552	20.1573	20.1594	20.1691	20.1709	20.1793	20.1793	20.1809	20.1761	20.1709	20.1672	20.1634 (88)
util rest of house	0.9463	0.9210	0.8787	0.7835	0.6450	0.4653	0.3225	0.3604	0.5803	0.8159	0.9172	0.9517 (89)
MIT 2	18.5349	18.7953	19.1611	19.6326	19.9531	20.1263	20.1679	20.1641	20.0639	19.6500	19.0416	18.5030 (90)
Living area fraction	18.9015	19.1643	19.5351	20.0163	20.3543	20.5429	20.5945	20.5876	FLA = Living area / (4) =	20.0280	19.4075	0.5286 (91)
MIT	18.9015	19.1643	19.5351	20.0163	20.3543	20.5429	20.5945	20.5876	20.4700	20.0280	19.4075	18.8660 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9015	19.1643	19.5351	20.0163	20.3543	20.5429	20.5945	20.5876	20.4700	20.0280	19.4075	18.8660 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9343	0.9078	0.8664	0.7784	0.6543	0.4911	0.3577	0.3960	0.6010	0.8108	0.9051	0.9403 (94)
Useful gains	325.4051	356.7585	369.2668	368.1910	325.6960	242.6224	169.3806	175.7316	247.3452	296.6929	309.0719	314.9911 (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	654.2932	637.4521	580.9669	489.2345	379.9780	258.0360	173.4366	181.4454	277.7751	413.9465	542.9754	650.2728 (97)
Space heating kWh	244.6927	188.6261	157.5049	87.1513	40.3857	0.0000	0.0000	0.0000	0.0000	87.2367	168.4105	249.4496 (98a)
Space heating requirement - total per year (kWh/year)												1223.4577
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	244.6927	188.6261	157.5049	87.1513	40.3857	0.0000	0.0000	0.0000	0.0000	87.2367	168.4105	249.4496 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1223.4577
Space heating per m2										(98c) / (4) =		24.9685 (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	408.1401	321.3018	329.3004	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8634	0.9113	0.8915	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	352.3785	292.7882	293.5566	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	543.7860	521.6011	488.3394	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	137.8134	170.2368	144.9184	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	34.4534	42.5592	36.2296	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												113.2422 (107)
Energy for space heating												24.9685 (99)
Energy for space cooling												2.3111 (108)
Total												27.2796 (109)
Fabric Energy Efficiency (DFEE)												27.3 (109)

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

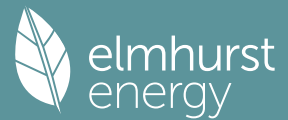
1. Overall dwelling characteristics

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

2. Ventilation rate

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

Full SAP Calculation Printout



Number of sides sheltered

2 (19)

Shelter factor

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

Infiltration rate adjusted to include shelter factor

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

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

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.8000	1.0000	1.8000			(26)
TER Opening Type (Uw = 1.20)			6.2000	1.1450	7.0992			(27)
External Wall 1	59.8635	6.2000	53.6635	0.1800	9.6594			(29a)
Wall to Stairs	7.3400	1.8000	5.5400	0.1800	0.9972			(29a)
Total net area of external elements Aum(A, m2)			67.2035					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	19.5559		(33)
Party Wall 1			11.2000	0.0000	0.0000			(32)

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

109.9632 (35)

List of Thermal Bridges

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

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

3.1326 (36)

Point Thermal bridges

$$(36a) = 0.0000$$

Total fabric heat loss

$$(33) + (36) + (36a) = 22.6885 \quad (37)$$

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.8460	23.6892	23.5355	22.8136	22.6786	22.0499	22.0499	21.9335	22.2921	22.6786	22.9518	23.2374	(38)
Heat transfer coeff	46.5344	46.3777	46.2240	45.5021	45.3671	44.7383	44.7383	44.6219	44.9805	45.3671	45.6403	45.9259	(39)
Average = Sum(39)m / 12 =												45.5015	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9497	0.9465	0.9433	0.9286	0.9259	0.9130	0.9130	0.9107	0.9180	0.9259	0.9314	0.9373	(40)
HLP (average)												0.9286	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

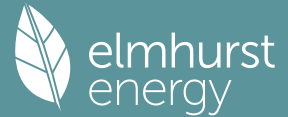
4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6607 (42)
Hot water usage for mixer showers													(42a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Hot water usage for baths	22.5124	22.1781	21.7073	20.8392	20.1891	19.4684	19.0790	19.5466	20.0556	20.8269	21.7129	22.4363	(42b)
Hot water usage for other uses	31.6372	30.4868	29.3364	28.1859	27.0355	25.8850	25.8850	27.0355	28.1859	29.3364	30.4868	31.6372	(42c)
Average daily hot water use (litres/day)												49.6337	(43)
Daily hot water use	54.1497	52.6649	51.0436	49.0251	47.2246	45.3534	44.9640	46.5820	48.2415	50.1632	52.1997	54.0736	(44)
Energy conte	85.7599	74.9941	78.4522	67.1129	63.5734	55.7673	54.3801	57.6783	59.4866	68.0710	74.3680	84.6662	(45)
Energy content (annual)										Total = Sum(45)m =		824.3098	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	72.8959	63.7450	66.6843	57.0459	54.0374	47.4022	46.2231	49.0265	50.5636	57.8604	63.2128	71.9662	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	72.8959	63.7450	66.6843	57.0459	54.0374	47.4022	46.2231	49.0265	50.5636	57.8604	63.2128	71.9662	(64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				700.6633	(64)
Electric shower(s)	41.6946	37.1502	40.5666	38.7122	39.4386	37.6206	38.8746	39.4386	38.7122	40.5666	39.8038	41.6946	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												474.2733	(64a)
Heat gains from water heating, kWh/month	28.6476	25.2238	26.8127	23.9395	23.3690	21.2557	21.2744	22.1163	22.3190	24.6067	25.7541	28.4152	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													

Full SAP Calculation Printout



Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	80.0290	88.6035	80.0290	82.6966	80.0290	82.6966	80.0290	80.0290	82.6966	80.0290	82.6966	80.0290 (67)
144.6370	146.1379	142.3557	134.3039	124.1400	114.5873	108.2055	106.7047	110.4868	118.5386	128.7025	138.2552	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	(71)
Water heating gains (Table 5)	38.5049	37.5354	36.0386	33.2494	31.4099	29.5218	28.5947	29.7262	30.9986	33.0736	35.7696	(72)
Total internal gains	311.0813	320.1873	306.3338	298.1604	283.4894	274.7162	264.7397	264.3703	272.0925	279.5517	295.0793	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
East				1.8900	19.6403	0.6300	0.7000			0.7700			11.3444 (76)
West				4.3100	19.6403	0.6300	0.7000			0.7700			25.8700 (80)
Solar gains	37.2144	72.7992	119.8900	174.8524	214.2881	219.3620	208.8416	179.3918	139.4370	86.3824	46.4020	30.6033 (83)	
Total gains	348.2957	392.9865	426.2237	473.0127	497.7775	494.0782	473.5813	443.7622	411.5295	365.9341	341.4813	334.9905 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	32.1637	32.2725	32.3798	32.8935	32.9914	33.4550	33.4550	33.5423	33.2749	32.9914	32.7939	32.5899
alpha	3.1442	3.1515	3.1587	3.1929	3.1994	3.2303	3.2303	3.2362	3.2183	3.1994	3.1863	3.1727
util living area	0.9541	0.9327	0.8972	0.8158	0.6956	0.5331	0.4011	0.4412	0.6467	0.8483	0.9306	0.9586 (86)
MIT	19.1311	19.4010	19.7880	20.3029	20.6794	20.9023	20.9706	20.9597	20.8121	20.3162	19.6613	19.0993 (87)
Th 2	20.1255	20.1282	20.1308	20.1432	20.1456	20.1564	20.1564	20.1585	20.1523	20.1456	20.1409	20.1359 (88)
util rest of house	0.9476	0.9233	0.8828	0.7905	0.6547	0.4744	0.3293	0.3677	0.5897	0.8216	0.9196	0.9528 (89)
MIT 2	18.4181	18.6838	19.0621	19.5604	19.9029	20.0960	20.1430	20.1391	20.0267	19.5847	18.9519	18.3944 (90)
Living area fraction	fLA = Living area / (4) = 0.5286 (91)											
MIT	18.7950	19.0629	19.4458	19.9529	20.3133	20.5222	20.5804	20.5728	20.4419	19.9713	19.3269	18.7670 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.7950	19.0629	19.4458	19.9529	20.3133	20.5222	20.5804	20.5728	20.4419	19.9713	19.3269	18.7670 (93)

