

Summary for Input Data

Property Reference	SAP 0898 Plot 15	Issued on Date	06/01/2025
Assessment Reference	Rev C	Prop Type Ref	
Property	Plot 15, Wharton's Lane, Southampton		

SAP Rating	91 B	DER	10.44	TER	11.06
Environmental	91 B	% DER < TER			5.61
CO ₂ Emissions (t/year)	0.74	DFEE	31.72	TFEE	34.30
Compliance Check	See BREL	% DFEE < TFEE			7.54
% DPER < TPER	2.16	DPER	56.48	TPER	57.73

Assessor Details	Mr. Tobias Whiting	Assessor ID	E477-0001
Client			

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

Orientation	Northwest
Property Tenure	ND
Transaction Type	6
Terrain Type	Suburban
1.0 Property Type	House, Semi-Detached
Which Floor	0
2.0 Number of Storeys	2
3.0 Date Built	2023
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	195.11 kJ/m ² K
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
	Ground floor:	18.56 m	42.31 m ²	2.39 m
	1st Storey:	18.56 m	42.31 m ²	2.61 m

8.0 Living Area	12.29 m ²
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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
Brick and Block	Cavity Wall	Other	0.18	42.22	92.80	79.14	0.00	None	13.66	Calculate Wall Area

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)	Shelter Res	Shelter
Party Wall 1	Solid Wall	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	41.18	0.00	None

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Ground Floor Stud	Plasterboard on timber frame	9.00	48.94
First Floor Stud	Plasterboard on timber frame	9.00	94.78
Ground Floor Block	Dense block, plasterboard on dabs	75.00	26.85

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area (m ²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Pitched Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	42.31	42.31	None	0.00	Calculate Wall Area	0.00

Description	Storey	Construction	Area (m ²)
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Summary for Input Data

Internal Ceiling 1 Lowest occupied Plasterboard ceiling, carpeted chipboard floor 42.31

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Lowest occupied	Other	0.12	None	0.00	90.00	42.31

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
First Floor		Plasterboard ceiling, carpeted chipboard floor	9.00	42.31

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door				0.00			1.10
Windows	Manufacturer	Window	Double Low-E Soft 0.1			0.45		0.70	1.00

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Front Door	Front Door	Brick and Block	North West	2.15	0
Front Elevation	Windows	Brick and Block	North West	3.81	0
Rear Elevation	Windows	Brick and Block	South East	6.97	0
Side Elevation	Windows	Brick and Block	North East	0.72	0

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	9.87	0.03	0.03 Catnic	No
E3 Sill	Independently assessed	7.27	0.03	0.03 Knauf P5	No
E4 Jamb	Independently assessed	24.00	0.02	0.02 Knauf P6	No
E5 Ground floor (normal)	Independently assessed	18.56	0.06	0.06 SEES-2242-E5	No
E6 Intermediate floor within a dwelling	Independently assessed	18.56	0.00	0.00 Knauf P14	No
E10 Eaves (insulation at ceiling level)	Non Gov Approved Schemes	18.56	0.07	0.07 Knauf P16	No
E16 Corner (normal)	Independently assessed	10.00	0.04	0.04 Knauf P23	No
E18 Party wall between dwellings	Independently assessed	10.00	0.03	0.03 Knauf P25 Halved	No
P1 Party wall - Ground floor	Table K1 - Default	8.24	0.32	0.32 K1	No
P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	8.24	0.00	0.00 K1	No
P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	8.24	0.03	0.03 Knauf P29 Halved	No

Y-value 0.04 W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - centralised
MV Reference Number	500031
Configuration	2
MVHR Duct Insulated	Uninsulated Ducts
Manufacturer SFP	0.41
Duct Type	Rigid
Wet Rooms	2
SFP from Installer Commissioning Certificate	No

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	0

Summary for Input Data

Number of passive vents

Number of flueless gas fires

21.0 Fixed Cooling System

22.0 Pressure Testing

Designed AP₅₀ m³/(h.m²) @ 50 Pa

Property Tested?

Test Method

22.0 Lighting

No Fixed Lighting

Name	Efficacy	Power	Capacity	Count
Low energy Lighting	78.00	10.00	780.00	16

24.0 Main Heating 1

Description

Percentage of Heat %

Database Ref. No.

Fuel Type

SAP Code

In Winter

In Summer

Model Name

Manufacturer

System Type

Controls SAP Code

PCDF Controls

Delayed Start Stat

Burner Control

Boiler Compensator

HETAS approved System

Flue Type

Fan Assisted Flue

Is MHS Pumped

Heating Pump Age

Heat Emitter

Flow Temperature

Flow Temperature Value

Boiler Interlock

Combi boiler type

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									

27.0 Secondary Heating

28.0 Water Heating

Water Heating

Summary for Input Data

SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	Yes
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
Baths connected to WWHRS	0
Supplementary Immersion	No
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Ensuite	Combi boiler or unvented hot water system	8.00		Yes	Instantaneous System 1

28.3 Waste Water Heat Recovery System Instantaneous System 1

Database ID	80194
Brand Model	Zypho, Slim DW50
Details	Year: 2022 + current Efficiency: 54.9 Utilisation factor: 0.987

29.0 Hot Water Cylinder

Cylinder Stat	None	
Cylinder In Heated Space	No	
Independent Time Control	No	
Insulation Type	None	
Insulation Thickness	0	
Cylinder Volume	0.00	L
Loss	0.00	kWh/day
In Airing Cupboard	No	

31.0 Thermal Store

Thermal Store Pipework	None
	within a single casing

32.0 Photovoltaic Unit

Export Capable Meter?	One Dwelling
Connected To Dwelling	Yes
Diverter	Yes
Battery Capacity [kWh]	No
	0.00

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
1.22	South East	30°	None Or Little	No	No	1.00		

34.0 Small-scale Hydro

Electricity Generated	None	
Apportioned	0.00	kWh/Year
Connected to dwelling's electricity meter	0.00	
Electricity Generation	Yes	
	Annual	

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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Recommendations
Lower cost measures
None

Summary for Input Data



Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating			B 91	A 93
			0	0
			0	0

Full SAP Calculation Printout



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Assessment Reference	Rev C		Prop Type Ref			
Property	Plot 15, Wharton's Lane, Southampton					
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Environmental	91 B	% DER < TER				5.61
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Compliance Check	See BREL	% DFEE < TFEE				7.54
% DPER < TPER	2.16	DPER	56.48	TPER	57.73	
Assessor Details	Mr. Tobias Whiting				Assessor ID	E477-0001
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	42.3100 (1b)	x 2.3900 (2b)	= 101.1209 (1b) - (3b)
First floor	42.3100 (1c)	x 2.6100 (2c)	= 110.4291 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.5500 (5)

2. Ventilation rate

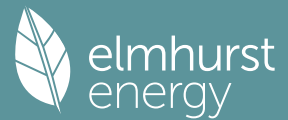
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (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) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2000 (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) = 0.1700 (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	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998 (22b)
Mechanical extract ventilation - centralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
Front Door			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.00)			11.5000	0.9615	11.0577		(27)
Ground Floor			42.3100	0.1200	5.0772	90.0000	3807.9000 (28a)
Brick and Block		13.6500	79.1500	0.1800	14.2470	42.2200	3341.7130 (29a)
Pitched Roof	92.8000		42.3100	0.0900	3.8079	9.0000	380.7900 (30)
Total net area of external elements Aum(A, m ²)			177.4200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.5548		(33)
Party Wall 1			41.1800	0.0000	0.0000	110.0000	4529.8000 (32)
Ground Floor Stud			48.9400			9.0000	440.4600 (32c)
First Floor Stud			94.7800			9.0000	853.0200 (32c)
Ground Floor Block			26.8500			75.0000	2013.7500 (32c)
First Floor			42.3100			18.0000	761.5800 (32d)
Internal Ceiling 1			42.3100			9.0000	380.7900 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	16509.8030 (34)

Full SAP Calculation Printout



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

195.1052 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	9.8740	0.0300	0.2962
E2 Other lintels (including other steel lintels)	7.2700	0.0250	0.1817
E3 Sill	24.0000	0.0190	0.4560
E4 Jamb	18.5600	0.0580	1.0765
E5 Ground floor (normal)	18.5600	0.0020	0.0371
E6 Intermediate floor within a dwelling	18.5600	0.0650	1.2064
E10 Eaves (insulation at ceiling level)	9.9960	0.0360	0.3599
E16 Corner (normal)	9.9960	0.0280	0.2799
E18 Party wall between dwellings	8.2400	0.3200	2.6368
P1 Party wall - Ground floor	8.2400	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	8.2400	0.0340	0.2802
P4 Party wall - Roof (insulation at ceiling level)			

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

6.8107 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 43.3655 (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	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058
Heat transfer coeff	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712
Average = Sum(39)m / 12 =												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250
HLP (average)												
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5447 (42)
Hot water usage for mixer showers	66.8860	65.8809	64.4161	61.6136	59.5455	57.2391	55.9281	57.3818	58.9752	61.4516	64.3143	66.6298	(42a)
Hot water usage for baths	28.8864	28.4574	27.8533	26.7394	25.9053	24.9804	24.4809	25.0808	25.7340	26.7236	27.8604	28.7887	(42b)
Hot water usage for other uses	40.6903	39.2106	37.7310	36.2514	34.7717	33.2921	33.2921	34.7717	36.2514	37.7310	39.2106	40.6903	(42c)
Average daily hot water use (litres/day)													125.4401 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	136.4627	133.5489	130.0004	124.6044	120.2225	115.5116	113.7011	117.2342	120.9605	125.9062	131.3854	136.1088 (44)
Energy conte	216.1236	190.1719	199.8058	170.5771	161.8426	142.0350	137.5116	145.1605	149.1564	170.8535	187.1825	213.1135 (45)
Energy content (annual)										Total =	Sum(45)m =	2083.5339
Distribution loss (46)m = 0.15 x (45)m	32.4185	28.5258	29.9709	25.5866	24.2764	21.3052	20.6267	21.7741	22.3735	25.6280	28.0774	31.9670 (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 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 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 0.0000 (59)

Combi loss 1.6233 1.4894 1.6428 1.5037 1.5047 1.3942 1.3772 1.3973 1.3747 1.4817 1.5105 1.6090 (61)

Total heat required for water heating calculated for each month

WWHRS -46.9638 -41.5351 -43.4932 -36.0141 -33.5638 -28.7208 -26.9212 -28.6280 -29.7157 -35.0315 -39.6864 -46.0941 (63a)

FV 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 170.7832 150.1261 157.9554 136.0668 129.7835 114.7083 111.9676 117.9298 120.8154 137.3037 149.0066 168.6284 (64)

12Total per year (kWh/year) Total per year (kWh/year) = Sum(64)m = 1665.0748 (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 72.2669 63.6045 66.8461 57.0928 54.1888 47.5752 46.0669 48.6152 49.9382 57.1792 62.6158 71.2625 (65)

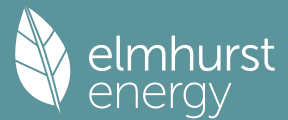
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	124.6271	137.9800	124.6271	128.7813	124.6271	128.7813	124.6271	124.6271	128.7813	124.6271	128.7813	124.6271	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.8250	231.1995	225.2159	212.4774	196.3974	181.2845	171.1881	168.8137	174.7973	187.5357	203.6157	218.7287	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	(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)	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	(71)
Water heating gains (Table 5)	97.1330	94.6495	89.8469	79.2956	72.8345	66.0766	61.9179	65.3430	69.3586	76.8538	86.9664	95.7829	(72)
Total internal gains	514.7556	527.9995	503.8604	484.7249	458.0295	437.3130	418.9036	419.9543	434.1077	453.1871	483.5340	503.3092	(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
Northeast	0.7200	11.2829	0.4500	0.7000	0.7700	1.7734 (75)
Southeast	6.9700	36.7938	0.4500	0.7000	0.7700	55.9824 (77)
Northwest	3.8100	11.2829	0.4500	0.7000	0.7700	9.3841 (81)