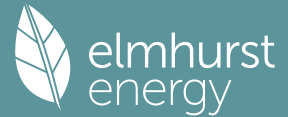
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9353	0.9097	0.8697	0.7843	0.6631	0.5005	0.3659	0.4046	0.6101	0.8156	0.9069	0.9411	(94)
Useful gains	325.7561	357.5023	370.6858	370.9866	330.0775	247.2688	173.2859	179.5282	251.0623	298.4408	309.7035	315.2550	(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	674.5149	656.8418	598.4059	502.9288	390.7617	264.9492	178.0786	186.1999	285.2601	425.1498	558.0368	669.0018	(97)
Space heating kWh	259.4765	201.1561	169.4238	94.9984	45.1490	0.0000	0.0000	0.0000	0.0000	94.2715	178.8000	263.1876	(98a)
Space heating requirement - total per year (kWh/year)												1306.4629	
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	259.4765	201.1561	169.4238	94.9984	45.1490	0.0000	0.0000	0.0000	0.0000	94.2715	178.8000	263.1876	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1306.4629	
Space heating per m2										(98c) / (4) =		26.6625	(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	420.5405	331.0638	339.1266	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8509	0.9015	0.8806	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	357.8563	298.4485	298.6497	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	543.7860	521.6011	488.3394	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	133.8694	166.0255	141.1291	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	33.4673	41.5064	35.2823	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												110.2560 (107)
Energy for space heating												26.6625 (99)
Energy for space cooling												2.2501 (108)
Total												28.9126 (109)
Fabric Energy Efficiency (TFEE)												28.9 (109)

Full SAP Calculation Printout



Property Reference	01109				Issued on Date	03/07/2024	
Assessment Reference	00001			Prop Type Ref			
Property	Zoar Chapel, Flat 3, South Street, Reading						
SAP Rating	81 B	DER	5.57	TER	13.71		
Environmental	96 A	% DER < TER				59.37	
CO ₂ Emissions (t/year)	0.26	DFEE	27.28	TFEE	28.91		
Compliance Check	See BREL	% DFEE < TFEE				5.65	
% DPER < TPER	18.55	DPER	59.19	TPER	72.67		
Assessor Details	Mr. Matthew Carter				Assessor ID	7869-0001	
Client							

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

1. Overall dwelling characteristics

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

2. Ventilation rate

		m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1666	(8)
Pressure test	Yes		
Pressure Test Method	Blower Door		
Measured/design AP50	4.0000		(17)
Infiltration rate	0.3666		(18)
Number of sides sheltered	2		(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3116	(21)

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

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.00)			6.2000	0.9615	5.9615		(27)
Doo to Hall			1.8000	1.4000	2.5200		(26)
External Wall 1	59.8635	6.2000	53.6635	0.1800	9.6594	14.0000	751.2890 (29a)
Wall to Stairs	7.3400	1.8000	5.5400	0.1600	0.8864	14.0000	77.5600 (29a)
Total net area of external elements Aum(A, m ²)			67.2035				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	19.0274			(33)
Party Wall 1			11.2000	0.0000	0.0000	20.0000	224.0000 (32)
Party Floor 1			49.0000			40.0000	1960.0000 (32d)
Party Ceiling 1			49.0000			30.0000	1470.0000 (32b)
Internal Wall 1			46.1500			9.0000	415.3500 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =	4898.1990	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K						99.9632	(35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				3.9200	0.0060	0.0235	
E3 Sill				0.9000	0.0120	0.0108	
E4 Jamb				6.2000	0.0230	0.1426	
E7 Party floor between dwellings (in blocks of flats)				27.4300	0.0210	0.5760	
E16 Corner (normal)				7.3500	0.0750	0.5512	

Full SAP Calculation Printout



E17 Corner (inverted - internal area greater than external area)	4.9000	-0.0450	-0.2205
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	4.5700	0.0000	0.0000
E18 Party wall between dwellings	7.3500	0.2400	1.7640
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			2.8477 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	21.8751 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	22.9349	22.8135	22.6945	22.1355	22.0309	21.5441	21.5441	21.4539	21.7316	22.0309	22.2425	22.4637
Heat transfer coeff	44.8100	44.6886	44.5696	44.0106	43.9060	43.4192	43.4192	43.3290	43.6067	43.9060	44.1176	44.3388
Average = Sum(39)m / 12 =												44.0101
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9145	0.9120	0.9096	0.8982	0.8960	0.8861	0.8861	0.8843	0.8899	0.8960	0.9004	0.9049
HLP (average)												0.8982
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6607 (42)
Hot water usage for mixer showers												
52.0640	51.2816	50.1414	47.9600	46.3501	44.5548	43.5344	44.6659	45.9062	47.8338	50.0621	51.8645	(42a)
Hot water usage for baths												
22.5124	22.1781	21.7073	20.8392	20.1891	19.4684	19.0790	19.5466	20.0556	20.8269	21.7129	22.4363	(42b)
Hot water usage for other uses												
31.6372	30.4868	29.3364	28.1859	27.0355	25.8850	25.8850	27.0355	28.1859	29.3364	30.4868	31.6372	(42c)
Average daily hot water use (litres/day)												97.6350 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	106.2137	103.9465	101.1851	96.9850	93.5747	89.9082	88.4984	91.2479	94.1477	97.9970	102.2618	105.9381
Energy conte	168.2165	148.0184	155.5177	132.7677	125.9695	110.5526	107.0312	112.9839	116.0936	132.9811	145.6907	165.8734
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m												1621.6962
25.2325	22.2028	23.3276	19.9152	18.8954	16.5829	16.0547	16.9476	17.4140	19.9472	21.8536	24.8810	(46)
Water storage loss:												180.0000 (47)
Store volume												1.4000 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.7800 (49)
Temperature factor from Table 2b												1.0920 (55)
Enter (49) or (54) in (55)												
Total storage loss												
33.8520	30.5760	33.8520	32.7600	33.8520	32.7600	33.8520	33.8520	32.7600	33.8520	32.7600	33.8520	(56)
If cylinder contains dedicated solar storage												
33.8520	30.5760	33.8520	32.7600	33.8520	32.7600	33.8520	33.8520	32.7600	33.8520	32.7600	33.8520	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month												
256.9261	228.1432	244.2273	218.6157	214.6791	165.8246	164.1456	170.0983	171.3656	221.6907	231.5387	254.5830	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
256.9261	228.1432	244.2273	218.6157	214.6791	165.8246	164.1456	170.0983	171.3656	221.6907	231.5387	254.5830	(64)
12Total per year (kWh/year)												2541.8378 (64)
Electric shower(s)												2542 (64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
99.8181	88.8551	95.5957	86.6157	85.7710	54.7683	54.1978	56.1771	56.6107	88.1023	90.9125	99.0390	(65)

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

Metabolic gains (Table 5), Watts												
(66)m	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
80.0290	88.6035	80.0290	82.6966	80.0290	82.6966	80.0290	82.6966	80.0290	82.6966	80.0290	82.6966	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
144.6370	146.1379	142.3557	134.3039	124.1400	114.5873	108.2055	106.7047	110.4868	118.5386	128.7025	138.2552	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	(71)
Water heating gains (Table 5)												
134.1641	132.2249	128.4888	120.2995	115.2835	76.0671	72.8465	75.5068	78.6260	118.4170	126.2674	133.1169	(72)
Total internal gains												
406.7405	414.8768	398.7840	385.2105	367.3630	321.2615	308.9915	310.1510	319.7199	364.8951	385.5771	399.3116	(73)

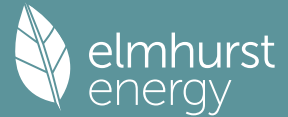
6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d			Gains W
East					1.8900	19.6403	0.6300	0.7000	0.7700			11.3444 (76)
West					4.3100	19.6403	0.6300	0.7000	0.7700			25.8700 (80)

Solar gains	37.2144	72.7992	119.8900	174.8524	214.2881	219.3620	208.8416	179.3918	139.4370	86.3824	46.4020	30.6033 (83)
Total gains	443.9549	487.6760	518.6740	560.0629	581.6511	540.6236	517.8331	489.5428	459.1569	451.2776	431.9790	429.9149 (84)

7. Mean internal temperature (heating season)

Full SAP Calculation Printout



Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.3640	30.4465	30.5278	30.9155	30.9892	31.3366	31.3366	31.4019	31.2019	30.9892	30.8406	30.6867	
alpha	3.0243	3.0298	3.0352	3.0610	3.0659	3.0891	3.0891	3.0935	3.0801	3.0659	3.0560	3.0458	
util living area	0.9045	0.8747	0.8279	0.7344	0.6093	0.4798	0.3580	0.3918	0.5805	0.7585	0.8664	0.9111 (86)	
Living	19.7196	19.9019	20.1602	20.4851	20.7152	20.8370	20.8812	20.8748	20.7824	20.5084	20.0828	19.6941	
Non living	18.6560	18.8831	19.2023	19.5995	19.8638	20.0004	20.0400	20.0370	19.9466	19.6367	19.1194	18.6307	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.3450	19.9019	20.1602	20.4851	20.7152	20.8370	20.8812	20.8748	20.7824	20.5084	20.0828	19.8768 (87)	
Th 2	20.1552	20.1573	20.1594	20.1691	20.1709	20.1793	20.1793	20.1809	20.1761	20.1709	20.1672	20.1634 (88)	
util rest of house													
	0.8934	0.8608	0.8088	0.7062	0.5696	0.4266	0.2950	0.3270	0.5268	0.7265	0.8496	0.9008 (89)	
MIT 2	19.5575	18.8831	19.2023	19.5995	19.8638	20.0004	20.0400	20.0370	19.9466	19.6367	19.1194	18.9069 (90)	
Living area fraction									fLA = Living area / (4) =				0.5286 (91)
MIT	19.9737	19.4216	19.7086	20.0676	20.3138	20.4426	20.4846	20.4798	20.3884	20.0974	19.6287	19.4196 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.9737	19.4216	19.7086	20.0676	20.3138	20.4426	20.4846	20.4798	20.3884	20.0974	19.6287	19.4196 (93)	

8. Space heating requirement													

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8909	0.8471	0.7976	0.7026	0.5767	0.4440	0.3188	0.3511	0.5412	0.7235	0.8373	0.8904 (94)	
Useful gains	395.5125	413.0939	413.6869	393.4758	335.4181	240.0585	165.0735	171.8640	248.5026	326.5015	361.6818	382.7907 (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	702.3405	648.9496	588.7024	491.4921	378.1990	253.6799	168.6662	176.7750	274.2160	416.9942	552.7347	674.8165 (97)	
Space heating kWh	228.2800	158.4950	130.2115	70.5718	31.8290	0.0000	0.0000	0.0000	0.0000	67.3266	137.5581	217.2673 (98a)	
Space heating requirement - total per year (kWh/year)												1041.5392	
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	228.2800	158.4950	130.2115	70.5718	31.8290	0.0000	0.0000	0.0000	0.0000	67.3266	137.5581	217.2673 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1041.5392	
Space heating per m2										(98c) / (4) =		21.2559 (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 %)												310.9707 (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	228.2800	158.4950	130.2115	70.5718	31.8290	0.0000	0.0000	0.0000	0.0000	67.3266	137.5581	217.2673 (98)	
Space heating efficiency (main heating system 1)	310.9707	310.9707	310.9707	310.9707	310.9707	0.0000	0.0000	0.0000	0.0000	310.9707	310.9707	310.9707 (210)	
Space heating fuel (main heating system)	73.4088	50.9678	41.8726	22.6940	10.2354	0.0000	0.0000	0.0000	0.0000	21.6505	44.2351	69.8674 (211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)	
Water heating													
Water heating requirement	256.9261	228.1432	244.2273	218.6157	214.6791	165.8246	164.1456	170.0983	171.3656	221.6907	231.5387	254.5830 (64)	
Efficiency of water heater (217)m	180.5920	180.5920	180.5920	180.5920	180.5920	180.5920	180.5920	180.5920	180.5920	180.5920	180.5920	180.5920 (216)	
Fuel for water heating, kWh/month	142.2688	126.3307	135.2370	121.0550	118.8752	91.8228	90.8930	94.1893	94.8910	122.7578	128.2109	140.9714 (219)	
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)	
Lighting	18.3887	14.7521	13.2826	9.7314	7.5168	6.1413	6.8571	8.9131	11.5773	15.1900	17.1571	18.8998 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1												334.9316 (211)	
Space heating fuel - main system 2												0.0000 (213)	
Space heating fuel - secondary												0.0000 (215)	
Efficiency of water heater												180.5920	
Water heating fuel used												1407.5031 (219)	
Space cooling fuel												0.0000 (221)	
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000 (231)	
Electricity for lighting (calculated in Appendix L)												148.4076 (232)	
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000 (233)	

Full SAP Calculation Printout



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	1890.8423 (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	334.9316	0.1557	52.1357 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1407.5031	0.1416	199.3634 (264)
Space and water heating			251.4991 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	148.4076	0.1443	21.4198 (268)
Total CO2, kg/year			272.9189 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.5700 (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	334.9316	1.5763	527.9386 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1407.5031	1.5238	2144.7537 (278)
Space and water heating			2672.6923 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	148.4076	1.5338	227.6325 (282)
Total Primary energy kWh/year			2900.3248 (286)
Dwelling Primary energy Rate (DPER)			59.1900 (287)

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

1. Overall dwelling characteristics

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

2. Ventilation rate

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

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

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			1.8000	1.0000	1.8000		(26)
TER Opening Type (Uw = 1.20)			6.2000	1.1450	7.0992		(27)
External Wall 1	59.8635	6.2000	53.6635	0.1800	9.6594		(29a)
Wall to Stairs	7.3400	1.8000	5.5400	0.1800	0.9972		(29a)

Full SAP Calculation Printout



Total net area of external elements Aum(A, m2)	67.2035		(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	19.5559	(33)
Party Wall 1	11.2000	0.0000	0.0000 (32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 109.9632 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	3.9200	0.0500	0.1960
E2 Other lintels (including other steel lintels)	0.9000	0.0500	0.0450
E3 Sill	6.2000	0.0500	0.3100
E4 Jamb	27.4300	0.0700	1.9201
E7 Party floor between dwellings (in blocks of flats)	7.3500	0.0900	0.6615
E16 Corner (normal)	4.9000	-0.0900	-0.4410
E17 Corner (inverted - internal area greater than external area)	4.5700	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.3500	0.0600	0.4410
E18 Party wall between dwellings			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			3.1326 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	22.6885 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.8460	23.6892	23.5355	22.8136	22.6786	22.0499	22.0499	21.9335	22.2921	22.6786	22.9518	23.2374	(38)
Heat transfer coeff	46.5344	46.3777	46.2240	45.5021	45.3671	44.7383	44.7383	44.6219	44.9805	45.3671	45.6403	45.9259	(39)
Average = Sum(39)m / 12 =												45.5015	
HLP	0.9497	0.9465	0.9433	0.9286	0.9259	0.9130	0.9130	0.9107	0.9180	0.9259	0.9314	Dec	
HLP (average)												0.9373	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

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

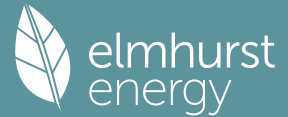
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	83.0351	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.0290	88.6035	80.0290	82.6966	80.0290	82.6966	80.0290	80.0290	82.6966	80.0290	82.6966	80.0290	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	144.6370	146.1379	142.3557	134.3039	124.1400	114.5873	108.2055	106.7047	110.4868	118.5386	128.7025	138.2552	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	31.3035	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	(71)
Water heating gains (Table 5)	128.1265	126.1874	122.4513	114.2620	109.2460	104.0029	100.7822	103.4426	106.5618	112.3795	120.2299	127.0794	(72)
Total internal gains	403.7030	411.8392	395.7464	382.1730	364.3254	349.1973	336.9273	338.0867	347.6557	361.8576	382.5395	396.2741	(73)

6. Solar gains

[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
-------	------------	--------------------------------	-----------------------------------	------------------------------------	------------------------------	------------

Full SAP Calculation Printout



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

Solar gains	37.2144	72.7992	119.8900	174.8524	214.2881	219.3620	208.8416	179.3918	139.4370	86.3824	46.4020	30.6033 (83)
Total gains	440.9173	484.6385	515.6364	557.0253	578.6136	568.5594	545.7689	517.4786	487.0927	448.2400	428.9415	426.8774 (84)

7. Mean internal temperature (heating season)

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

21.0000 (85)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	32.1637	32.2725	32.3798	32.8935	32.9914	33.4550	33.4550	33.5423	33.2749	32.9914	32.7939	32.5899
alpha	3.1442	3.1515	3.1587	3.1929	3.1994	3.2303	3.2303	3.2362	3.2183	3.1994	3.1863	3.1727
util living area	0.9195	0.8922	0.8483	0.7570	0.6313	0.4748	0.3520	0.3844	0.5735	0.7810	0.8845	0.9254 (86)

MIT	19.4383	19.6781	20.0195	20.4545	20.7601	20.9302	20.9799	20.9730	20.8681	20.4842	19.9217	19.4111 (87)
Th 2	20.1255	20.1282	20.1308	20.1432	20.1456	20.1564	20.1564	20.1585	20.1523	20.1456	20.1409	20.1359 (88)
util rest of house	0.9092	0.8789	0.8295	0.7282	0.5895	0.4197	0.2877	0.3183	0.5174	0.7486	0.8682	0.9158 (89)
MIT 2	18.3164	18.6152	19.0374	19.5676	19.9169	20.1020	20.1449	20.1422	20.0421	19.6155	18.9320	18.2898 (90)
Living area fraction									fLA = Living area / (4) =			0.5286 (91)
MIT	18.9094	19.1770	19.5565	20.0364	20.3626	20.5398	20.5862	20.5813	20.4787	20.0747	19.4551	18.8825 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9094	19.1770	19.5565	20.0364	20.3626	20.5398	20.5862	20.5813	20.4787	20.0747	19.4551	18.8825 (93)

8. Space heating requirement

Utilisation	0.8920	0.8619	0.8156	0.7243	0.6005	0.4452	0.3208	0.3519	0.5397	0.7457	0.8532	0.8990 (94)
Useful gains	393.2875	417.7335	420.5392	403.4611	347.4542	253.1012	175.0711	182.1242	262.8704	334.2371	365.9634	383.7525 (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	679.8405	662.1336	603.5231	506.7292	392.9952	265.7355	178.3375	186.5783	286.9187	429.8379	563.8922	674.3062 (97)
Space heating kWh	213.1955	164.2369	136.1400	74.3530	33.8825	0.0000	0.0000	0.0000	0.0000	71.1270	142.5088	216.1720 (98a)
Space heating requirement - total per year (kWh/year)												1051.6156
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	213.1955	164.2369	136.1400	74.3530	33.8825	0.0000	0.0000	0.0000	0.0000	71.1270	142.5088	216.1720 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1051.6156
Space heating per m2										(98c) / (4) =		21.4615 (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	213.1955	164.2369	136.1400	74.3530	33.8825	0.0000	0.0000	0.0000	0.0000	71.1270	142.5088	216.1720 (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)	230.9810	177.9381	147.4973	80.5558	36.7091	0.0000	0.0000	0.0000	0.0000	77.0607	154.3974	234.2058 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)