Full SAP Calculation Printout



Solar gains	67.1398	118.0700	171.3925	228.8636	271.4066	276.0685	263.4027	230.6509	191.1356	133.1467	81.0930	57.0210 (83)
Total gains	581.8954	646.0696	675.2529	713.5884	729.4361	713.3815	682.3063	650.6051	625.2433	586.3338	564.6269	560.3302 (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	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919
alpha	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061
util living area	0.9894	0.9813	0.9667	0.9243	0.8298	0.6601	0.4959	0.5394	0.7647	0.9347	0.9803	0.9912 (86)
MIT	19.8204	19.9900	20.2224	20.5363	20.8022	20.9515	20.9902	20.9853	20.9001	20.5710	20.1380	19.7749 (87)
Th 2	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463 (88)
util rest of house	0.9869	0.9768	0.9585	0.9049	0.7874	0.5865	0.4039	0.4457	0.6988	0.9139	0.9748	0.9891 (89)
MIT 2	19.0721	19.2394	19.4674	19.7680	20.0064	20.1210	20.1431	20.1411	20.0877	19.8054	19.3871	19.0271 (90)
Living area fraction										FLA = Living area / (4) =		0.1452 (91)
MIT	19.1808	19.3484	19.5771	19.8796	20.1220	20.2416	20.2661	20.2637	20.2057	19.9166	19.4961	19.1357 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1808	19.3484	19.5771	19.8796	20.1220	20.2416	20.2661	20.2637	20.2057	19.9166	19.4961	19.1357 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9831	0.9715	0.9516	0.8978	0.7861	0.5952	0.4171	0.4590	0.7038	0.9072	0.9694	0.9857 (94)
Useful gains	572.0595	627.6296	642.5971	640.6243	573.3799	424.5851	284.5647	298.6005	440.0224	531.9161	547.3461	552.3177 (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	1164.7350	1130.8975	1023.5591	859.3845	659.1995	441.5776	286.9520	302.4156	477.8987	729.2237	970.2599	1169.0358 (97)
Space heating kWh	440.9506	338.1960	283.4358	157.5074	63.8498	0.0000	0.0000	0.0000	0.0000	146.7969	304.4980	458.8383 (98a)
Space heating requirement - total per year (kWh/year)												2194.0727
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	440.9506	338.1960	283.4358	157.5074	63.8498	0.0000	0.0000	0.0000	0.0000	146.7969	304.4980	458.8383 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2194.0727
Space heating per m2										(98c) / (4) =		25.9285 (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 %)												88.7000 (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	440.9506	338.1960	283.4358	157.5074	63.8498	0.0000	0.0000	0.0000	0.0000	146.7969	304.4980	458.8383 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	497.1258	381.2808	319.5443	177.5731	71.9840	0.0000	0.0000	0.0000	0.0000	165.4982	343.2897	517.2923 (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	170.7832	150.1261	157.9554	136.0668	129.7835	114.7083	111.9676	117.9298	120.8154	137.3037	149.0066	168.6284 (64)
Efficiency of water heater	84.8157	84.4415	83.7817	82.4326	79.9135	76.2000	76.2000	76.2000	76.2000	82.1844	84.1637	76.2000 (216)
Fuel for water heating, kWh/month	201.3580	177.7872	188.5321	165.0643	162.4049	150.5359	146.9390	154.7636	158.5505	167.0679	177.0438	84.9547 (217)
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	19.8862	17.9617	19.8862	19.2447	19.8862	19.2447	19.8862	19.8862	19.2447	19.8862	19.2447	19.8862 (231)
Lighting	26.1258	20.9591	18.8713	13.8259	10.6795	8.7253	9.7422	12.6633	16.4484	21.5812	24.3759	26.8519 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-20.0355	-30.6896	-48.1000	-58.5998	-66.7765	-63.6584	-62.8125	-57.4248	-48.3684	-36.9354	-22.8032	-16.9991 (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	-6.7440	-15.2186	-32.8014	-52.9023	-73.0116	-74.4517	-73.1984	-60.1736	-41.6760	-22.5415	-9.2145	-5.2329 (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												2473.5881 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												76.2000
Water heating fuel used												2048.5391 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.5740)												
mechanical ventilation fans (SFP = 0.5740)												148.1442 (230a)

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central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	234.1442 (231)
Electricity for lighting (calculated in Appendix L)	210.8498 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1000.3695 (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	3966.7518 (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	2473.5881	0.2100	519.4535 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2048.5391	0.2100	430.1932 (264)
Space and water heating			949.6467 (265)
Pumps, fans and electric keep-hot	234.1442	0.1387	32.4787 (267)
Energy for lighting	210.8498	0.1443	30.4321 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-533.2029	0.1330	-70.9107
PV Unit electricity exported	-467.1666	0.1241	-57.9717
Total			-128.8824 (269)
Total CO2, kg/year			883.6752 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.4400 (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	2473.5881	1.1300	2795.1546 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2048.5391	1.1300	2314.8492 (278)
Space and water heating			5110.0038 (279)
Pumps, fans and electric keep-hot	234.1442	1.5128	354.2134 (281)
Energy for lighting	210.8498	1.5338	323.4085 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-533.2029	1.4914	-795.2293
PV Unit electricity exported	-467.1666	0.4554	-212.7574
Total			-1007.9867 (283)
Total Primary energy kWh/year			4779.6390 (286)
Dwelling Primary energy Rate (DPER)			56.4800 (287)

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

1. Overall dwelling characteristics

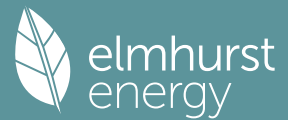
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	42.3100 (1b)	x 2.3900 (2b)	= 101.1209 (1b) - (3b)
First floor	42.3100 (1c)	x 2.6100 (2c)	= 110.4291 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.5500 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1418 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3918 (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) = 0.3330 (21)

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

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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												
Effective ac	0.4246	0.4163	0.4080	0.3663	0.3580	0.3164	0.3164	0.3081	0.3330	0.3580	0.3747	0.3913 (22b)
	0.5902	0.5867	0.5832	0.5671	0.5641	0.5501	0.5501	0.5475	0.5555	0.5641	0.5702	0.5766 (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			2.1500	1.0000	2.1500		(26)
TER Opening Type (Uw = 1.20)			11.5000	1.1450	13.1679		(27)
Ground Floor			42.3100	0.1300	5.5003		(28a)
Brick and Block	92.8000	13.6500	79.1500	0.1800	14.2470		(29a)
Pitched Roof	42.3100		42.3100	0.1100	4.6541		(30)
Total net area of external elements Aum(A, m2)			177.4200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.7193		(33)
Party Wall 1			41.1800	0.0000	0.0000		(32)

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

195.1052 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.8740	0.0500	0.4937
E3 Sill	7.2700	0.0500	0.3635
E4 Jamb	24.0000	0.0500	1.2000
E5 Ground floor (normal)	18.5600	0.1600	2.9696
E6 Intermediate floor within a dwelling	18.5600	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	18.5600	0.0600	1.1136
E16 Corner (normal)	9.9960	0.0900	0.8996
E18 Party wall between dwellings	9.9960	0.0600	0.5998
P1 Party wall - Ground floor	8.2400	0.0800	0.6592
P2 Party wall - Intermediate floor within a dwelling	8.2400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	8.2400	0.1200	0.9888
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.2878 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 49.0071 (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	41.1995	40.9551	40.7155	39.5903	39.3798	38.3998	38.3998	38.2184	38.7773	39.3798	39.8057	40.2509 (38)
Heat transfer coeff	90.2066	89.9622	89.7227	88.5975	88.3870	87.4070	87.4070	87.2255	87.7845	88.3870	88.8128	89.2581 (39)
Average = Sum(39)m / 12 =												88.5965

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0660	1.0631	1.0603	1.0470	1.0445	1.0329	1.0329	1.0308	1.0374	1.0445	1.0495	1.0548 (40)
HLP (average)												1.0470
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

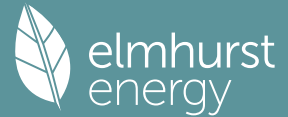
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5447 (42)
Hot water usage for mixer showers												
66.8860	65.8809	64.4161	61.6136	59.5455	57.2391	55.9281	57.3818	58.9752	61.4516	64.3143	66.6298 (42a)	
Hot water usage for baths												
28.8864	28.4574	27.8533	26.7394	25.9053	24.9804	24.4809	25.0808	25.7340	26.7236	27.8604	28.7887 (42b)	
Hot water usage for other uses												
40.6903	39.2106	37.7310	36.2514	34.7717	33.2921	33.2921	34.7717	36.2514	37.7310	39.2106	40.6903 (42c)	
Average daily hot water use (litres/day)												125.4401 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
136.4627	133.5489	130.0004	124.6044	120.2225	115.5116	113.7011	117.2342	120.9605	125.9062	131.3854	136.1088 (44)	
Energy content (annual)	216.1236	190.1719	199.8058	170.5771	161.8426	142.0350	137.5116	145.1605	149.1564	170.8535	187.1825	213.1135 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2083.5339
32.4185	28.5258	29.9709	25.5866	24.2764	21.3052	20.6267	21.7741	22.3735	25.6280	28.0774	31.9670 (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 (59)	
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
267.0825	236.1993	250.7647	219.8922	212.8015	191.3500	188.4705	196.1194	198.4715	221.8124	236.4976	264.0724 (62)	
WWHRS	-30.5775	-27.0430	-28.3179	-23.4483	-21.8530	-18.6997	-17.5280	-18.6393	-19.3475	-22.8085	-25.8393	-30.0112 (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												
236.5050	209.1563	222.4468	196.4439	190.9485	172.6503	170.9424	177.4801	179.1240	199.0039	210.6583	234.0611 (64)	
12Total per year (kWh/year)												2399.4206 (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 (64a)	
												0.0000 (64a)
Heat gains from water heating, kWh/month												
84.6008	74.7390	79.1751	69.0457	66.5524	59.5554	58.4623	61.0056	61.9233	69.5485	74.5670	83.6000 (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	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	124.6271	137.9800	124.6271	128.7813	124.6271	128.7813	124.6271	124.6271	128.7813	124.6271	128.7813	124.6271 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.8250	231.1995	225.2159	212.4774	196.3974	181.2845	171.1881	168.8137	174.7973	187.5357	203.6157	218.7287 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235 (69)

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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)											
	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881 (71)
Water heating gains (Table 5)												
	113.7108	111.2187	106.4182	95.8968	89.4521	82.7158	78.5784	81.9968	86.0046	93.4792	103.5652	112.3655 (72)
Total internal gains												
	531.3334	544.5688	520.4317	501.3260	474.6472	453.9522	435.5641	436.6080	450.7537	469.8125	500.1328	519.8918 (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
Northeast					0.7200	11.2829	0.6300	0.7000			0.7700			2.4827 (75)
Southeast					6.9700	36.7938	0.6300	0.7000			0.7700			78.3754 (77)
Northwest					3.8100	11.2829	0.6300	0.7000			0.7700			13.1377 (81)
Solar gains	93.9958	165.2981	239.9495	320.4090	379.9693	386.4959	368.7637	322.9112	267.5898	186.4054	113.5302			79.8294 (83)
Total gains	625.3292	709.8668	760.3812	821.7350	854.6164	840.4481	804.3279	759.5192	718.3435	656.2179	613.6629			599.7212 (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	50.8395	50.9776	51.1137	51.7628	51.8861	52.4679	52.4679	52.5770	52.2422	51.8861	51.6373	51.3797
alpha	4.3893	4.3985	4.4076	4.4509	4.4591	4.4979	4.4979	4.5051	4.4828	4.4591	4.4425	4.4253
util living area	0.9876	0.9774	0.9588	0.9066	0.8006	0.6257	0.4690	0.5138	0.7419	0.9243	0.9769	0.9895 (86)
MIT	19.6117	19.8207	20.1056	20.4870	20.7837	20.9472	20.9884	20.9827	20.8856	20.5093	20.0046	19.5813 (87)
Th 2	20.0287	20.0311	20.0334	20.0443	20.0464	20.0560	20.0560	20.0578	20.0523	20.0464	20.0422	20.0379 (88)
util rest of house	0.9845	0.9719	0.9484	0.8829	0.7522	0.5473	0.3727	0.4151	0.6697	0.9000	0.9703	0.9869 (89)
MIT 2	18.4190	18.6848	19.0439	19.5173	19.8554	20.0219	20.0513	20.0502	19.9687	19.5544	18.9279	18.3868 (90)
Living area fraction									FLA = Living area / (4) =			0.1452 (91)
MIT	18.5922	18.8498	19.1981	19.6581	19.9902	20.1563	20.1874	20.1856	20.1019	19.6931	19.0843	18.5603 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5922	18.8498	19.1981	19.6581	19.9902	20.1563	20.1874	20.1856	20.1019	19.6931	19.0843	18.5603 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9781	0.9629	0.9370	0.8715	0.7490	0.5561	0.3864	0.4289	0.6738	0.8890	0.9614	0.9812 (94)
Useful gains	611.6036	683.4961	712.4446	716.1691	640.1478	467.3636	310.7833	325.7792	484.0550	583.3705	589.9757	588.4669 (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	1289.2517	1254.9513	1139.3061	953.1409	732.7446	485.6584	313.5638	330.2020	526.8719	803.7094	1064.3586	1281.7741 (97)
Space heating kWh	504.1701	384.0179	317.5850	170.6197	68.8920	0.0000	0.0000	0.0000	0.0000	163.9322	341.5557	515.8206 (98a)
Space heating requirement - total per year (kWh/year)												2466.5932
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	504.1701	384.0179	317.5850	170.6197	68.8920	0.0000	0.0000	0.0000	0.0000	163.9322	341.5557	515.8206 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2466.5932
Space heating per m2										(98c) / (4) =		29.1491 (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 %)												92.4000 (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	504.1701	384.0179	317.5850	170.6197	68.8920	0.0000	0.0000	0.0000	0.0000	163.9322	341.5557	515.8206 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	545.6387	415.6038	343.7067	184.6533	74.5585	0.0000	0.0000	0.0000	0.0000	177.4158	369.6490	558.2474 (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	236.5050	209.1563	222.4468	196.4439	190.9485	172.6503	170.9424	177.4801	179.1240	199.0039	210.6583	234.0611 (64)
Efficiency of water heater (217)m	85.9604	85.6650	85.1438	84.0808	82.4138	80.3000	80.3000	80.3000	80.3000	83.9690	85.4105	86.0243 (216)
Fuel for water heating, kWh/month	275.1326	244.1560	261.2600	233.6371	231.6949	215.0066	212.8798	221.0213	223.0685	236.9968	246.6422	272.0872 (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	25.8950	20.7740	18.7047	13.7038	10.5852	8.6482	9.6562	12.5515	16.3032	21.3906	24.1607	26.6147 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-39.3106	-55.2717	-79.2267	-88.8116	-95.5275	-89.0656	-87.9600	-83.1611	-74.6468	-63.0814	-43.1638	-34.0034 (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)