Water heating												
Water heating requirement	193.6577	171.4454	182.7177	162.1697	158.2019	143.6509	142.6300	147.7178	148.6877	164.4696	173.2316	191.7554 (64)
Efficiency of water heater (217)m	84.2758	83.9635	83.4094	82.4262	81.2526	79.8000	79.8000	79.8000	79.8000	82.3188	83.6254	79.8000 (216)
Fuel for water heating, kWh/month	229.7903	204.1903	219.0614	196.7455	194.7038	180.0137	178.7344	185.1100	186.3255	199.7959	207.1518	227.3890 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	16.6284	13.3399	12.0111	8.7999	6.7973	5.5534	6.2007	8.0599	10.4690	13.7359	15.5147	17.0906 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-16.9067	-24.7279	-36.8671	-43.0624	-47.8618	-45.2293	-44.7162	-41.5339	-36.1202	-29.0308	-18.9160	-14.5174 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-7.0085	-14.9791	-30.2039	-45.9874	-61.3975	-61.8738	-61.1056	-51.4318	-37.3240	-21.5809	-9.4118	-5.5217 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1139.3452 (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												2409.0115 (219)
Space cooling fuel												0.0000 (221)

Full SAP Calculation Printout



Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	134.2010 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-807.3159 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	2961.2418 (238)

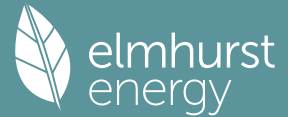
----- 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP -----

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1139.3452	0.2100	239.2625 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2409.0115	0.2100	505.8924 (264)
Space and water heating			745.1549 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	134.2010	0.1443	19.3694 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-399.4898	0.1338	-53.4489
PV Unit electricity exported	-407.8261	0.1255	-51.1874
Total			-104.6363 (269)
Total CO2, kg/year			671.8172 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.7100 (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	1139.3452	1.1300	1287.4601 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2409.0115	1.1300	2722.1831 (278)
Space and water heating			4009.6431 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	134.2010	1.5338	205.8420 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-399.4898	1.4944	-597.0100
PV Unit electricity exported	-407.8261	0.4607	-187.8861
Total			-784.8962 (283)
Total Primary energy kWh/year			3560.6897 (286)
Target Primary Energy Rate (TPER)			72.6700 (287)

Full SAP Calculation Printout



Property Reference	01109	Issued on Date	03/07/2024
Assessment Reference	00001	Prop Type Ref	
Property	Zoar Chapel, Flat 3, South Street, Reading		
SAP Rating	81 B	DER	5.57
Environmental	96 A	% DER < TER	59.37
CO ₂ Emissions (t/year)	0.26	DFEE	27.28
Compliance Check	See BREL	% DFEE < TFEE	5.65
% DPER < TPER	18.55	DPER	59.19
Assessor Details	Mr. Matthew Carter	Assessor ID	7869-0001
Client			

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

1. Overall dwelling characteristics

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

2. Ventilation rate

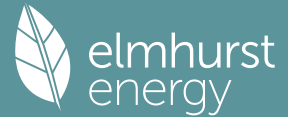
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1666 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3666 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3116 (21)

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

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.00)			6.2000	0.9615	5.9615		(27)
Doo to Hall			1.8000	1.4000	2.5200		(26)
External Wall 1	59.8635	6.2000	53.6635	0.1800	9.6594	14.0000	751.2890 (29a)
Wall to Stairs	7.3400	1.8000	5.5400	0.1600	0.8864	14.0000	77.5600 (29a)
Total net area of external elements Aum(A, m ²)			67.2035				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	19.0274			(33)
Party Wall 1			11.2000	0.0000	0.0000	20.0000	224.0000 (32)
Party Floor 1			49.0000			40.0000	1960.0000 (32d)
Party Ceiling 1			49.0000			40.0000	1960.0000 (32b)
Internal Wall 1			46.1500			9.0000	415.3500 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	5388.1990 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							109.9632 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				3.9200	0.0060	0.0235	
E3 Sill				0.9000	0.0120	0.0108	
E4 Jamb				6.2000	0.0230	0.1426	
E7 Party floor between dwellings (in blocks of flats)				27.4300	0.0210	0.5760	
E16 Corner (normal)				7.3500	0.0750	0.5512	

Full SAP Calculation Printout



E17 Corner (inverted - internal area greater than external area)	4.9000	-0.0450	-0.2205
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	4.5700	0.0000	0.0000
E18 Party wall between dwellings	7.3500	0.2400	1.7640
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			2.8477 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	21.8751 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 22.9349	Feb 22.8135	Mar 22.6945	Apr 22.1355	May 22.0309	Jun 21.5441	Jul 21.5441	Aug 21.4539	Sep 21.7316	Oct 22.0309	Nov 22.2425	Dec 22.4637 (38)
Heat transfer coeff	44.8100	44.6886	44.5696	44.0106	43.9060	43.4192	43.4192	43.3290	43.6067	43.9060	44.1176	44.3388 (39)
Average = Sum(39)m / 12 =												44.0101
HLP	Jan 0.9145	Feb 0.9120	Mar 0.9096	Apr 0.8982	May 0.8960	Jun 0.8861	Jul 0.8861	Aug 0.8843	Sep 0.8899	Oct 0.8960	Nov 0.9004	Dec 0.9049 (40)
HLP (average)												0.8982
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

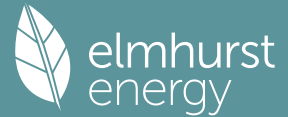
4. Water heating energy requirements (kWh/year)													
Assumed occupancy												1.6607 (42)	
Hot water usage for mixer showers													
52.0640	51.2816	50.1414	47.9600	46.3501	44.5548	43.5344	44.6659	45.9062	47.8338	50.0621	51.8645	(42a)	
Hot water usage for baths													
22.5124	22.1781	21.7073	20.8392	20.1891	19.4684	19.0790	19.5466	20.0556	20.8269	21.7129	22.4363	(42b)	
Hot water usage for other uses													
31.6372	30.4868	29.3364	28.1859	27.0355	25.8850	25.8850	27.0355	28.1859	29.3364	30.4868	31.6372	(42c)	
Average daily hot water use (litres/day)												97.6350 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.2137	103.9465	101.1851	96.9850	93.5747	89.9082	88.4984	91.2479	94.1477	97.9970	102.2618	105.9381	(44)
Energy conte	168.2165	148.0184	155.5177	132.7677	125.9695	110.5526	107.0312	112.9839	116.0936	132.9811	145.6907	165.8734	(45)
Energy content (annual)											Total = Sum(45)m =	1621.6962	
Distribution loss (46)m = 0.15 x (45)m													
25.2325	22.2028	23.3276	19.9152	18.8954	16.5829	16.0547	16.9476	17.4140	19.9472	21.8536	24.8810	(46)	
Water storage loss:													
Store volume												180.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.4000 (48)	
Temperature factor from Table 2b												0.7800 (49)	
Enter (49) or (54) in (55)												1.0920 (55)	
Total storage loss													
33.8520	30.5760	33.8520	32.7600	33.8520	32.7600	33.8520	33.8520	32.7600	33.8520	32.7600	33.8520	(56)	
If cylinder contains dedicated solar storage													
33.8520	30.5760	33.8520	32.7600	33.8520	32.7600	33.8520	33.8520	32.7600	33.8520	32.7600	33.8520	(57)	
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)	
Total heat required for water heating calculated for each month													
256.9261	228.1432	244.2273	218.6157	214.6791	165.8246	164.1456	170.0983	171.3656	221.6907	231.5387	254.5830	(62)	
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)	
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)	
Output from w/h													
256.9261	228.1432	244.2273	218.6157	214.6791	165.8246	164.1456	170.0983	171.3656	221.6907	231.5387	254.5830	(64)	
Electric shower(s)												Total per year (kWh/year) = Sum(64)m = 2541.8378 (64)	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)	
Heat gains from water heating, kWh/month													
99.8181	88.8551	95.5957	86.6157	85.7710	54.7683	54.1978	56.1771	56.6107	88.1023	90.9125	99.0390	(65)	

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
21.0086	18.6597	15.1751	11.4885	8.5878	7.2502	7.8341	10.1830	13.6676	17.3542	20.2549	21.5925	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
215.8761	218.1162	212.4712	200.4536	185.2835	171.0258	161.5008	159.2607	164.9057	176.9233	192.0934	206.3511	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	(71)
Water heating gains (Table 5)												
134.1641	132.2249	128.4888	120.2995	115.2835	76.0671	72.8465	75.5068	78.6260	118.4170	126.2674	133.1169	(72)
Total internal gains												
450.8877	448.8397	435.9740	412.0805	388.9938	334.1821	322.0203	324.7895	337.0383	392.5335	418.4546	440.8994	(73)