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Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-22.6395	-47.5858	-94.5147	-141.8638	-187.4987	-188.3752	-186.1618	-157.6581	-115.6037	-68.0236	-30.2168	-17.9059 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1												2669.4731 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												2873.5829 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												208.9878 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2091.2778 (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												3746.7661 (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	2669.4731	0.2100	560.5894 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2873.5829	0.2100	603.4524 (264)
Space and water heating			1164.0418 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	208.9878	0.1443	30.1634 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-833.2302	0.1346	-112.1942
PV Unit electricity exported	-1258.0476	0.1259	-158.4058
Total			-270.6001 (269)
Total CO2, kg/year			935.5344 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.0600 (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	2669.4731	1.1300	3016.5046 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2873.5829	1.1300	3247.1486 (278)
Space and water heating			6263.6533 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	208.9878	1.5338	320.5525 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-833.2302	1.4976	-1247.8840
PV Unit electricity exported	-1258.0476	0.4622	-581.4593
Total			-1829.3433 (283)
Total Primary energy kWh/year			4884.9633 (286)
Target Primary Energy Rate (TPER)			57.7300 (287)

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Property Reference	SAP 0898 Plot 15				Issued on Date	06/01/2025
Assessment Reference	Rev C		Prop Type Ref			
Property	Plot 15, Wharton's Lane, Southampton					
SAP Rating	91 B	DER	10.44	TER	11.06	
Environmental	91 B	% DER < TER				5.61
CO ₂ Emissions (t/year)	0.74	DFEE	31.72	TFEE	34.30	
Compliance Check	See BREL	% DFEE < TFEE				7.54
% DPER < TPER	2.16	DPER	56.48	TPER	57.73	
Assessor Details	Mr. Tobias Whiting				Assessor ID	E477-0001
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	42.3100 (1b)	x 2.3900 (2b)	= 101.1209 (1b) - (3b)
First floor	42.3100 (1c)	x 2.6100 (2c)	= 110.4291 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.5500 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 30.0000 / (5) = 0.1418 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3418 (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) = 0.2905 (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	0.3704	0.3632	0.3559	0.3196	0.3123	0.2760	0.2760	0.2687	0.2905	0.3123	0.3269	0.3414 (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	0.5686	0.5659	0.5633	0.5511	0.5488	0.5381	0.5381	0.5361	0.5422	0.5488	0.5534	0.5583 (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
Front Door			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.00)			11.5000	0.9615	11.0577		(27)
Ground Floor			42.3100	0.1200	5.0772	90.0000	3807.9000 (28a)
Brick and Block		13.6500	79.1500	0.1800	14.2470	42.2200	3341.7130 (29a)
Pitched Roof	92.8000		42.3100	0.0900	3.8079	9.0000	380.7900 (30)
Total net area of external elements Aum(A, m ²)			177.4200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.5548		(33)
Party Wall 1			41.1800	0.0000	0.0000	110.0000	4529.8000 (32)
Ground Floor Stud			48.9400			9.0000	440.4600 (32c)
First Floor Stud			94.7800			9.0000	853.0200 (32c)
Ground Floor Block			26.8500			75.0000	2013.7500 (32c)
First Floor			42.3100			18.0000	761.5800 (32d)
Internal Ceiling 1			42.3100			9.0000	380.7900 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	16509.8030 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							195.1052 (35)
List of Thermal Bridges							

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K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.8740	0.0300	0.2962
E3 Sill	7.2700	0.0250	0.1817
E4 Jamb	24.0000	0.0190	0.4560
E5 Ground floor (normal)	18.5600	0.0580	1.0765
E6 Intermediate floor within a dwelling	18.5600	0.0020	0.0371
E10 Eaves (insulation at ceiling level)	18.5600	0.0650	1.2064
E16 Corner (normal)	9.9960	0.0360	0.3599
E18 Party wall between dwellings	9.9960	0.0280	0.2799
P1 Party wall - Ground floor	8.2400	0.3200	2.6368
P2 Party wall - Intermediate floor within a dwelling	8.2400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	8.2400	0.0340	0.2802
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.8107 (36)
Point Thermal bridges			0.0000 (36a) =
Total fabric heat loss			43.3655 (37) (33) + (36) + (36a) =

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	39.6956	39.5096	39.3273	38.4710	38.3108	37.5650	37.5650	37.4268	37.8522	38.3108	38.6349	38.9738 (38)
Average = Sum(39)m / 12 =	83.0611	82.8751	82.6928	81.8365	81.6763	80.9304	80.9304	80.7923	81.2177	81.6763	82.0004	82.3392 (39)
	81.8357											
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9816	0.9794	0.9772	0.9671	0.9652	0.9564	0.9564	0.9548	0.9598	0.9652	0.9690	0.9730 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.5447 (42)
Hot water usage for mixer showers												
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for other uses	28.8864	28.4574	27.8533	26.7394	25.9053	24.9804	24.4809	25.0808	25.7340	26.7236	27.8604	28.7887 (42b)
Average daily hot water use (litres/day)	40.6903	39.2106	37.7310	36.2514	34.7717	33.2921	33.2921	34.7717	36.2514	37.7310	39.2106	40.6903 (42c)
												63.7734 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	69.5767	67.6680	65.5843	62.9907	60.6770	58.2725	57.7729	59.8525	61.9853	64.4546	67.0711	69.4790 (44)
Energy content (annual)	110.1925	96.3584	100.8006	86.2312	81.6829	71.6528	69.8714	74.1099	76.4341	87.4643	95.5550	108.7874 (45)
Distribution loss (46)m = 0.15 x (45)m												1059.1404
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	93.6636	81.9046	85.6805	73.2965	69.4305	60.9049	59.3907	62.9934	64.9690	74.3446	81.2218	92.4693 (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	93.6636	81.9046	85.6805	73.2965	69.4305	60.9049	59.3907	62.9934	64.9690	74.3446	81.2218	92.4693 (64)
12Total per year (kWh/year)												900.2693 (64)
Electric shower(s)	53.5646	47.7265	52.1155	49.7332	50.6664	48.3308	49.9418	50.6664	49.7332	52.1155	51.1355	53.5646 (64a)
												609.2937 (64a)
Heat gains from water heating, kWh/month	36.8070	32.4078	34.4490	30.7574	30.0242	27.3089	27.3331	28.4149	28.6755	31.6150	33.0893	36.5085 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	124.6271	137.9800	124.6271	128.7813	124.6271	128.7813	124.6271	124.6271	128.7813	124.6271	128.7813	124.6271 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	228.8250	231.1995	225.2159	212.4774	196.3974	181.2845	171.1881	168.8137	174.7973	187.5357	203.6157	218.7287 (68)
Pumps, fans	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881 (71)
Total internal gains	49.4718	48.2259	46.3024	42.7186	40.3551	37.9291	36.7381	38.1921	39.8271	42.4933	45.9574	49.0705 (72)
	464.0945	478.5759	457.3159	445.1479	422.5502	409.1654	393.7238	392.8034	404.5763	415.8266	439.5250	453.5968 (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
Northeast					0.7200	11.2829	0.4500	0.7000		0.7700		1.7734 (75)
Southeast					6.9700	36.7938	0.4500	0.7000		0.7700		55.9824 (77)
Northwest					3.8100	11.2829	0.4500	0.7000		0.7700		9.3841 (81)
Solar gains	67.1398	118.0700	171.3925	228.8636	271.4066	276.0685	263.4027	230.6509	191.1356	133.1467	81.0930	57.0210 (83)
Total gains	531.2343	596.6459	628.7084	674.0115	693.9568	685.2339	657.1265	623.4542	595.7118	548.9734	520.6179	510.6178 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	55.2130	55.3370	55.4590	56.0393	56.1492	56.6667	56.6667	56.7635	56.4662	56.1492	55.9273	55.6971
alpha	4.6809	4.6891	4.6973	4.7360	4.7433	4.7778	4.7778	4.7842	4.7644	4.7433	4.7285	4.7131
util living area	0.9931	0.9872	0.9765	0.9420	0.8610	0.6954	0.5282	0.5748	0.8003	0.9514	0.9865	0.9942 (86)
MIT	19.6316	19.8129	20.0676	20.4324	20.7410	20.9337	20.9856	20.9787	20.8662	20.4773	20.0002	19.6033 (87)
Th 2	20.0987	20.1006	20.1024	20.1108	20.1124	20.1198	20.1198	20.1212	20.1170	20.1124	20.1092	20.1059 (88)
util rest of house	0.9913	0.9839	0.9702	0.9257	0.8218	0.6198	0.4289	0.4745	0.7361	0.9346	0.9825	0.9928 (89)
MIT 2	18.8480	19.0291	19.2819	19.6420	19.9257	20.0846	20.1150	20.1135	20.0366	19.6908	19.2227	18.8254 (90)
Living area fraction	18.9618	19.1429	19.3960	19.7568	20.0441	20.2079	20.2415	20.2391	fLA = Living area / (4) =			0.1452 (91)
MIT	18.9618	19.1429	19.3960	19.7568	20.0441	20.2079	20.2415	20.2391	20.1571	19.8050	19.3356	18.9384 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9618	19.1429	19.3960	19.7568	20.0441	20.2079	20.2415	20.2391	20.1571	19.8050	19.3356	18.9384 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9883	0.9794	0.9639	0.9179	0.8183	0.6279	0.4431	0.4885	0.7393	0.9273	0.9779	0.9901 (94)
Useful gains	525.0141	584.3564	606.0231	618.7020	567.8863	430.2632	291.1467	304.5510	440.4216	509.0901	509.0898	505.5816 (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	1217.8247	1180.3860	1066.4094	888.4847	681.5174	453.8518	294.7053	310.1728	491.9459	751.8301	1003.3257	1213.5453 (97)
Space heating kWh	515.4511	400.5319	342.5274	194.2435	84.5416	0.0000	0.0000	0.0000	0.0000	180.5985	355.8498	526.7249 (98a)
Space heating requirement - total per year (kWh/year)												2600.4688
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	515.4511	400.5319	342.5274	194.2435	84.5416	0.0000	0.0000	0.0000	0.0000	180.5985	355.8498	526.7249 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2600.4688
Space heating per m2										(98c) / (4) =		30.7311 (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	760.7460	598.8852	614.0216	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8186	0.8916	0.8658	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	622.7568	533.9564	531.6256	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	745.7918	715.6055	678.7671	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	88.5852	135.1469	109.4733	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	22.1463	33.7867	27.3683	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												83.3014 (107)
Energy for space heating												30.7311 (99)
Energy for space cooling												0.9844 (108)
Total												31.7156 (109)
Fabric Energy Efficiency (DFEE)												31.7 (109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

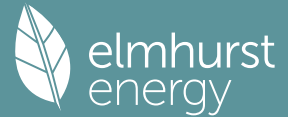
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	42.3100 (1b)	x 2.3900 (2b)	= 101.1209 (1b) - (3b)
First floor	42.3100 (1c)	x 2.6100 (2c)	= 110.4291 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.5500 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)

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Number of passive vents
Number of flueless gas fires

0 * 10 = 0.0000 (7b)
0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =
Pressure Test
Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered

Air changes per hour
30.0000 / (5) = 0.1418 (8)
Yes
Blower Door
5.0000 (17)
0.3918 (18)
2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3330 (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	0.4246	0.4163	0.4080	0.3663	0.3580	0.3164	0.3164	0.3081	0.3330	0.3580	0.3747	0.3913	(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	0.5902	0.5867	0.5832	0.5671	0.5641	0.5501	0.5501	0.5475	0.5555	0.5641	0.5702	0.5766	(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			2.1500	1.0000	2.1500			(26)
TER Opening Type (Uw = 1.20)			11.5000	1.1450	13.1679			(27)
Ground Floor			42.3100	0.1300	5.5003			(28a)
Brick and Block	92.8000	13.6500	79.1500	0.1800	14.2470			(29a)
Pitched Roof	42.3100		42.3100	0.1100	4.6541			(30)
Total net area of external elements Aum(A, m2)			177.4200					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 39.7193			(33)
Party Wall 1			41.1800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 195.1052 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	9.8740	0.0500	0.4937	
E3 Sill	7.2700	0.0500	0.3635	
E4 Jamb	24.0000	0.0500	1.2000	
E5 Ground floor (normal)	18.5600	0.1600	2.9696	
E6 Intermediate floor within a dwelling	18.5600	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	18.5600	0.0600	1.1136	
E16 Corner (normal)	9.9960	0.0900	0.8996	
E18 Party wall between dwellings	9.9960	0.0600	0.5998	
P1 Party wall - Ground floor	8.2400	0.0800	0.6592	
P2 Party wall - Intermediate floor within a dwelling	8.2400	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	8.2400	0.1200	0.9888	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2878 (36)

Point Thermal bridges

Total fabric heat loss (33) + (36) + (36a) = 49.0071 (37)