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

7. Mean internal temperature (heating season)												
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)

Full SAP Calculation Printout



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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	33.4015	33.4923	33.5817	34.0082	34.0892	34.4715	34.4715	34.5432	34.3232	34.0892	33.9257	33.7565
alpha	3.2268	3.2328	3.2388	3.2672	3.2726	3.2981	3.2981	3.3029	3.2882	3.2726	3.2617	3.2504
util living area	0.8952	0.8692	0.8181	0.7271	0.6017	0.4748	0.3519	0.3840	0.5718	0.7474	0.8585	0.9031 (86)
Living	19.9113	20.0553	20.2930	20.5665	20.7604	20.8583	20.8930	20.8884	20.8150	20.5891	20.2191	19.8839
Non living	18.8884	19.0673	19.3590	19.6921	19.9120	20.0216	20.0517	20.0501	19.9793	19.7270	19.2811	18.8613
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.4430	20.0553	20.2930	20.5665	20.7604	20.8583	20.8930	20.8884	20.8150	20.5891	20.2191	20.0401 (87)
Th 2	20.1552	20.1573	20.1594	20.1691	20.1709	20.1793	20.1793	20.1809	20.1761	20.1709	20.1672	20.1634 (88)
util rest of house	0.8828	0.8542	0.7976	0.6976	0.5609	0.4210	0.2891	0.3195	0.5171	0.7136	0.8402	0.8916 (89)
MIT 2	19.6502	19.0673	19.3590	19.6921	19.9120	20.0216	20.0517	20.0501	19.9793	19.7270	19.2811	19.0959 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	20.0693	19.5895	19.8527	20.1543	20.3605	20.4638	20.4964	20.4932	20.4210	20.1827	19.7769	0.5286 (91)
Temperature adjustment												0.0000
adjusted MIT	20.0693	19.5895	19.8527	20.1543	20.3605	20.4638	20.4964	20.4932	20.4210	20.1827	19.7769	19.5950 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8815	0.8430	0.7895	0.6971	0.5705	0.4401	0.3136	0.3445	0.5339	0.7142	0.8306	0.8828 (94)
Useful gains	430.2442	439.7314	438.8326	409.1326	344.1896	243.5983	166.5048	173.6660	254.3964	342.0227	386.1147	416.2279 (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	706.6206	656.4541	595.1235	495.3076	380.2463	254.6033	169.1773	177.3538	275.6385	420.7368	559.2742	682.5935 (97)
Space heating kWh	205.6240	145.6376	116.2804	62.0460	26.8262	0.0000	0.0000	0.0000	0.0000	58.5633	124.6748	198.1759 (98a)
Space heating requirement - total per year (kWh/year)												937.8283
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	205.6240	145.6376	116.2804	62.0460	26.8262	0.0000	0.0000	0.0000	0.0000	58.5633	124.6748	198.1759 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												937.8283
Space heating per m2										(98c) / (4) =		19.1394 (99)

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

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

Fraction of space heat from main system(s)		0.0000 (201)
Efficiency of main space heating system 1 (in %)		1.0000 (202)
Efficiency of main space heating system 2 (in %)		310.9707 (206)
Efficiency of secondary/supplementary heating system, %		0.0000 (207)
		0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	205.6240	145.6376	116.2804	62.0460	26.8262	0.0000	0.0000	0.0000	0.0000	58.5633	124.6748	198.1759 (98)
Space heating efficiency (main heating system 1)	310.9707	310.9707	310.9707	310.9707	310.9707	0.0000	0.0000	0.0000	0.0000	310.9707	310.9707	310.9707 (210)
Space heating fuel (main heating system)	66.1233	46.8332	37.3927	19.9524	8.6266	0.0000	0.0000	0.0000	0.0000	18.8324	40.0921	63.7282 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	256.9261	228.1432	244.2273	218.6157	214.6791	165.8246	164.1456	170.0983	171.3656	221.6907	231.5387	254.5830 (64)
Efficiency of water heater	180.5920	180.5920	180.5920	180.5920	180.5920	180.5920	180.5920	180.5920	180.5920	180.5920	180.5920	180.5920 (216)
Fuel for water heating, kWh/month	142.2688	126.3307	135.2370	121.0550	118.8752	91.8228	90.8930	94.1893	94.8910	122.7578	128.2109	140.9714 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	18.3887	14.7521	13.2826	9.7314	7.5168	6.1413	6.8571	8.9131	11.5773	15.1900	17.1571	18.8998 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												301.5809 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												180.5920
Water heating fuel used												1407.5031 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:

Total electricity for the above, kWh/year

Electricity for lighting (calculated in Appendix L)

0.0000 (231)

148.4076 (232)

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

PV generation

0.0000 (233)

Wind generation

0.0000 (234)

Full SAP Calculation Printout



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	1857.4916 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	301.5809	16.4900	49.7307 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1407.5031	16.4900	232.0973 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	148.4076	16.4900	24.4724 (250)
Additional standing charges			0.0000 (251)
Total energy cost			306.3004 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	1.1731 (257)
SAP value	80.9846
SAP rating (Section 12)	81 (258)
SAP band	B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	301.5809	0.1558	46.9872 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1407.5031	0.1416	199.3634 (264)
Space and water heating			246.3506 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	148.4076	0.1443	21.4198 (268)
Total CO2, kg/year			267.7704 (272)
CO2 emissions per m2			5.4600 (273)
EI value			96.1828
EI rating			96 (274)
EI band			A

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

1. Overall dwelling characteristics

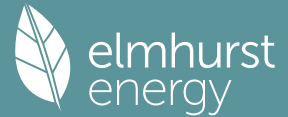
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	49.0000 (1b)	x 2.4500 (2b)	= 120.0500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 120.0500 (5)

2. Ventilation rate

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

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

Full SAP Calculation Printout



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

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Windows (Uw = 1.00)			6.2000	0.9615	5.9615			(27)
Doo to Hall			1.8000	1.4000	2.5200			(26)
External Wall 1	59.8635	6.2000	53.6635	0.1800	9.6594	14.0000	751.2890	(29a)
Wall to Stairs	7.3400	1.8000	5.5400	0.1600	0.8864	14.0000	77.5600	(29a)
Total net area of external elements Aum (A, m2)			67.2035					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0274			(33)
Party Wall 1			11.2000	0.0000	0.0000	20.0000	224.0000	(32)
Party Floor 1			49.0000			40.0000	1960.0000	(32d)
Party Ceiling 1			49.0000			40.0000	1960.0000	(32b)
Internal Wall 1			46.1500			9.0000	415.3500	(32c)

Heat capacity Cm = Sum(A x k)

(28)...(30) + (32) + (32a)...(32e) = 5388.1990 (34)

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

109.9632 (35)

List of Thermal Bridges

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

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

2.8477 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 21.8751 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	21.9288	21.7316	21.7316	21.4539	21.4539	21.1173	21.1979	21.0392	21.1173	21.2808	21.2808	21.5441	(38)
Heat transfer coeff	43.8038	43.6067	43.6067	43.3290	43.3290	42.9924	43.0730	42.9143	42.9924	43.1559	43.1559	43.4192	(39)
Average = Sum(39)m / 12 =												43.2815	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8940	0.8899	0.8899	0.8843	0.8843	0.8774	0.8790	0.8758	0.8774	0.8807	0.8807	0.8861	(40)
HLP (average)												0.8833	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

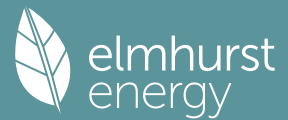
4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6607 (42)
Hot water usage for mixer showers	52.0640	51.2816	50.1414	47.9600	46.3501	44.5548	43.5344	44.6659	45.9062	47.8338	50.0621	51.8645	(42a)
Hot water usage for baths	22.5124	22.1781	21.7073	20.8392	20.1891	19.4684	19.0790	19.5466	20.0556	20.8269	21.7129	22.4363	(42b)
Hot water usage for other uses	31.6372	30.4868	29.3364	28.1859	27.0355	25.8850	25.8850	27.0355	28.1859	29.3364	30.4868	31.6372	(42c)
Average daily hot water use (litres/day)												97.6350	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.2137	103.9465	101.1851	96.9850	93.5747	89.9082	88.4984	91.2479	94.1477	97.9970	102.2618	105.9381	(44)
Energy conte	168.2165	148.0184	155.5177	132.7677	125.9695	110.5526	107.0312	112.9839	116.0936	132.9811	145.6907	165.8734	(45)
Energy content (annual)										Total = Sum(45)m =		1621.6962	
Distribution loss (46)m = 0.15 x (45)m	25.2325	22.2028	23.3276	19.9152	18.8954	16.5829	16.0547	16.9476	17.4140	19.9472	21.8536	24.8810	(46)
Water storage loss:													
Store volume												180.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4000	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												1.0920	(55)
Total storage loss	33.8520	30.5760	33.8520	32.7600	33.8520	32.7600	33.8520	33.8520	32.7600	33.8520	32.7600	33.8520	(56)
If cylinder contains dedicated solar storage	33.8520	30.5760	33.8520	32.7600	33.8520	32.7600	33.8520	33.8520	32.7600	33.8520	32.7600	33.8520	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	256.9261	228.1432	244.2273	218.6157	214.6791	165.8246	164.1456	170.0983	171.3656	221.6907	231.5387	254.5830	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	256.9261	228.1432	244.2273	218.6157	214.6791	165.8246	164.1456	170.0983	171.3656	221.6907	231.5387	254.5830	(64)
								Total per year (kWh/year) = Sum(64)m =				2541.8378	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)
Heat gains from water heating, kWh/month	99.8181	88.8551	95.5957	86.6157	85.7710	54.7683	54.1978	56.1771	56.6107	88.1023	90.9125	99.0390	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.0086	18.6597	15.1751	11.4885	8.5878	7.2502	7.8341	10.1830	13.6676	17.3542	20.2549	21.5925	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	215.8761	218.1162	212.4712	200.4536	185.2835	171.0258	161.5008	159.2607	164.9057	176.9233	192.0934	206.3511	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Full SAP Calculation Printout



Losses e.g. evaporation (negative values) (Table 5)	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281 (71)
Water heating gains (Table 5)	134.1641	132.2249	128.4888	120.2995	115.2835	76.0671	72.8465	75.5068	78.6260	118.4170	126.2674	133.1169 (72)
Total internal gains	450.8877	448.8397	435.9740	412.0805	388.9938	334.1821	322.0203	324.7895	337.0383	392.5335	418.4546	440.8994 (73)

6. Solar gains

[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
East			1.8900		22.3313		0.6300		0.7000		0.7700		12.8988 (76)
West			4.3100		22.3313		0.6300		0.7000		0.7700		29.4146 (80)
Solar gains	42.3134	74.4565	120.9043	181.2008	215.9084	236.3513	222.6525	195.8814	152.2514	94.2818	54.0502		34.4588 (83)
Total gains	493.2011	523.2963	556.8783	593.2814	604.9022	570.5334	544.6727	520.6708	489.2896	486.8153	472.5048		475.3583 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)											
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	34.1687	34.3232	34.3232	34.5432	34.5432	34.8136	34.7485	34.8770	34.8136	34.6817	34.6817	34.4715
alpha	3.2779	3.2882	3.2882	3.3029	3.3029	3.3209	3.3166	3.3251	3.3209	3.3121	3.3121	3.2981
util living area	0.8780	0.8520	0.7903	0.6816	0.5302	0.3675	0.2434	0.2614	0.4815	0.6939	0.8292	0.8861 (86)
Living	20.0594	20.1801	20.4142	20.6600	20.8234	20.8902	20.9041	20.9036	20.8628	20.6879	20.3607	20.0393
Non living	19.0859	19.2359	19.5191	19.8098	19.9876	20.0567	20.0652	20.0678	20.0347	19.8502	19.4667	19.0672
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.5188	20.1801	20.4142	20.6600	20.8234	20.8902	20.9041	20.9036	20.8628	20.6879	20.3607	20.1737 (87)
Th 2	20.1726	20.1761	20.1761	20.1809	20.1809	20.1868	20.1854	20.1881	20.1868	20.1839	20.1839	20.1793 (88)
util rest of house	0.8636	0.8352	0.7670	0.6484	0.4849	0.3108	0.1802	0.1961	0.4218	0.6546	0.8073	0.8725 (89)
MIT 2	19.7394	19.2359	19.5191	19.8098	19.9876	20.0567	20.0652	20.0678	20.0347	19.8502	19.4667	19.2676 (90)
Living area fraction	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
MIT	20.1514	19.7350	19.9922	20.2592	20.4293	20.4972	20.5086	20.5096	20.4724	20.2930	19.9392	19.7465 (92)
Temperature adjustment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
adjusted MIT	20.1514	19.7350	19.9922	20.2592	20.4293	20.4972	20.5086	20.5096	20.4724	20.2930	19.9392	19.7465 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	425.7254	431.8478	423.9989	386.6371	301.8267	189.7986	111.8853	115.6604	216.8699	321.3575	378.0884	410.9578 (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	659.3084	616.3796	549.1057	448.8530	321.9062	193.3471	112.3609	116.2792	226.6723	375.1532	515.2475	635.9406 (97)
Space heating kWh	173.7858	124.0054	93.0795	44.7954	14.9391	0.0000	0.0000	0.0000	0.0000	40.0240	98.7545	167.3872 (98a)
Space heating requirement - total per year (kWh/year)	756.7708											756.7708
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
Space heating kWh	173.7858	124.0054	93.0795	44.7954	14.9391	0.0000	0.0000	0.0000	0.0000	40.0240	98.7545	167.3872 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	756.7708											756.7708
Space heating per m ²	(98c) / (4) =											15.4443 (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 %)												310.1091 (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	173.7858	124.0054	93.0795	44.7954	14.9391	0.0000	0.0000	0.0000	0.0000	40.0240	98.7545	167.3872 (98)
Space heating efficiency (main heating system 1)	310.1091	310.1091	310.1091	310.1091	310.1091	0.0000	0.0000	0.0000	0.0000	310.1091	310.1091	310.1091 (210)
Space heating fuel (main heating system)	56.0402	39.9877	30.0151	14.4451	4.8174	0.0000	0.0000	0.0000	0.0000	12.9064	31.8451	53.9769 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	256.9261	228.1432	244.2273	218.6157	214.6791	165.8246	164.1456	170.0983	171.3656	221.6907	231.5387	254.5830 (64)
Efficiency of water heater	180.0343	180.0343	180.0343	180.0343	180.0343	180.0343	180.0343	180.0343	180.0343	180.0343	180.0343	180.0343 (216)
(217)m	180.0343	180.0343	180.0343	180.0343	180.0343	180.0343	180.0343	180.0343	180.0343	180.0343	180.0343	180.0343 (217)
Fuel for water heating, kWh/month	142.7095	126.7221	135.6560	121.4300	119.2435	92.1072	91.1746	94.4811	95.1850	123.1380	128.6081	141.4081 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	18.3887	14.7521	13.2826	9.7314	7.5168	6.1413	6.8571	8.9131	11.5773	15.1900	17.1571	18.8998 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												

Full SAP Calculation Printout



(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												244.0337	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												180.0343	
Water heating fuel used												1411.8632	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												148.4076	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												1804.3046	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	244.0337	26.0600	63.5952	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1411.8632	26.0600	367.9316	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	148.4076	26.0600	38.6750	(250)
Additional standing charges			0.0000	(251)
Total energy cost			470.2018	(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	244.0337	0.1565	38.1885	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1411.8632	0.1416	199.9810	(264)
Space and water heating			238.1695	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	148.4076	0.1443	21.4198	(268)
Total CO2, kg/year			259.5893	(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	244.0337	1.5793	385.4096	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1411.8632	1.5238	2151.3977	(278)
Space and water heating			2536.8072	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	148.4076	1.5338	227.6325	(282)
Total Primary energy kWh/year			2764.4397	(286)

SAP 10 EPC IMPROVEMENTS

00001

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

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

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

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

Total Savings £0 0.00 kg/m²

Full SAP Calculation Printout



Potential energy efficiency rating:
Potential environmental impact rating:

B 81
A 96

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

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

Electricity	Current £470	Potential £470	£0	Saving
Space heating	£64	£64	£0	
Water heating	£368	£368	£0	
Lighting	£39	£39	£0	
Total cost of fuels	£470	£470	£0	
Total cost of uses	£471	£471	£0	
Delivered energy	37 kWh/m ²	37 kWh/m ²	0 kWh/m ²	
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes	
CO2 emissions per m ²	5 kg/m ²	5 kg/m ²	0 kg/m ²	
Primary energy	56 kWh/m ²	56 kWh/m ²	0 kWh/m ²	

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

1. Overall dwelling characteristics

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

2. Ventilation rate

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

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

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

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

3. Heat losses and heat loss parameter

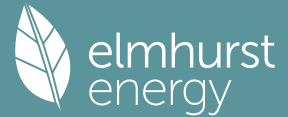
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.00)			6.2000	0.9615	5.9615		(27)
Door to Hall			1.8000	1.4000	2.5200		(26)
External Wall 1	59.8635	6.2000	53.6635	0.1800	9.6594	14.0000	751.2890 (29a)
Wall to Stairs	7.3400	1.8000	5.5400	0.1600	0.8864	14.0000	77.5600 (29a)
Total net area of external elements Aum(A, m ²)			67.2035				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	19.0274			(33)
Party Wall 1			11.2000	0.0000	0.0000	20.0000	224.0000 (32)
Party Floor 1			49.0000			40.0000	1960.0000 (32d)
Party Ceiling 1			49.0000			40.0000	1960.0000 (32b)
Internal Wall 1			46.1500			9.0000	415.3500 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 5388.1990 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K	109.9632 (35)

List of Thermal Bridges

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

Full SAP Calculation Printout



E18 Party wall between dwellings
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Point Thermal bridges
Total fabric heat loss

7.3500
0.2400
1.7640
2.8477 (36)
0.0000
(33) + (36) + (36a) = 21.8751 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
(38)m
Heat transfer coeff
Average = Sum(39)m / 12 =

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9145	0.9120	0.9096	0.8982	0.8960	0.8861	0.8861	0.8843	0.8899	0.8960	0.9004	0.9049 (40)
HLP (average)												0.8982
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy
Hot water usage for mixer showers
Hot water usage for baths
Hot water usage for other uses
Average daily hot water use (litres/day)

Daily hot water use
Energy conte
Energy content (annual)
Distribution loss (46)m = 0.15 x (45)m
Water storage loss:
Store volume
a) If manufacturer declared loss factor is known (kWh/day):
Temperature factor from Table 2b
Enter (49) or (54) in (55)
Total storage loss
If cylinder contains dedicated solar storage
Primary loss
Combi loss
Total heat required for water heating calculated for each month
WWHRS
PV diverter
Solar input
FGHRS
Output from w/h
Electric shower(s)
Heat gains from water heating, kWh/month