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

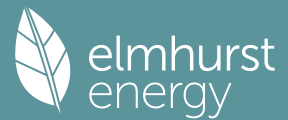
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	41.1995	40.9551	40.7155	39.5903	39.3798	38.3998	38.3998	38.2184	38.7773	39.3798	39.8057	40.2509	(38)
Heat transfer coeff	90.2066	89.9622	89.7227	88.5975	88.3870	87.4070	87.4070	87.2255	87.7845	88.3870	88.8128	89.2581	(39)
Average = Sum(39)m / 12 =												88.5965	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0660	1.0631	1.0603	1.0470	1.0445	1.0329	1.0329	1.0308	1.0374	1.0445	1.0495	1.0548	(40)
HLP (average)												1.0470	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5447 (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	0.0000	(42a)
Hot water usage for baths	28.8864	28.4574	27.8533	26.7394	25.9053	24.9804	24.4809	25.0808	25.7340	26.7236	27.8604	28.7887	(42b)
Hot water usage for other uses	40.6903	39.2106	37.7310	36.2514	34.7717	33.2921	33.2921	34.7717	36.2514	37.7310	39.2106	40.6903	(42c)
Average daily hot water use (litres/day)													63.7734 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	69.5767	67.6680	65.5843	62.9907	60.6770	58.2725	57.7729	59.8525	61.9853	64.4546	67.0711	69.4790	(44)
Energy content (annual)	110.1925	96.3584	100.8006	86.2312	81.6829	71.6528	69.8714	74.1099	76.4341	87.4643	95.5550	108.7874	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1059.1404	
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	(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													
93.6636	81.9046	85.6805	73.2965	69.4305	60.9049	59.3907	62.9934	64.9690	74.3446	81.2218	92.4693	(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	93.6636	81.9046	85.6805	73.2965	69.4305	60.9049	59.3907	62.9934	64.9690	74.3446	81.2218	92.4693	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		900.2693	(64)
Electric shower(s)	53.5646	47.7265	52.1155	49.7332	50.6664	48.3308	49.9418	50.6664	49.7332	52.1155	51.1355	53.5646	(64a)

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Heat gains from water heating, kWh/month
36.8070 32.4078 34.4490 30.7574 30.0242 27.3089 27.3331 28.4149 28.6755 31.6150 33.0893 36.5085 (65)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 609.2937 (64a)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	124.6271	137.9800	124.6271	128.7813	124.6271	128.7813	124.6271	124.6271	128.7813	124.6271	128.7813	124.6271	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.8250	231.1995	225.2159	212.4774	196.3974	181.2845	171.1881	168.8137	174.7973	187.5357	203.6157	218.7287	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	(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)	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	(71)
Water heating gains (Table 5)	49.4718	48.2259	46.3024	42.7186	40.3551	37.9291	36.7381	38.1921	39.8271	42.4933	45.9574	49.0705	(72)
Total internal gains	464.0945	478.5759	457.3159	445.1479	422.5502	409.1654	393.7238	392.8034	404.5763	415.8266	439.5250	453.5968	(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		
Northeast					0.7200	11.2829	0.6300	0.7000			0.7700			2.4827 (75)		
Southeast					6.9700	36.7938	0.6300	0.7000			0.7700			78.3754 (77)		
Northwest					3.8100	11.2829	0.6300	0.7000			0.7700			13.1377 (81)		
Solar gains					93.9958	165.2981	239.9495	320.4090	379.9693	386.4959	368.7637	322.9112	267.5898	186.4054	113.5302	79.8294 (83)
Total gains					558.0902	643.8739	697.2654	765.5569	802.5194	795.6613	762.4875	715.7146	672.1661	602.2321	553.0551	533.4262 (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	50.8395	50.9776	51.1137	51.7628	51.8861	52.4679	52.4679	52.5770	52.2422	51.8861	51.6373	51.3797	
alpha	4.3893	4.3985	4.4076	4.4509	4.4591	4.4979	4.4979	4.5051	4.4828	4.4591	4.4425	4.4253	
util living area	0.9919	0.9841	0.9693	0.9240	0.8265	0.6531	0.4926	0.5417	0.7727	0.9419	0.9842	0.9933	(86)
MIT	19.5118	19.7267	20.0224	20.4280	20.7509	20.9374	20.9859	20.9787	20.8643	20.4476	19.9181	19.4817	(87)
Th 2	20.0287	20.0311	20.0334	20.0443	20.0464	20.0560	20.0560	20.0578	20.0523	20.0464	20.0422	20.0379	(88)
util rest of house	0.9898	0.9801	0.9611	0.9035	0.7809	0.5738	0.3924	0.4392	0.7026	0.9220	0.9795	0.9916	(89)
MIT 2	18.6755	18.8899	19.1825	19.5806	19.8721	20.0240	20.0515	20.0504	19.9733	19.6074	19.0896	18.6527	(90)
Living area fraction	18.7970	19.0115	19.3045	19.7037	19.9997	20.1567	20.1872	20.1852	20.1027	19.7295	19.2099	18.7731	(91)
MIT	18.7970	19.0115	19.3045	19.7037	19.9997	20.1567	20.1872	20.1852	20.1027	19.7295	19.2099	18.7731	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7970	19.0115	19.3045	19.7037	19.9997	20.1567	20.1872	20.1852	20.1027	19.7295	19.2099	18.7731	(93)

8. Space heating requirement

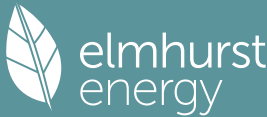
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9862	0.9745	0.9534	0.8948	0.7784	0.5828	0.4067	0.4536	0.7067	0.9137	0.9740	0.9885	(94)
Useful gains	550.3943	627.4328	664.7401	685.0170	624.6506	463.6842	310.1287	324.6374	475.0493	550.2726	538.6740	527.2861	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1307.7227	1269.4973	1148.8555	957.1766	733.5889	485.6900	313.5461	330.1643	526.9441	806.9251	1075.5159	1300.7666	(97)
Space heating kWh	563.4523	431.4674	360.1819	195.9549	81.0501	0.0000	0.0000	0.0000	0.0000	190.9495	386.5261	575.4695	(98a)
Space heating requirement - total per year (kWh/year)												2785.0516	
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	563.4523	431.4674	360.1819	195.9549	81.0501	0.0000	0.0000	0.0000	0.0000	190.9495	386.5261	575.4695	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2785.0516	
Space heating per m ²												32.9125	(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	821.6256	646.8116	662.9138	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8428	0.9065	0.8807	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	692.4802	586.3235	583.8603	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	874.8628	838.7548	786.6039	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	131.3154	187.8089	150.8412	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fc = cooled area / (4) =				(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	32.8289	46.9522	37.7103	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												117.4914	(107)
Energy for space heating												32.9125	(99)

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Energy for space cooling	1.3885 (108)
Total	34.3009 (109)
Fabric Energy Efficiency (TFEE)	34.3 (109)

Full SAP Calculation Printout



Property Reference	SAP 0898 Plot 15				Issued on Date	06/01/2025
Assessment Reference	Rev C		Prop Type Ref			
Property	Plot 15, Wharton's Lane, Southampton					
SAP Rating	91 B	DER	10.44	TER	11.06	
Environmental	91 B	% DER < TER				5.61
CO ₂ Emissions (t/year)	0.74	DFEE	31.72	TFEE	34.30	
Compliance Check	See BREL	% DFEE < TFEE				7.54
% DPER < TPER	2.16	DPER	56.48	TPER	57.73	
Assessor Details	Mr. Tobias Whiting				Assessor ID	E477-0001
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	42.3100 (1b)	x 2.3900 (2b)	= 101.1209 (1b) - (3b)
First floor	42.3100 (1c)	x 2.6100 (2c)	= 110.4291 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.5500 (5)

2. Ventilation rate

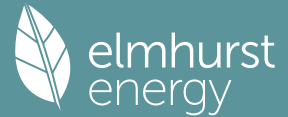
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (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) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2000 (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) = 0.1700 (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	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998 (22b)
Mechanical extract ventilation - centralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
Front Door			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.00)			11.5000	0.9615	11.0577		(27)
Ground Floor			42.3100	0.1200	5.0772	90.0000	3807.9000 (28a)
Brick and Block		13.6500	79.1500	0.1800	14.2470	42.2200	3341.7130 (29a)
Pitched Roof	92.8000		42.3100	0.0900	3.8079	9.0000	380.7900 (30)
Total net area of external elements Aum(A, m ²)			177.4200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.5548		(33)
Party Wall 1			41.1800	0.0000	0.0000	110.0000	4529.8000 (32)
Ground Floor Stud			48.9400			9.0000	440.4600 (32c)
First Floor Stud			94.7800			9.0000	853.0200 (32c)
Ground Floor Block			26.8500			75.0000	2013.7500 (32c)
First Floor			42.3100			18.0000	761.5800 (32d)
Internal Ceiling 1			42.3100			9.0000	380.7900 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	16509.8030 (34)

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

195.1052 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	9.8740	0.0300	0.2962
E2 Other lintels (including other steel lintels)	7.2700	0.0250	0.1817
E3 Sill	24.0000	0.0190	0.4560
E4 Jamb	18.5600	0.0580	1.0765
E5 Ground floor (normal)	18.5600	0.0020	0.0371
E6 Intermediate floor within a dwelling	18.5600	0.0650	1.2064
E10 Eaves (insulation at ceiling level)	9.9960	0.0360	0.3599
E16 Corner (normal)	9.9960	0.0280	0.2799
E18 Party wall between dwellings	8.2400	0.3200	2.6368
P1 Party wall - Ground floor	8.2400	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	8.2400	0.0340	0.2802
P4 Party wall - Roof (insulation at ceiling level)			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.8107 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	43.3655 (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	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058 (38)
Heat transfer coeff	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712 (39)
Average = Sum(39)m / 12 =												78.2712
HLP	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250 (40)
HLP (average)												0.9250
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5447 (42)
Hot water usage for mixer showers	66.8860	65.8809	64.4161	61.6136	59.5455	57.2391	55.9281	57.3818	58.9752	61.4516	64.3143	66.6298	(42a)
Hot water usage for baths	28.8864	28.4574	27.8533	26.7394	25.9053	24.9804	24.4809	25.0808	25.7340	26.7236	27.8604	28.7887	(42b)
Hot water usage for other uses	40.6903	39.2106	37.7310	36.2514	34.7717	33.2921	33.2921	34.7717	36.2514	37.7310	39.2106	40.6903	(42c)
Average daily hot water use (litres/day)													125.4401 (43)
Daily hot water use	136.4627	133.5489	130.0004	124.6044	120.2225	115.5116	113.7011	117.2342	120.9605	125.9062	131.3854	136.1088	(44)
Energy conte	216.1236	190.1719	199.8058	170.5771	161.8426	142.0350	137.5116	145.1605	149.1564	170.8535	187.1825	213.1135	(45)
Energy content (annual)										Total = Sum(45)m =		2083.5339	
Distribution loss (46)m = 0.15 x (45)m	32.4185	28.5258	29.9709	25.5866	24.2764	21.3052	20.6267	21.7741	22.3735	25.6280	28.0774	31.9670	(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	1.6233	1.4894	1.6428	1.5037	1.5047	1.3942	1.3772	1.3973	1.3747	1.4817	1.5105	1.6090	(61)
Total heat required for water heating calculated for each month													
WWHRS	217.7469	191.6612	201.4486	172.0809	163.3473	143.4291	138.8887	146.5578	150.5311	172.3352	188.6930	214.7225	(62)
FV diverter	-46.9638	-41.5351	-43.4932	-36.0141	-33.5638	-28.7208	-26.9212	-28.6280	-29.7157	-35.0315	-39.6864	-46.0941	(63a)
Solar input	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
Output from w/h	170.7832	150.1261	157.9554	136.0668	129.7835	114.7083	111.9676	117.9298	120.8154	137.3037	149.0066	168.6284	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1665.0748	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
													0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													
Heat gains from water heating, kWh/month	72.2669	63.6045	66.8461	57.0928	54.1888	47.5752	46.0669	48.6152	49.9382	57.1792	62.6158	71.2625	(65)

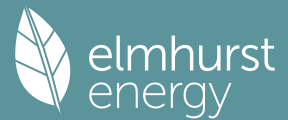
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	124.6271	137.9800	124.6271	128.7813	124.6271	128.7813	124.6271	124.6271	128.7813	124.6271	128.7813	124.6271	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.8250	231.1995	225.2159	212.4774	196.3974	181.2845	171.1881	168.8137	174.7973	187.5357	203.6157	218.7287	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	(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)	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	(71)
Water heating gains (Table 5)	97.1330	94.6495	89.8469	79.2956	72.8345	66.0766	61.9179	65.3430	69.3586	76.8538	86.9664	95.7829	(72)
Total internal gains	514.7556	527.9995	503.8604	484.7249	458.0295	437.3130	418.9036	419.9543	434.1077	453.1871	483.5340	503.3092	(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
Northeast	0.7200	11.2829	0.4500	0.7000	0.7700	1.7734 (75)
Southeast	6.9700	36.7938	0.4500	0.7000	0.7700	55.9824 (77)
Northwest	3.8100	11.2829	0.4500	0.7000	0.7700	9.3841 (81)

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Solar gains	67.1398	118.0700	171.3925	228.8636	271.4066	276.0685	263.4027	230.6509	191.1356	133.1467	81.0930	57.0210 (83)
Total gains	581.8954	646.0696	675.2529	713.5884	729.4361	713.3815	682.3063	650.6051	625.2433	586.3338	564.6269	560.3302 (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	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919
alpha	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061
util living area	0.9894	0.9813	0.9667	0.9243	0.8298	0.6601	0.4959	0.5394	0.7647	0.9347	0.9803	0.9912 (86)
MIT	19.8204	19.9900	20.2224	20.5363	20.8022	20.9515	20.9902	20.9853	20.9001	20.5710	20.1380	19.7749 (87)
Th 2	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463 (88)
util rest of house	0.9869	0.9768	0.9585	0.9049	0.7874	0.5865	0.4039	0.4457	0.6988	0.9139	0.9748	0.9891 (89)
MIT 2	19.0721	19.2394	19.4674	19.7680	20.0064	20.1210	20.1431	20.1411	20.0877	19.8054	19.3871	19.0271 (90)
Living area fraction										FLA = Living area / (4) =		0.1452 (91)
MIT	19.1808	19.3484	19.5771	19.8796	20.1220	20.2416	20.2661	20.2637	20.2057	19.9166	19.4961	19.1357 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1808	19.3484	19.5771	19.8796	20.1220	20.2416	20.2661	20.2637	20.2057	19.9166	19.4961	19.1357 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9831	0.9715	0.9516	0.8978	0.7861	0.5952	0.4171	0.4590	0.7038	0.9072	0.9694	0.9857 (94)
Useful gains	572.0595	627.6296	642.5971	640.6243	573.3799	424.5851	284.5647	298.6005	440.0224	531.9161	547.3461	552.3177 (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	1164.7350	1130.8975	1023.5591	859.3845	659.1995	441.5776	286.9520	302.4156	477.8987	729.2237	970.2599	1169.0358 (97)
Space heating kWh	440.9506	338.1960	283.4358	157.5074	63.8498	0.0000	0.0000	0.0000	0.0000	146.7969	304.4980	458.8383 (98a)
Space heating requirement - total per year (kWh/year)												2194.0727
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	440.9506	338.1960	283.4358	157.5074	63.8498	0.0000	0.0000	0.0000	0.0000	146.7969	304.4980	458.8383 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2194.0727
Space heating per m2										(98c) / (4) =		25.9285 (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 %)												88.7000 (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	440.9506	338.1960	283.4358	157.5074	63.8498	0.0000	0.0000	0.0000	0.0000	146.7969	304.4980	458.8383 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	497.1258	381.2808	319.5443	177.5731	71.9840	0.0000	0.0000	0.0000	0.0000	165.4982	343.2897	517.2923 (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	170.7832	150.1261	157.9554	136.0668	129.7835	114.7083	111.9676	117.9298	120.8154	137.3037	149.0066	168.6284 (64)
Efficiency of water heater	84.8157	84.4415	83.7817	82.4326	79.9135	76.2000	76.2000	76.2000	76.2000	82.1844	84.1637	76.2000 (216)
Fuel for water heating, kWh/month	201.3580	177.7872	188.5321	165.0643	162.4049	150.5359	146.9390	154.7636	158.5505	167.0679	177.0438	84.9547 (217)
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	19.8862	17.9617	19.8862	19.2447	19.8862	19.2447	19.8862	19.8862	19.2447	19.8862	19.2447	19.8862 (231)
Lighting	26.1258	20.9591	18.8713	13.8259	10.6795	8.7253	9.7422	12.6633	16.4484	21.5812	24.3759	26.8519 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-20.0355	-30.6896	-48.1000	-58.5998	-66.7765	-63.6584	-62.8125	-57.4248	-48.3684	-36.9354	-22.8032	-16.9991 (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	-6.7440	-15.2186	-32.8014	-52.9023	-73.0116	-74.4517	-73.1984	-60.1736	-41.6760	-22.5415	-9.2145	-5.2329 (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												2473.5881 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												76.2000
Water heating fuel used												2048.5391 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:												
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.5740)												
mechanical ventilation fans (SFP = 0.5740)												148.1442 (230a)

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central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	234.1442 (231)
Electricity for lighting (calculated in Appendix L)	210.8498 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1000.3695 (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	3966.7518 (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	2473.5881	0.2100	519.4535 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2048.5391	0.2100	430.1932 (264)
Space and water heating			949.6467 (265)
Pumps, fans and electric keep-hot	234.1442	0.1387	32.4787 (267)
Energy for lighting	210.8498	0.1443	30.4321 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-533.2029	0.1330	-70.9107
PV Unit electricity exported	-467.1666	0.1241	-57.9717
Total			-128.8824 (269)
Total CO2, kg/year			883.6752 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.4400 (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	2473.5881	1.1300	2795.1546 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2048.5391	1.1300	2314.8492 (278)
Space and water heating			5110.0038 (279)
Pumps, fans and electric keep-hot	234.1442	1.5128	354.2134 (281)
Energy for lighting	210.8498	1.5338	323.4085 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-533.2029	1.4914	-795.2293
PV Unit electricity exported	-467.1666	0.4554	-212.7574
Total			-1007.9867 (283)
Total Primary energy kWh/year			4779.6390 (286)
Dwelling Primary energy Rate (DPER)			56.4800 (287)

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

1. Overall dwelling characteristics

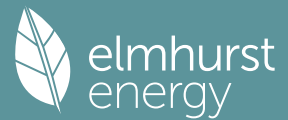
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	42.3100 (1b)	x 2.3900 (2b)	= 101.1209 (1b) - (3b)
First floor	42.3100 (1c)	x 2.6100 (2c)	= 110.4291 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.5500 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	30.0000 / (5) = 0.1418 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3918 (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) = 0.3330 (21)

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

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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												
Effective ac	0.4246	0.4163	0.4080	0.3663	0.3580	0.3164	0.3164	0.3081	0.3330	0.3580	0.3747	0.3913 (22b)
	0.5902	0.5867	0.5832	0.5671	0.5641	0.5501	0.5501	0.5475	0.5555	0.5641	0.5702	0.5766 (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			2.1500	1.0000	2.1500		(26)
TER Opening Type (Uw = 1.20)			11.5000	1.1450	13.1679		(27)
Ground Floor			42.3100	0.1300	5.5003		(28a)
Brick and Block	92.8000	13.6500	79.1500	0.1800	14.2470		(29a)
Pitched Roof	42.3100		42.3100	0.1100	4.6541		(30)
Total net area of external elements Aum(A, m2)			177.4200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.7193		(33)
Party Wall 1			41.1800	0.0000	0.0000		(32)

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

195.1052 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.8740	0.0500	0.4937
E3 Sill	7.2700	0.0500	0.3635
E4 Jamb	24.0000	0.0500	1.2000
E5 Ground floor (normal)	18.5600	0.1600	2.9696
E6 Intermediate floor within a dwelling	18.5600	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	18.5600	0.0600	1.1136
E16 Corner (normal)	9.9960	0.0900	0.8996
E18 Party wall between dwellings	9.9960	0.0600	0.5998
P1 Party wall - Ground floor	8.2400	0.0800	0.6592
P2 Party wall - Intermediate floor within a dwelling	8.2400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	8.2400	0.1200	0.9888
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.2878 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 49.0071 (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	41.1995	40.9551	40.7155	39.5903	39.3798	38.3998	38.3998	38.2184	38.7773	39.3798	39.8057	40.2509 (38)
Heat transfer coeff	90.2066	89.9622	89.7227	88.5975	88.3870	87.4070	87.4070	87.2255	87.7845	88.3870	88.8128	89.2581 (39)
Average = Sum(39)m / 12 =												88.5965

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0660	1.0631	1.0603	1.0470	1.0445	1.0329	1.0329	1.0308	1.0374	1.0445	1.0495	1.0548 (40)
HLP (average)												1.0470
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

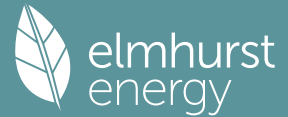
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5447 (42)
Hot water usage for mixer showers													
66.8860	65.8809	64.4161	61.6136	59.5455	57.2391	55.9281	57.3818	58.9752	61.4516	64.3143	66.6298	(42a)	
Hot water usage for baths													
28.8864	28.4574	27.8533	26.7394	25.9053	24.9804	24.4809	25.0808	25.7340	26.7236	27.8604	28.7887	(42b)	
Hot water usage for other uses													
40.6903	39.2106	37.7310	36.2514	34.7717	33.2921	33.2921	34.7717	36.2514	37.7310	39.2106	40.6903	(42c)	
Average daily hot water use (litres/day)												125.4401 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
136.4627	133.5489	130.0004	124.6044	120.2225	115.5116	113.7011	117.2342	120.9605	125.9062	131.3854	136.1088	(44)	
Energy content (annual)	216.1236	190.1719	199.8058	170.5771	161.8426	142.0350	137.5116	145.1605	149.1564	170.8535	187.1825	213.1135 (45)	
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2083.5339	
32.4185	28.5258	29.9709	25.5866	24.2764	21.3052	20.6267	21.7741	22.3735	25.6280	28.0774	31.9670	(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	(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	(59)	
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)	
Total heat required for water heating calculated for each month													
267.0825	236.1993	250.7647	219.8922	212.8015	191.3500	188.4705	196.1194	198.4715	221.8124	236.4976	264.0724 (62)		
WWHRS	-30.5775	-27.0430	-28.3179	-23.4483	-21.8530	-18.6997	-17.5280	-18.6393	-19.3475	-22.8085	-25.8393	-30.0112 (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													
236.5050	209.1563	222.4468	196.4439	190.9485	172.6503	170.9424	177.4801	179.1240	199.0039	210.6583	234.0611 (64)		
12Total per year (kWh/year)													
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
												0.0000 (64a)	
Heat gains from water heating, kWh/month													
84.6008	74.7390	79.1751	69.0457	66.5524	59.5554	58.4623	61.0056	61.9233	69.5485	74.5670	83.6000 (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	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351	127.2351 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	124.6271	137.9800	124.6271	128.7813	124.6271	128.7813	124.6271	124.6271	128.7813	124.6271	128.7813	124.6271 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.8250	231.1995	225.2159	212.4774	196.3974	181.2845	171.1881	168.8137	174.7973	187.5357	203.6157	218.7287 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235	35.7235 (69)

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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)											
	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881 (71)
Water heating gains (Table 5)												
	113.7108	111.2187	106.4182	95.8968	89.4521	82.7158	78.5784	81.9968	86.0046	93.4792	103.5652	112.3655 (72)
Total internal gains												
	531.3334	544.5688	520.4317	501.3260	474.6472	453.9522	435.5641	436.6080	450.7537	469.8125	500.1328	519.8918 (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
Northeast					0.7200	11.2829	0.6300	0.7000	0.7700			2.4827 (75)
Southeast					6.9700	36.7938	0.6300	0.7000	0.7700			78.3754 (77)
Northwest					3.8100	11.2829	0.6300	0.7000	0.7700			13.1377 (81)
Solar gains	93.9958	165.2981	239.9495	320.4090	379.9693	386.4959	368.7637	322.9112	267.5898	186.4054	113.5302	79.8294 (83)
Total gains	625.3292	709.8668	760.3812	821.7350	854.6164	840.4481	804.3279	759.5192	718.3435	656.2179	613.6629	599.7212 (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	50.8395	50.9776	51.1137	51.7628	51.8861	52.4679	52.4679	52.5770	52.2422	51.8861	51.6373	51.3797
alpha	4.3893	4.3985	4.4076	4.4509	4.4591	4.4979	4.4979	4.5051	4.4828	4.4591	4.4425	4.4253
util living area	0.9876	0.9774	0.9588	0.9066	0.8006	0.6257	0.4690	0.5138	0.7419	0.9243	0.9769	0.9895 (86)
MIT	19.6117	19.8207	20.1056	20.4870	20.7837	20.9472	20.9884	20.9827	20.8856	20.5093	20.0046	19.5813 (87)
Th 2	20.0287	20.0311	20.0334	20.0443	20.0464	20.0560	20.0560	20.0578	20.0523	20.0464	20.0422	20.0379 (88)
util rest of house	0.9845	0.9719	0.9484	0.8829	0.7522	0.5473	0.3727	0.4151	0.6697	0.9000	0.9703	0.9869 (89)
MIT 2	18.4190	18.6848	19.0439	19.5173	19.8554	20.0219	20.0513	20.0502	19.9687	19.5544	18.9279	18.3868 (90)
Living area fraction									FLA = Living area / (4) =			0.1452 (91)
MIT	18.5922	18.8498	19.1981	19.6581	19.9902	20.1563	20.1874	20.1856	20.1019	19.6931	19.0843	18.5603 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5922	18.8498	19.1981	19.6581	19.9902	20.1563	20.1874	20.1856	20.1019	19.6931	19.0843	18.5603 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9781	0.9629	0.9370	0.8715	0.7490	0.5561	0.3864	0.4289	0.6738	0.8890	0.9614	0.9812 (94)
Useful gains	611.6036	683.4961	712.4446	716.1691	640.1478	467.3636	310.7833	325.7792	484.0550	583.3705	589.9757	588.4669 (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	1289.2517	1254.9513	1139.3061	953.1409	732.7446	485.6584	313.5638	330.2020	526.8719	803.7094	1064.3586	1281.7741 (97)
Space heating kWh	504.1701	384.0179	317.5850	170.6197	68.8920	0.0000	0.0000	0.0000	0.0000	163.9322	341.5557	515.8206 (98a)
Space heating requirement - total per year (kWh/year)												2466.5932
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	504.1701	384.0179	317.5850	170.6197	68.8920	0.0000	0.0000	0.0000	0.0000	163.9322	341.5557	515.8206 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2466.5932
Space heating per m2										(98c) / (4) =		29.1491 (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 %)												92.4000 (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	504.1701	384.0179	317.5850	170.6197	68.8920	0.0000	0.0000	0.0000	0.0000	163.9322	341.5557	515.8206 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	545.6387	415.6038	343.7067	184.6533	74.5585	0.0000	0.0000	0.0000	0.0000	177.4158	369.6490	558.2474 (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	236.5050	209.1563	222.4468	196.4439	190.9485	172.6503	170.9424	177.4801	179.1240	199.0039	210.6583	234.0611 (64)
Efficiency of water heater (217)m	85.9604	85.6650	85.1438	84.0808	82.4138	80.3000	80.3000	80.3000	80.3000	83.9690	85.4105	86.0243 (216)
Fuel for water heating, kWh/month	275.1326	244.1560	261.2600	233.6371	231.6949	215.0066	212.8798	221.0213	223.0685	236.9968	246.6422	272.0872 (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	25.8950	20.7740	18.7047	13.7038	10.5852	8.6482	9.6562	12.5515	16.3032	21.3906	24.1607	26.6147 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-39.3106	-55.2717	-79.2267	-88.8116	-95.5275	-89.0656	-87.9600	-83.1611	-74.6468	-63.0814	-43.1638	-34.0034 (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)