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

Metabolic gains (Table 5), Watts
(66)m
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
Pumps, fans
Losses e.g. evaporation (negative values) (Table 5)
Water heating gains (Table 5)
Total internal gains

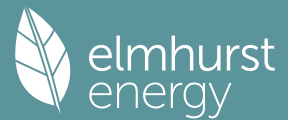
6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
East	1.8900	19.6403	0.6300	0.7000	0.7700	11.3444 (76)
West	4.3100	19.6403	0.6300	0.7000	0.7700	25.8700 (80)
Solar gains	37.2144	72.7992	119.8900	174.8524	214.2881	219.3620
Total gains	488.1021	521.6390	555.8640	586.9329	603.2819	553.5441

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)
Utilisation factor for gains for living area, nil,m (see Table 9a)

Full SAP Calculation Printout



tau	33.4015	33.4923	33.5817	34.0082	34.0892	34.4715	34.4715	34.5432	34.3232	34.0892	33.9257	33.7565
alpha	3.2268	3.2328	3.2388	3.2672	3.2726	3.2981	3.2981	3.3029	3.2882	3.2726	3.2617	3.2504
util living area	0.8952	0.8692	0.8181	0.7271	0.6017	0.4748	0.3519	0.3840	0.5718	0.7474	0.8585	0.9031 (86)
Living	19.9113	20.0553	20.2930	20.5665	20.7604	20.8583	20.8930	20.8884	20.8150	20.5891	20.2191	19.8839
Non living	18.8884	19.0673	19.3590	19.6921	19.9120	20.0216	20.0517	20.0501	19.9793	19.7270	19.2811	18.8613
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.4430	20.0553	20.2930	20.5665	20.7604	20.8583	20.8930	20.8884	20.8150	20.5891	20.2191	20.0401 (87)
Th 2	20.1552	20.1573	20.1594	20.1691	20.1709	20.1793	20.1793	20.1809	20.1761	20.1709	20.1672	20.1634 (88)
util rest of house	0.8828	0.8542	0.7976	0.6976	0.5609	0.4210	0.2891	0.3195	0.5171	0.7136	0.8402	0.8916 (89)
MIT 2	19.6502	19.0673	19.3590	19.6921	19.9120	20.0216	20.0517	20.0501	19.9793	19.7270	19.2811	19.0959 (90)
Living area fraction									fLA = Living area / (4) =			0.5286 (91)
MIT	20.0693	19.5895	19.8527	20.1543	20.3605	20.4638	20.4964	20.4932	20.4210	20.1827	19.7769	19.5950 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0693	19.5895	19.8527	20.1543	20.3605	20.4638	20.4964	20.4932	20.4210	20.1827	19.7769	19.5950 (93)

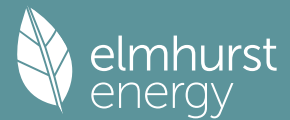
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8815	0.8430	0.7895	0.6971	0.5705	0.4401	0.3136	0.3445	0.5339	0.7142	0.8306	0.8828 (94)
Useful gains	430.2442	439.7314	438.8326	409.1326	344.1896	243.5983	166.5048	173.6660	254.3964	342.0227	386.1147	416.2279 (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	706.6206	656.4541	595.1235	495.3076	380.2463	254.6033	169.1773	177.3538	275.6385	420.7368	559.2742	682.5935 (97)
Space heating kWh	205.6240	145.6376	116.2804	62.0460	26.8262	0.0000	0.0000	0.0000	0.0000	58.5633	124.6748	198.1759 (98a)
Space heating requirement - total per year (kWh/year)												937.8283
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	205.6240	145.6376	116.2804	62.0460	26.8262	0.0000	0.0000	0.0000	0.0000	58.5633	124.6748	198.1759 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												937.8283
Space heating per m2										(98c) / (4) =		19.1394 (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 %)												310.9707 (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	205.6240	145.6376	116.2804	62.0460	26.8262	0.0000	0.0000	0.0000	0.0000	58.5633	124.6748	198.1759 (98)
Space heating efficiency (main heating system 1)	310.9707	310.9707	310.9707	310.9707	310.9707	0.0000	0.0000	0.0000	0.0000	310.9707	310.9707	310.9707 (210)
Space heating fuel (main heating system)	66.1233	46.8332	37.3927	19.9524	8.6266	0.0000	0.0000	0.0000	0.0000	18.8324	40.0921	63.7282 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	256.9261	228.1432	244.2273	218.6157	214.6791	165.8246	164.1456	170.0983	171.3656	221.6907	231.5387	254.5830 (64)
Efficiency of water heater	180.5920	180.5920	180.5920	180.5920	180.5920	180.5920	180.5920	180.5920	180.5920	180.5920	180.5920	180.5920 (216)
Fuel for water heating, kWh/month	142.2688	126.3307	135.2370	121.0550	118.8752	91.8228	90.8930	94.1893	94.8910	122.7578	128.2109	140.9714 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	18.3887	14.7521	13.2826	9.7314	7.5168	6.1413	6.8571	8.9131	11.5773	15.1900	17.1571	18.8998 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												301.5809 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												180.5920
Water heating fuel used												1407.5031 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												148.4076 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)

Full SAP Calculation Printout



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

-0.0000 (236)
 0.0000 (237)
 1857.4916 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	301.5809	16.4900	49.7307 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1407.5031	16.4900	232.0973 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	148.4076	16.4900	24.4724 (250)
Additional standing charges			0.0000 (251)
Total energy cost			306.3004 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.1731 (257)
SAP value		80.9846
SAP rating (Section 12)		81 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	301.5809	0.1558	46.9872 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1407.5031	0.1416	199.3634 (264)
Space and water heating			246.3506 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	148.4076	0.1443	21.4198 (268)
Total CO2, kg/year			267.7704 (272)
CO2 emissions per m2			5.4600 (273)
EI value			96.1828
EI rating			96 (274)
EI band			A

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

1. Overall dwelling characteristics

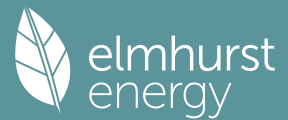
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	49.0000 (1b)	x 2.4500 (2b)	= 120.0500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	120.0500 (5)

2. Ventilation rate

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

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

Full SAP Calculation Printout



3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Windows (Uw = 1.00)			6.2000	0.9615	5.9615			(27)
Doo to Hall			1.8000	1.4000	2.5200			(26)
External Wall 1	59.8635	6.2000	53.6635	0.1800	9.6594	14.0000	751.2890	(29a)
Wall to Stairs	7.3400	1.8000	5.5400	0.1600	0.8864	14.0000	77.5600	(29a)
Total net area of external elements Aum(A, m2)			67.2035					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0274			(33)
Party Wall 1			11.2000	0.0000		20.0000	224.0000	(32)
Party Floor 1			49.0000			40.0000	1960.0000	(32d)
Party Ceiling 1			49.0000			40.0000	1960.0000	(32b)
Internal Wall 1			46.1500			9.0000	415.3500	(32c)

Heat capacity Cm = Sum(A x k)

(28)...(30) + (32) + (32a)...(32e) = 5388.1990 (34)

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

109.9632 (35)

List of Thermal Bridges

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

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

2.8477 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 21.8751 (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	
	21.9288	21.7316	21.7316	21.4539	21.4539	21.1173	21.1979	21.0392	21.1173	21.2808	21.2808	21.5441	(38)
Heat transfer coeff	43.8038	43.6067	43.6067	43.3290	43.3290	42.9924	43.0730	42.9143	42.9924	43.1559	43.1559	43.4192	(39)
Average = Sum(39)m / 12 =												43.2815	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8940	0.8899	0.8899	0.8843	0.8843	0.8774	0.8790	0.8758	0.8774	0.8807	0.8807	0.8861	(40)
HLP (average)												0.8833	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

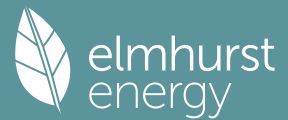
4. Water heating energy requirements (kWh/year)

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

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

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	99.6421	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	21.0086	18.6597	15.1751	11.4885	8.5878	7.2502	7.8341	10.1830	13.6676	17.3542	20.2549	21.5925	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	215.8761	218.1162	212.4712	200.4536	185.2835	171.0258	161.5008	159.2607	164.9057	176.9233	192.0934	206.3511	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	46.6249	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	-66.4281	(71)