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Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-22.6395	-47.5858	-94.5147	-141.8638	-187.4987	-188.3752	-186.1618	-157.6581	-115.6037	-68.0236	-30.2168	-17.9059 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1												2669.4731 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												2873.5829 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												208.9878 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2091.2778 (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												3746.7661 (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	2669.4731	0.2100	560.5894 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2873.5829	0.2100	603.4524 (264)
Space and water heating			1164.0418 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	208.9878	0.1443	30.1634 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-833.2302	0.1346	-112.1942
PV Unit electricity exported	-1258.0476	0.1259	-158.4058
Total			-270.6001 (269)
Total CO2, kg/year			935.5344 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.0600 (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	2669.4731	1.1300	3016.5046 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2873.5829	1.1300	3247.1486 (278)
Space and water heating			6263.6533 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	208.9878	1.5338	320.5525 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-833.2302	1.4976	-1247.8840
PV Unit electricity exported	-1258.0476	0.4622	-581.4593
Total			-1829.3433 (283)
Total Primary energy kWh/year			4884.9633 (286)
Target Primary Energy Rate (TPER)			57.7300 (287)

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Property Reference	SAP 0898 Plot 15				Issued on Date	06/01/2025
Assessment Reference	Rev C		Prop Type Ref			
Property	Plot 15, Wharton's Lane, Southampton					
SAP Rating	91 B	DER	10.44	TER	11.06	
Environmental	91 B	% DER < TER				5.61
CO ₂ Emissions (t/year)	0.74	DFEE	31.72	TFEE	34.30	
Compliance Check	See BREL	% DFEE < TFEE				7.54
% DPER < TPER	2.16	DPER	56.48	TPER	57.73	
Assessor Details	Mr. Tobias Whiting				Assessor ID	E477-0001
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	42.3100 (1b)	x 2.3900 (2b)	= 101.1209 (1b) - (3b)
First floor	42.3100 (1c)	x 2.6100 (2c)	= 110.4291 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.5500 (5)

2. Ventilation rate

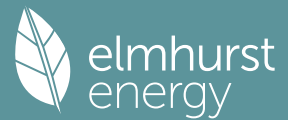
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (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) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2000 (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) = 0.1700 (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	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998 (22b)
Mechanical extract ventilation - centralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
Front Door			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.00)			11.5000	0.9615	11.0577		(27)
Ground Floor			42.3100	0.1200	5.0772	90.0000	3807.9000 (28a)
Brick and Block		13.6500	79.1500	0.1800	14.2470	42.2200	3341.7130 (29a)
Pitched Roof	92.8000		42.3100	0.0900	3.8079	9.0000	380.7900 (30)
Total net area of external elements Aum(A, m ²)			177.4200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.5548		(33)
Party Wall 1			41.1800	0.0000	0.0000	110.0000	4529.8000 (32)
Ground Floor Stud			48.9400			9.0000	440.4600 (32c)
First Floor Stud			94.7800			9.0000	853.0200 (32c)
Ground Floor Block			26.8500			75.0000	2013.7500 (32c)
First Floor			42.3100			18.0000	761.5800 (32d)
Internal Ceiling 1			42.3100			9.0000	380.7900 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	16509.8030 (34)

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

195.1052 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	9.8740	0.0300	0.2962
E2 Other lintels (including other steel lintels)	7.2700	0.0250	0.1817
E3 Sill	24.0000	0.0190	0.4560
E4 Jamb	18.5600	0.0580	1.0765
E5 Ground floor (normal)	18.5600	0.0020	0.0371
E6 Intermediate floor within a dwelling	18.5600	0.0650	1.2064
E10 Eaves (insulation at ceiling level)	9.9960	0.0360	0.3599
E16 Corner (normal)	9.9960	0.0280	0.2799
E18 Party wall between dwellings	8.2400	0.3200	2.6368
P1 Party wall - Ground floor	8.2400	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	8.2400	0.0340	0.2802
P4 Party wall - Roof (insulation at ceiling level)			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.8107 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	43.3655 (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	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058 (38)
Heat transfer coeff	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712 (39)
Average = Sum(39)m / 12 =												78.2712
HLP	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250 (40)
HLP (average)												0.9250
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5447 (42)
Hot water usage for mixer showers	66.8860	65.8809	64.4161	61.6136	59.5455	57.2391	55.9281	57.3818	58.9752	61.4516	64.3143	66.6298 (42a)
Hot water usage for baths	28.8864	28.4574	27.8533	26.7394	25.9053	24.9804	24.4809	25.0808	25.7340	26.7236	27.8604	28.7887 (42b)
Hot water usage for other uses	40.6903	39.2106	37.7310	36.2514	34.7717	33.2921	33.2921	34.7717	36.2514	37.7310	39.2106	40.6903 (42c)
Average daily hot water use (litres/day)												125.4401 (43)
Daily hot water use	136.4627	133.5489	130.0004	124.6044	120.2225	115.5116	113.7011	117.2342	120.9605	125.9062	131.3854	136.1088 (44)
Energy conte	216.1236	190.1719	199.8058	170.5771	161.8426	142.0350	137.5116	145.1605	149.1564	170.8535	187.1825	213.1135 (45)
Energy content (annual)										Total = Sum(45)m =		2083.5339
Distribution loss (46)m = 0.15 x (45)m	32.4185	28.5258	29.9709	25.5866	24.2764	21.3052	20.6267	21.7741	22.3735	25.6280	28.0774	31.9670 (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	1.6233	1.4894	1.6428	1.5037	1.5047	1.3942	1.3772	1.3973	1.3747	1.4817	1.5105	1.6090 (61)
Total heat required for water heating calculated for each month												
WWHRS	217.7469	191.6612	201.4486	172.0809	163.3473	143.4291	138.8887	146.5578	150.5311	172.3352	188.6930	214.7225 (62)
FV diverter	-46.9638	-41.5351	-43.4932	-36.0141	-33.5638	-28.7208	-26.9212	-28.6280	-29.7157	-35.0315	-39.6864	-46.0941 (63a)
Solar input	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
Output from w/h	170.7832	150.1261	157.9554	136.0668	129.7835	114.7083	111.9676	117.9298	120.8154	137.3037	149.0066	168.6284 (64)
								Total per year (kWh/year) = Sum(64)m =				1665.0748 (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	72.2669	63.6045	66.8461	57.0928	54.1888	47.5752	46.0669	48.6152	49.9382	57.1792	62.6158	71.2625 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	152.6821	152.6821	152.6821	152.6821	152.6821	152.6821	152.6821	152.6821	152.6821	152.6821	152.6821	152.6821 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.8480	26.5107	21.5600	16.3223	12.2011	10.3007	11.1302	14.4675	19.4183	24.6559	28.7771	30.6775 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	341.5299	345.0739	336.1431	317.1305	293.1305	270.5739	255.5047	251.9607	260.8915	279.9041	303.9041	326.4607 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8129	52.8129	52.8129	52.8129	52.8129	52.8129	52.8129	52.8129	52.8129	52.8129	52.8129	52.8129 (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)	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881 (71)
Water heating gains (Table 5)	97.1330	94.6495	89.8469	79.2956	72.8345	66.0766	61.9179	65.3430	69.3586	76.8538	86.9664	95.7829 (72)
Total internal gains	575.2178	572.9411	554.2570	519.4553	484.8730	450.6581	432.2597	435.4781	453.3753	488.1208	526.3546	559.6281 (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	

Northeast				0.7200	11.2829	0.4500	0.7000			0.7700	1.7734 (75)	
Southeast				6.9700	36.7938	0.4500	0.7000			0.7700	55.9824 (77)	
Northwest				3.8100	11.2829	0.4500	0.7000			0.7700	9.3841 (81)	

Solar gains	67.1398	118.0700	171.3925	228.8636	271.4066	276.0685	263.4027	230.6509	191.1356	133.1467	81.0930	57.0210 (83)

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Total gains 642.3576 691.0111 725.6495 748.3189 756.2796 726.7267 695.6624 666.1290 644.5109 621.2675 607.4475 616.6491 (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	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	
alpha	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	
util living area	0.9842	0.9756	0.9567	0.9120	0.8144	0.6505	0.4870	0.5280	0.7499	0.9211	0.9739	0.9869 (86)	
MIT	19.9114	20.0548	20.2892	20.5733	20.8194	20.9545	20.9909	20.9866	20.9085	20.6101	20.1994	19.8607 (87)	
Th 2	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463 (88)	
util rest of house	0.9805	0.9700	0.9464	0.8904	0.7704	0.5772	0.3964	0.4358	0.6832	0.8973	0.9668	0.9838 (89)	
MIT 2	19.1617	19.3026	19.5313	19.8013	20.0198	20.1227	20.1433	20.1416	20.0932	19.8403	19.4465	19.1117 (90)	
Living area fraction									fLA = Living area / (4) =				0.1452 (91)
MIT	19.2706	19.4119	19.6413	19.9134	20.1359	20.2435	20.2664	20.2643	20.2116	19.9521	19.5558	19.2205 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.2706	19.4119	19.6413	19.9134	20.1359	20.2435	20.2664	20.2643	20.2116	19.9521	19.5558	19.2205 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9756	0.9639	0.9391	0.8836	0.7698	0.5859	0.4094	0.4489	0.6887	0.8910	0.9606	0.9795	(94)
Useful gains	626.7056	666.0574	681.4243	661.2468	582.1994	425.8234	284.7770	298.9980	443.8687	553.5237	583.5066	604.0028	(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	1171.7649	1135.8626	1028.5890	862.0322	660.2889	441.7236	286.9774	302.4629	478.3621	732.0030	974.9345	1175.6734	(97)
Space heating kWh	405.5241	315.7091	258.2905	144.5655	58.0987	0.0000	0.0000	0.0000	0.0000	132.7886	281.8281	425.3229	(98a)
Space heating requirement - total per year (kWh/year)												2022.1274	
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	405.5241	315.7091	258.2905	144.5655	58.0987	0.0000	0.0000	0.0000	0.0000	132.7886	281.8281	425.3229	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2022.1274	
Space heating per m2											(98c) / (4) =	23.8966	(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 %)												88.7000 (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	405.5241	315.7091	258.2905	144.5655	58.0987	0.0000	0.0000	0.0000	0.0000	132.7886	281.8281	425.3229 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	457.1861	355.9291	291.1956	162.9825	65.5002	0.0000	0.0000	0.0000	0.0000	149.7053	317.7317	479.5072 (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	170.7832	150.1261	157.9554	136.0668	129.7835	114.7083	111.9676	117.9298	120.8154	137.3037	149.0066	168.6284 (64)
Efficiency of water heater	84.5880	84.2462	83.5020	82.1648	79.6719	76.2000	76.2000	76.2000	76.2000	81.8725	83.9378	76.2000 (216)
(217)m	84.5880	84.2462	83.5020	82.1648	79.6719	76.2000	76.2000	76.2000	76.2000	81.8725	83.9378	84.7528 (217)
Fuel for water heating, kWh/month	201.9000	178.1992	189.1636	165.6022	162.8973	150.5359	146.9390	154.7636	158.5505	167.7043	177.5202	198.9650 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	19.8862	17.9617	19.8862	19.2447	19.8862	19.2447	19.8862	19.8862	19.2447	19.8862	19.2447	19.8862 (231)
Lighting	26.1258	20.9591	18.8713	13.8259	10.6795	8.7253	9.7422	12.6633	16.4484	21.5812	24.3759	26.8519 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-20.0355	-30.6896	-48.1000	-58.5998	-66.7765	-63.6584	-62.8125	-57.4248	-48.3684	-36.9354	-22.8032	-16.9991 (233a)
(233a)m	-20.0355	-30.6896	-48.1000	-58.5998	-66.7765	-63.6584	-62.8125	-57.4248	-48.3684	-36.9354	-22.8032	-16.9991 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
(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)	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)
(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)	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)
(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)	-6.7440	-15.2186	-32.8014	-52.9023	-73.0116	-74.4517	-73.1984	-60.1736	-41.6760	-22.5415	-9.2145	-5.2329 (233b)
(233b)m	-6.7440	-15.2186	-32.8014	-52.9023	-73.0116	-74.4517	-73.1984	-60.1736	-41.6760	-22.5415	-9.2145	-5.2329 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
(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)	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)
(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)	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)
(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												2279.7377 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												76.2000
Water heating fuel used												2052.7409 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.5740)												
mechanical ventilation fans (SFP = 0.5740)												148.1442 (230a)
central heating pump												41.0000 (230c)

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main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	234.1442 (231)
Electricity for lighting (calculated in Appendix L)	210.8498 (232)

Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1000.3695 (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	3777.1032 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2279.7377	3.6400	82.9825 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2052.7409	3.6400	74.7198 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	234.1442	16.4900	38.6104 (249)
Energy for lighting	210.8498	16.4900	34.7691 (250)
Additional standing charges			92.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-533.2029	16.4900	-87.9252
PV Unit electricity exported	-467.1666	5.5900	-26.1146
Total			-114.0398 (252)
Total energy cost			209.0420 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] = 0.5806 (257)
SAP value	90.5888
SAP rating (Section 12)	91 (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	2279.7377	0.2100	478.7449 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2052.7409	0.2100	431.0756 (264)
Space and water heating			909.8205 (265)
Pumps, fans and electric keep-hot	234.1442	0.1387	32.4787 (267)
Energy for lighting	210.8498	0.1443	30.4321 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-533.2029	0.1330	-70.9107
PV Unit electricity exported	-467.1666	0.1241	-57.9717
Total			-128.8824 (269)
Total CO2, kg/year			843.8490 (272)
CO2 emissions per m2			9.9700 (273)
EI value			91.2764
EI rating			91 (274)
EI band			B

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	42.3100 (1b)	x 2.3900 (2b)	= 101.1209 (1b) - (3b)
First floor	42.3100 (1c)	x 2.6100 (2c)	= 110.4291 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.5500 (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	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

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Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											Air changes per hour
Pressure test												0.0000 / (5) = 0.0000 (8)
Pressure Test Method												Yes
Measured/design AP50												Blower Door
Infiltration rate												4.0000 (17)
Number of sides sheltered												0.2000 (18)
												2 (19)
Shelter factor												(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) = 0.1700 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	4.7000	4.6000	4.3000	4.3000	4.0000	4.0000	3.9000	4.0000	4.5000	4.4000	4.7000 (22)
Adj infilt rate	1.2750	1.1750	1.1500	1.0750	1.0750	1.0000	1.0000	0.9750	1.0000	1.1250	1.1000	1.1750 (22a)
	0.2167	0.1998	0.1955	0.1827	0.1827	0.1700	0.1700	0.1658	0.1700	0.1913	0.1870	0.1998 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
Front Door			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.00)			11.5000	0.9615	11.0577		(27)
Ground Floor			42.3100	0.1200	5.0772	90.0000	3807.9000 (28a)
Brick and Block	92.8000	13.6500	79.1500	0.1800	14.2470	42.2200	3341.7130 (29a)
Pitched Roof	42.3100		42.3100	0.0900	3.8079	9.0000	380.7900 (30)
Total net area of external elements Aum(A, m ²)			177.4200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.5548		(33)
Party Wall 1			41.1800	0.0000	0.0000	110.0000	4529.8000 (32)
Ground Floor Stud			48.9400			9.0000	440.4600 (32c)
First Floor Stud			94.7800			9.0000	853.0200 (32c)
Ground Floor Block			26.8500			75.0000	2013.7500 (32c)
First Floor			42.3100			18.0000	761.5800 (32d)
Internal Ceiling 1			42.3100			9.0000	380.7900 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 16509.8030 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 195.1052 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.8740	0.0300	0.2962
E3 Sill	7.2700	0.0250	0.1817
E4 Jamb	24.0000	0.0190	0.4560
E5 Ground floor (normal)	18.5600	0.0580	1.0765
E6 Intermediate floor within a dwelling	18.5600	0.0020	0.0371
E10 Eaves (insulation at ceiling level)	18.5600	0.0650	1.2064
E16 Corner (normal)	9.9960	0.0360	0.3599
E18 Party wall between dwellings	9.9960	0.0280	0.2799
P1 Party wall - Ground floor	8.2400	0.3200	2.6368
P2 Party wall - Intermediate floor within a dwelling	8.2400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	8.2400	0.0340	0.2802

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.8107 (36)

Point Thermal bridges (36a) = 0.0000

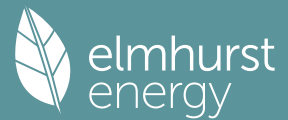
Total fabric heat loss (33) + (36) + (36a) = 43.3655 (37)

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	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058 (38)
Average = Sum(39)m / 12 =	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712 (39)
												78.2712
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5447 (42)
Hot water usage for mixer showers												66.6298 (42a)
Hot water usage for baths												28.7887 (42b)
Hot water usage for other uses												40.6903 (42c)
Average daily hot water use (litres/day)												125.4401 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	136.4627	133.5489	130.0004	124.6044	120.2225	115.5116	113.7011	117.2342	120.9605	125.9062	131.3854	136.1088 (44)
Energy content (annual)	216.1236	190.1719	199.8058	170.5771	161.8426	142.0350	137.5116	145.1605	149.1564	170.8535	187.1825	213.1135 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 2083.5339
Water storage loss:	32.4185	28.5258	29.9709	25.5866	24.2764	21.3052	20.6267	21.7741	22.3735	25.6280	28.0774	31.9670 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	1.6233	1.4894	1.6428	1.5037	1.5047	1.3942	1.3772	1.3973	1.3747	1.4817	1.5105	1.6090 (61)
Total heat required for water heating calculated for each month	217.7469	191.6612	201.4486	172.0809	163.3473	143.4291	138.8887	146.5578	150.5311	172.3352	188.6930	214.7225 (62)
WWHRS	-46.9638	-41.5351	-43.4932	-36.0141	-33.5638	-28.7208	-26.9212	-28.6280	-29.7157	-35.0315	-39.6864	-46.0941 (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)

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Output from w/h	170.7832	150.1261	157.9554	136.0668	129.7835	114.7083	111.9676	117.9298	120.8154	137.3037	149.0066	168.6284 (64)
	Total per year (kWh/year) = Sum(64)m =											1665.0748 (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	72.2669	63.6045	66.8461	57.0928	54.1888	47.5752	46.0669	48.6152	49.9382	57.1792	62.6158	71.2625 (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	152.6821	152.6821	152.6821	152.6821	152.6821	152.6821	152.6821	152.6821	152.6821	152.6821	152.6821	152.6821	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.8480	26.5107	21.5600	16.3223	12.2011	10.3007	11.1302	14.4675	19.4183	24.6559	28.7771	30.6775	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	341.5299	345.0739	336.1431	317.1305	293.1305	270.5739	255.5047	251.9607	260.8915	279.9041	303.9041	326.4607	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8129	52.8129	52.8129	52.8129	52.8129	52.8129	52.8129	52.8129	52.8129	52.8129	52.8129	52.8129	(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)	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	(71)
Water heating gains (Table 5)	97.1330	94.6495	89.8469	79.2956	72.8345	66.0766	61.9179	65.3430	69.3586	76.8538	86.9664	95.7829	(72)
Total internal gains	575.2178	572.9411	554.2570	519.4553	484.8730	450.6581	432.2597	435.4781	453.3753	488.1208	526.3546	559.6281	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d		Gains W	
Northeast					0.7200	15.0428	0.4500	0.7000		0.7700	2.3643 (75)		
Southeast					6.9700	46.3896	0.4500	0.7000		0.7700	70.5825 (77)		
Northwest					3.8100	15.0428	0.4500	0.7000		0.7700	12.5112 (81)		
Solar gains	85.4580	128.7397	186.8110	255.6814	290.9626	320.8257	298.5776	266.1024	221.4662	153.7947	102.3337	69.2698	(83)
Total gains	660.6758	701.6808	741.0679	775.1367	775.8356	771.4839	730.8373	701.5806	674.8415	641.9154	628.6883	628.8979	(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	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919
alpha	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061
util living area	0.9768	0.9686	0.9432	0.8834	0.7554	0.5523	0.3937	0.4096	0.6554	0.8746	0.9572	0.9804 (86)
MIT	20.0715	20.1647	20.3978	20.6653	20.8849	20.9802	20.9970	20.9964	20.9559	20.7441	20.3799	20.0377 (87)
Th 2	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463 (88)
util rest of house	0.9712	0.9612	0.9295	0.8557	0.7017	0.4745	0.3042	0.3168	0.5768	0.8379	0.9452	0.9756 (89)
MIT 2	19.3197	19.4104	19.6356	19.8847	20.0718	20.1376	20.1456	20.1454	20.1245	19.9602	19.6219	19.2869 (90)
Living area fraction	19.4289	19.5199	19.7463	19.9981	20.1899	20.2600	20.2692	20.2690	fLA = Living area / (4) =			0.1452 (91)
MIT	19.4289	19.5199	19.7463	19.9981	20.1899	20.2600	20.2692	20.2690	20.2452	20.0740	19.7320	19.3959 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4289	19.5199	19.7463	19.9981	20.1899	20.2600	20.2692	20.2690	20.2452	20.0740	19.7320	19.3959 (93)

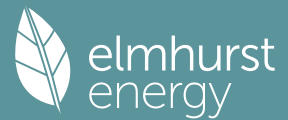
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9653	0.9544	0.9219	0.8503	0.7047	0.4852	0.3172	0.3303	0.5864	0.8343	0.9381	0.9701	(94)
Useful gains	637.7712	669.7121	683.2198	659.0806	546.7149	374.2971	231.8317	231.7015	395.7233	535.5732	589.7608	610.1097	(95)
Ext temp.	5.4000	5.7000	7.3000	9.6000	12.6000	15.4000	17.3000	17.3000	15.0000	11.8000	8.4000	5.5000	(96)
Heat loss rate W	1098.0563	1081.7017	974.1869	813.8723	594.0676	380.3964	232.4063	232.3899	410.5497	647.6174	886.9676	1087.6521	(97)
Space heating kWh	342.4521	276.8570	216.4795	111.4500	35.2304	0.0000	0.0000	0.0000	0.0000	83.3609	213.9889	355.2916	(98a)
Space heating requirement - total per year (kWh/year)												1635.1105	
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	342.4521	276.8570	216.4795	111.4500	35.2304	0.0000	0.0000	0.0000	0.0000	83.3609	213.9889	355.2916	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1635.1105	
Space heating per m2												(98c) / (4) =	19.3230 (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 %)												88.7000 (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	342.4521	276.8570	216.4795	111.4500	35.2304	0.0000	0.0000	0.0000	0.0000	83.3609	213.9889	355.2916	(98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000	(210)
Space heating fuel (main heating system)													

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Space heating efficiency (main heating system 2)	386.0790	312.1274	244.0580	125.6483	39.7186	0.0000	0.0000	0.0000	0.0000	93.9807	241.2502	400.5542	(211)
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	(212)
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	(213)
Water heating 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	(215)
Efficiency of water heater (217)m	170.7832	150.1261	157.9554	136.0668	129.7835	114.7083	111.9676	117.9298	120.8154	137.3037	149.0066	168.6284	(64)
Fuel for water heating, kWh/month	84.1088	83.8631	82.9591	81.3628	78.5638	76.2000	76.2000	76.2000	76.2000	80.4848	83.1040	84.2516	(216)
Space cooling fuel requirement (221)m	203.0503	179.0134	190.4014	167.2346	165.1950	150.5359	146.9390	154.7636	158.5505	170.5958	179.3014	200.1485	(219)
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	(221)
Lighting	19.8862	17.9617	19.8862	19.2447	19.8862	19.2447	19.8862	19.2447	19.8862	19.2447	19.8862	19.8862	(231)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	26.1258	20.9591	18.8713	13.8259	10.6795	8.7253	9.7422	12.6633	16.4484	21.5812	24.3759	26.8519	(232)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	-25.0765	-33.4766	-51.8766	-63.4265	-69.8136	-69.5642	-67.7076	-62.9770	-53.8914	-41.8086	-28.1341	-20.5216	(233a)
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	(234a)
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	(235a)
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	(235c)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	-9.8918	-17.7833	-37.8873	-62.2596	-80.4514	-91.0144	-86.6802	-73.5166	-51.9492	-28.4185	-13.3030	-7.1894	(233b)
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	(234b)
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	(235b)
Annual totals kWh/year	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Space heating fuel - main system 1												1843.4165	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												76.2000	(216)
Water heating fuel used												2065.7294	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.5740)													
mechanical ventilation fans (SFP = 0.5740)												148.1442	(230a)
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												234.1442	(231)
Electricity for lighting (calculated in Appendix L)												210.8498	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1148.6188	(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												3205.5212	(238)

10a. Fuel costs - using BEDF prices (556)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1843.4165	5.6000	103.2313	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2065.7294	5.6000	115.6808	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	234.1442	26.0600	61.0180	(249)
Energy for lighting	210.8498	26.0600	54.9475	(250)
Additional standing charges			99.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-588.2741	26.0600	-153.3042	
PV Unit electricity exported	-560.3447	5.8100	-32.5560	
Total			-185.8603	(252)
Total energy cost			248.0174	(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	1843.4165	0.2100	387.1175	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2065.7294	0.2100	433.8032	(264)
Space and water heating			820.9206	(265)
Pumps, fans and electric keep-hot	234.1442	0.1387	32.4787	(267)
Energy for lighting	210.8498	0.1443	30.4321	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-588.2741	0.1333	-78.4369	
PV Unit electricity exported	-560.3447	0.1242	-69.6117	
Total			-148.0485	(269)
Total CO2, kg/year			735.7829	(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	1843.4165	1.1300	2083.0607	(275)
Total CO2 associated with community systems			0.0000	(473)

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Water heating (other fuel)	2065.7294	1.1300	2334.2742 (278)
Space and water heating			4417.3349 (279)
Pumps, fans and electric keep-hot	234.1442	1.5128	354.2134 (281)
Energy for lighting	210.8498	1.5338	323.4085 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-588.2741	1.4927	-878.1129
PV Unit electricity exported	-560.3447	0.4559	-255.4404
Total			-1133.5533 (283)
Total Primary energy kWh/year			3961.4035 (286)

SAP 10 EPC IMPROVEMENTS

Rev C

Current energy efficiency rating: B 91
Current environmental impact rating: B 91

N Solar water heating SAP increase too small
U Solar photovoltaic panels Already installed
V2 Wind turbine Not applicable

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

Measures omitted - SAP change or cost saving too small:
N Solar water heating + 0.6 -£ 27 -165 kg (22.5%)

Recommended measures	Typical annual savings	Energy efficiency impact	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 91
Potential environmental impact rating: B 91

Fuel prices for cost data on this page from database revision number 556 TEST (29 Nov 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Southern England):

	Current	Potential	Saving
Electricity	£116	£116	£0
Mains gas	£318	£318	£0
Space heating	£263	£263	£0
Water heating	£116	£116	£0
Lighting	£55	£55	£0
Generated (PV)	-£186	-£186	£0
Total cost of fuels	£248	£248	£0
Total cost of uses	£248	£248	£0
Delivered energy	38 kWh/m²	38 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.7 tonnes	0.7 tonnes	0.0 tonnes
CO2 emissions per m²	9 kg/m²	9 kg/m²	0 kg/m²
Primary energy	47 kWh/m²	47 kWh/m²	0 kWh/m²

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	42.3100 (1b)	x 2.3900 (2b)	= 101.1209 (1b) - (3b)
First floor	42.3100 (1c)	x 2.6100 (2c)	= 110.4291 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.5500 (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	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 0.0000 / (5) = 0.0000 (8)
Pressure test Yes
Pressure Test Method Blower Door

Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1700 (21)

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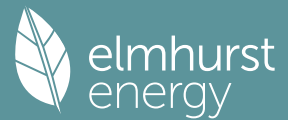
Element	Length	Psi-value	Total
K1 Element	9.8740	0.0300	0.2962
E2 Other lintels (including other steel lintels)	7.2700	0.0250	0.1817
E3 Sill	24.0000	0.0190	0.4560
E4 Jamb	18.5600	0.0580	1.0765
E5 Ground floor (normal)	18.5600	0.0020	0.0371
E6 Intermediate floor within a dwelling	18.5600	0.0650	1.2064
E10 Eaves (insulation at ceiling level)	9.9960	0.0360	0.3599
E16 Corner (normal)	9.9960	0.0280	0.2799
P1 Party wall - Ground floor	8.2400	0.3200	2.6368
P2 Party wall - Intermediate floor within a dwelling	8.2400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	8.2400	0.0340	0.2802
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.8107 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	43.3655 (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
	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058 (38)
Heat transfer coeff	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712 (39)
Average = Sum(39)m / 12 =	78.2712											

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250 (40)
HLP (average)												0.9250
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

[illegible]

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Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	72.2669	63.6045	66.8461	57.0928	54.1888	47.5752	46.0669	48.6152	49.9382	57.1792	62.6158	71.2625 (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	152.6821	152.6821	152.6821	152.6821	152.6821	152.6821	152.6821	152.6821	152.6821	152.6821	152.6821	152.6821 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.8480	26.5107	21.5600	16.3223	12.2011	10.3007	11.1302	14.4675	19.4183	24.6559	28.7771	30.6775 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	341.5299	345.0739	336.1431	317.1305	293.1305	270.5739	255.5047	251.9607	260.8915	279.9041	303.9041	326.4607 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8129	52.8129	52.8129	52.8129	52.8129	52.8129	52.8129	52.8129	52.8129	52.8129	52.8129	52.8129 (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)	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881 (71)
Water heating gains (Table 5)	97.1330	94.6495	89.8469	79.2956	72.8345	66.0766	61.9179	65.3430	69.3586	76.8538	86.9664	95.7829 (72)
Total internal gains	575.2178	572.9411	554.2570	519.4553	484.8730	450.6581	432.2597	435.4781	453.3753	488.1208	526.3546	559.6281 (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	
Northeast	0.7200				11.2829		0.4500		0.7000		0.7700		1.7734 (75)	
Southeast	6.9700				36.7938		0.4500		0.7000		0.7700		55.9824 (77)	
Northwest	3.8100				11.2829		0.4500		0.7000		0.7700		9.3841 (81)	
Solar gains	67.1398	118.0700	171.3925	228.8636	271.4066	276.0685	263.4027	230.6509	191.1356	133.1467	81.0930	57.0210 (83)		
Total gains	642.3576	691.0111	725.6495	748.3189	756.2796	726.7267	695.6624	666.1290	644.5109	621.2675	607.4475	616.6491 (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	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919
alpha	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061
util living area	0.9842	0.9756	0.9567	0.9120	0.8144	0.6505	0.4870	0.5280	0.7499	0.9211	0.9739	0.9869 (86)
MIT	19.9114	20.0548	20.2892	20.5733	20.8194	20.9545	20.9909	20.9866	20.9085	20.6101	20.1994	19.8607 (87)
Th 2	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463 (88)
util rest of house	0.9805	0.9700	0.9464	0.8904	0.7704	0.5772	0.3964	0.4358	0.6832	0.8973	0.9668	0.9838 (89)
MIT 2	19.1617	19.3026	19.5313	19.8013	20.0198	20.1227	20.1433	20.1416	20.0932	19.8403	19.4465	19.1117 (90)
Living area fraction									FLA = Living area / (4) =			0.1452 (91)
MIT	19.2706	19.4119	19.6413	19.9134	20.1359	20.2435	20.2664	20.2643	20.2116	19.9521	19.5558	19.2205 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2706	19.4119	19.6413	19.9134	20.1359	20.2435	20.2664	20.2643	20.2116	19.9521	19.5558	19.2205 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9756	0.9639	0.9391	0.8836	0.7698	0.5859	0.4094	0.4489	0.6887	0.8910	0.9606	0.9795 (94)
Useful gains	626.7056	666.0574	681.4243	661.2468	582.1994	425.8234	284.7770	298.9980	443.8687	553.5237	583.5066	604.0028 (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	1171.7649	1135.8626	1028.5890	862.0322	660.2889	441.7236	286.9774	302.4629	478.3621	732.0030	974.9345	1175.6734 (97)
Space heating kWh	405.5241	315.7091	258.2905	144.5655	58.0987	0.0000	0.0000	0.0000	0.0000	132.7886	281.8281	425.3229 (98a)
Space heating requirement - total per year (kWh/year)												2022.1274
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	405.5241	315.7091	258.2905	144.5655	58.0987	0.0000	0.0000	0.0000	0.0000	132.7886	281.8281	425.3229 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2022.1274
Space heating per m ²										(98c) / (4) =		23.8966 (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 %)												88.7000 (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	405.5241	315.7091	258.2905	144.5655	58.0987	0.0000	0.0000	0.0000	0.0000	132.7886	281.8281	425.3229 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	457.1861	355.9291	291.1956	162.9825	65.5002	0.0000	0.0000	0.0000	0.0000	149.7053	317.7317	479.5072 (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)

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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	170.7832	150.1261	157.9554	136.0668	129.7835	114.7083	111.9676	117.9298	120.8154	137.3037	149.0066	168.6284	(64)
Efficiency of water heater	84.5880	84.2462	83.5020	82.1648	79.6719	76.2000	76.2000	76.2000	76.2000	81.8725	83.9378	84.7528	(217)
Fuel for water heating, kWh/month	201.9000	178.1992	189.1636	165.6022	162.8973	150.5359	146.9390	154.7636	158.5505	167.7043	177.5202	198.9650	(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	19.8862	17.9617	19.8862	19.2447	19.8862	19.2447	19.8862	19.8862	19.2447	19.8862	19.2447	19.8862	(231)
Lighting	26.1258	20.9591	18.8713	13.8259	10.6795	8.7253	9.7422	12.6633	16.4484	21.5812	24.3759	26.8519	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-20.0355	-30.6896	-48.1000	-58.5998	-66.7765	-63.6584	-62.8125	-57.4248	-48.3684	-36.9354	-22.8032	-16.9991	(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	-6.7440	-15.2186	-32.8014	-52.9023	-73.0116	-74.4517	-73.1984	-60.1736	-41.6760	-22.5415	-9.2145	-5.2329	(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												2279.7377	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												76.2000	
Water heating fuel used												2052.7409	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.5740)													
mechanical ventilation fans (SFP = 0.5740)												148.1442	(230a)
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												234.1442	(231)
Electricity for lighting (calculated in Appendix L)												210.8498	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1000.3695	(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												3777.1032	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2279.7377	3.6400	82.9825 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2052.7409	3.6400	74.7198 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	234.1442	16.4900	38.6104 (249)
Energy for lighting	210.8498	16.4900	34.7691 (250)
Additional standing charges			92.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-533.2029	16.4900	-87.9252
PV Unit electricity exported	-467.1666	5.5900	-26.1146
Total			-114.0398 (252)
Total energy cost			209.0420 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.5806 (257)
SAP value		90.5888
SAP rating (Section 12)		91 (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	2279.7377	0.2100	478.7449 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2052.7409	0.2100	431.0756 (264)
Space and water heating			909.8205 (265)
Pumps, fans and electric keep-hot	234.1442	0.1387	32.4787 (267)
Energy for lighting	210.8498	0.1443	30.4321 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-533.2029	0.1330	-70.9107
PV Unit electricity exported	-467.1666	0.1241	-57.9717
Total			-128.8824 (269)
Total CO2, kg/year			843.8490 (272)
CO2 emissions per m2			9.9700 (273)
EI value			91.2764
EI rating			91 (274)
EI band			B

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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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.3100 (1b)	x 2.3900 (2b)	= 101.1209 (1b) - (3b)
First floor	42.3100 (1c)	x 2.6100 (2c)	= 110.4291 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.5500 (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	0 * 10 = 0.0000 (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) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2000	(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) =		0.1700 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	5.1000	4.7000	4.6000	4.3000	4.3000	4.0000	4.0000	3.9000	4.0000	4.5000	4.4000	4.7000	(22)
Wind factor	1.2750	1.1750	1.1500	1.0750	1.0750	1.0000	1.0000	0.9750	1.0000	1.1250	1.1000	1.1750	(22a)
Adj infilt rate	0.2167	0.1998	0.1955	0.1827	0.1827	0.1700	0.1700	0.1658	0.1700	0.1913	0.1870	0.1998	(22b)
Mechanical extract ventilation - centralised													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(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
Front Door			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.00)			11.5000	0.9615	11.0577		(27)
Ground Floor			42.3100	0.1200	5.0772	90.0000	3807.9000 (28a)
Brick and Block	92.8000	13.6500	79.1500	0.1800	14.2470	42.2200	3341.7130 (29a)
Pitched Roof	42.3100		42.3100	0.0900	3.8079	9.0000	380.7900 (30)
Total net area of external elements Aum(A, m ²)			177.4200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.5548		(33)
Party Wall 1			41.1800	0.0000	0.0000	110.0000	4529.8000 (32)
Ground Floor Stud			48.9400			9.0000	440.4600 (32c)
First Floor Stud			94.7800			9.0000	853.0200 (32c)
Ground Floor Block			26.8500			75.0000	2013.7500 (32c)
First Floor			42.3100			18.0000	761.5800 (32d)
Internal Ceiling 1			42.3100			9.0000	380.7900 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	16509.8030 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		195.1052 (35)

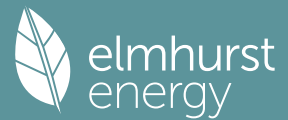
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	9.8740	0.0300	0.2962
E2 Other lintels (including other steel lintels)	7.2700	0.0250	0.1817
E3 Sill	24.0000	0.0190	0.4560
E4 Jamb	18.5600	0.0580	1.0765
E5 Ground floor (normal)	18.5600	0.0020	0.0371
E6 Intermediate floor within a dwelling	18.5600	