Full SAP Calculation Printout



Water heating gains (Table 5)	134.1641	132.2249	128.4888	120.2995	115.2835	76.0671	72.8465	75.5068	78.6260	118.4170	126.2674	133.1169 (72)
Total internal gains	450.8877	448.8397	435.9740	412.0805	388.9938	334.1821	322.0203	324.7895	337.0383	392.5335	418.4546	440.8994 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
East				1.8900	22.3313	0.6300	0.7000			0.7700			12.8988 (76)
West				4.3100	22.3313	0.6300	0.7000			0.7700			29.4146 (80)
Solar gains	42.3134	74.4565	120.9043	181.2008	215.9084	236.3513	222.6525	195.8814	152.2514	94.2818	54.0502	34.4588 (83)	
Total gains	493.2011	523.2963	556.8783	593.2814	604.9022	570.5334	544.6727	520.6708	489.2896	486.8153	472.5048	475.3583 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	34.1687	34.3232	34.3232	34.5432	34.5432	34.8136	34.7485	34.8770	34.8136	34.6817	34.6817	34.4715
alpha	3.2779	3.2882	3.2882	3.3029	3.3029	3.3209	3.3166	3.3251	3.3209	3.3121	3.3121	3.2981
util living area	0.8780	0.8520	0.7903	0.6816	0.5302	0.3675	0.2434	0.2614	0.4815	0.6939	0.8292	0.8861 (86)
Living	20.0594	20.1801	20.4142	20.6600	20.8234	20.8902	20.9041	20.9036	20.8628	20.6879	20.3607	20.0393
Non living	19.0859	19.2359	19.5191	19.8098	19.9876	20.0567	20.0652	20.0678	20.0347	19.8502	19.4667	19.0672
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.5188	20.1801	20.4142	20.6600	20.8234	20.8902	20.9041	20.9036	20.8628	20.6879	20.3607	20.1737 (87)
Th 2	20.1726	20.1761	20.1761	20.1809	20.1809	20.1868	20.1854	20.1881	20.1868	20.1839	20.1839	20.1793 (88)
util rest of house	0.8636	0.8352	0.7670	0.6484	0.4849	0.3108	0.1802	0.1961	0.4218	0.6546	0.8073	0.8725 (89)
MIT 2	19.7394	19.2359	19.5191	19.8098	19.9876	20.0567	20.0652	20.0678	20.0347	19.8502	19.4667	19.2676 (90)
Living area fraction									FLA = Living area / (4) =			0.5286 (91)
MIT	20.1514	19.7350	19.9922	20.2592	20.4293	20.4972	20.5086	20.5096	20.4724	20.2930	19.9392	19.7465 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1514	19.7350	19.9922	20.2592	20.4293	20.4972	20.5086	20.5096	20.4724	20.2930	19.9392	19.7465 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8632	0.8252	0.7614	0.6517	0.4990	0.3327	0.2054	0.2221	0.4432	0.6601	0.8002	0.8645 (94)
Useful gains	425.7254	431.8478	423.9989	386.6371	301.8267	189.7986	111.8853	115.6604	216.8699	321.3575	378.0884	410.9578 (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	659.3084	616.3796	549.1057	448.8530	321.9062	193.3471	112.3609	116.2792	226.6723	375.1532	515.2475	635.9406 (97)
Space heating kWh	173.7858	124.0054	93.0795	44.7954	14.9391	0.0000	0.0000	0.0000	0.0000	40.0240	98.7545	167.3872 (98a)
Space heating requirement - total per year (kWh/year)												756.7708
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	173.7858	124.0054	93.0795	44.7954	14.9391	0.0000	0.0000	0.0000	0.0000	40.0240	98.7545	167.3872 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												756.7708
Space heating per m ²										(98c) / (4) =		15.4443 (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 %)												310.1091 (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	173.7858	124.0054	93.0795	44.7954	14.9391	0.0000	0.0000	0.0000	0.0000	40.0240	98.7545	167.3872 (98)
Space heating efficiency (main heating system 1)	310.1091	310.1091	310.1091	310.1091	310.1091	0.0000	0.0000	0.0000	0.0000	310.1091	310.1091	310.1091 (210)
Space heating fuel (main heating system)	56.0402	39.9877	30.0151	14.4451	4.8174	0.0000	0.0000	0.0000	0.0000	12.9064	31.8451	53.9769 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	256.9261	228.1432	244.2273	218.6157	214.6791	165.8246	164.1456	170.0983	171.3656	221.6907	231.5387	254.5830 (64)
Efficiency of water heater	180.0343	180.0343	180.0343	180.0343	180.0343	180.0343	180.0343	180.0343	180.0343	180.0343	180.0343	180.0343 (216)
Fuel for water heating, kWh/month	142.7095	126.7221	135.6560	121.4300	119.2435	92.1072	91.1746	94.4811	95.1850	123.1380	128.6081	141.4081 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	18.3887	14.7521	13.2826	9.7314	7.5168	6.1413	6.8571	8.9131	11.5773	15.1900	17.1571	18.8998 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												

Full SAP Calculation Printout



(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												244.0337	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												180.0343	
Water heating fuel used												1411.8632	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												148.4076	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												1804.3046	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	244.0337	26.0600	63.5952	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1411.8632	26.0600	367.9316	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	148.4076	26.0600	38.6750	(250)
Additional standing charges			0.0000	(251)
Total energy cost			470.2018	(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	244.0337	0.1565	38.1885	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1411.8632	0.1416	199.9810	(264)
Space and water heating			238.1695	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	148.4076	0.1443	21.4198	(268)
Total CO2, kg/year			259.5893	(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	244.0337	1.5793	385.4096	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1411.8632	1.5238	2151.3977	(278)
Space and water heating			2536.8072	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	148.4076	1.5338	227.6325	(282)
Total Primary energy kWh/year			2764.4397	(286)

Predicted Energy Assessment



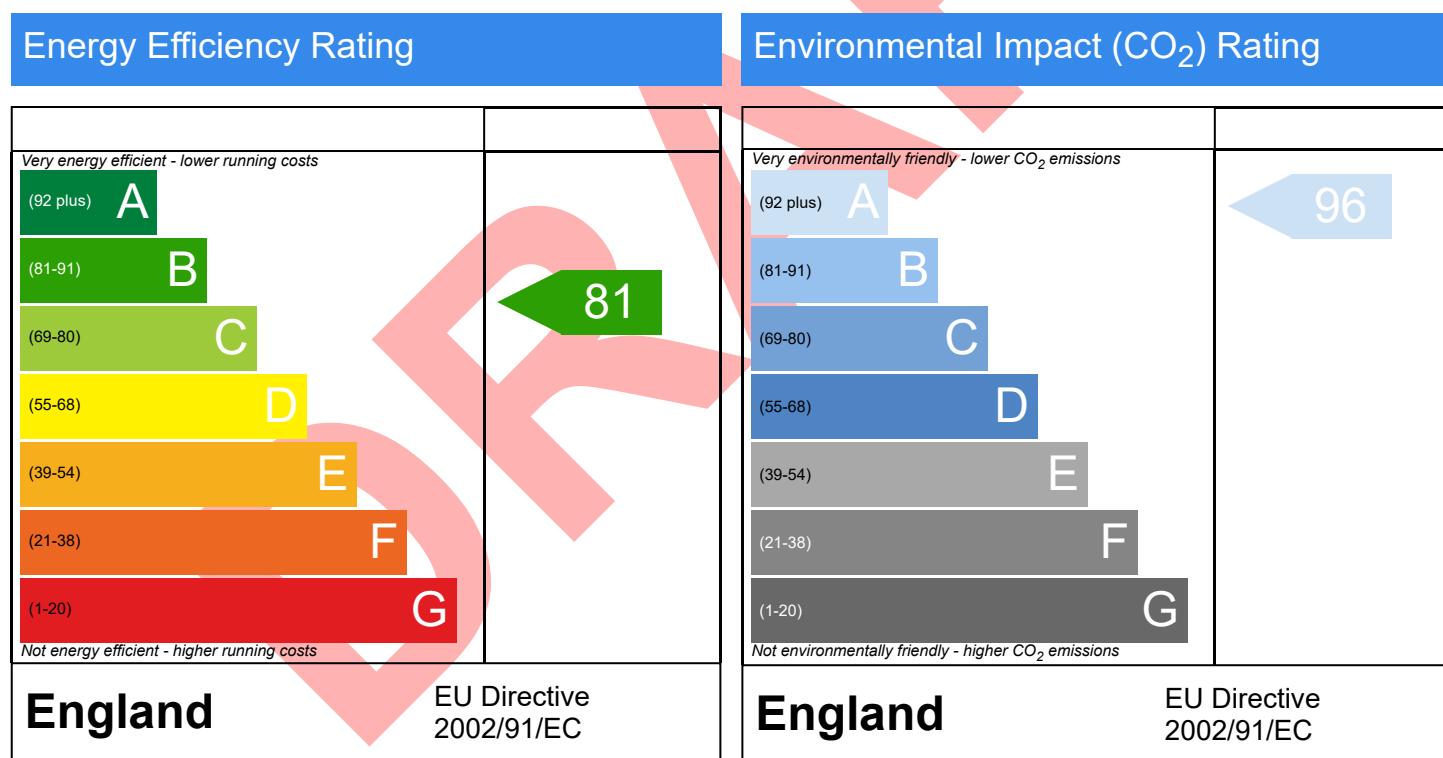
Zoar Chapel, Flat 3, South Street, Reading

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

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

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

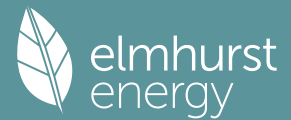
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

Thermal Bridging



Property Reference	01109	Issued on Date	03/07/2024
Assessment Reference	00001	Prop Type Ref	Semi-Detached Flat
Property	Zoar Chapel, Flat 3, South Street, Reading		

SAP Rating	81 B	DER	5.57	TER	13.71
Environmental	96 A	% DER < TER			59.37
CO ₂ Emissions (t/year)	0.26	DFEE	27.28	TFEE	28.91
Compliance Check	See BREL	% DFEE < TFEE			5.65
% DPER < TPER	18.55	DPER	59.19	TPER	72.67

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

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

Total: 62.62 W/mK:
Y-Value: 0.04 W/m²K: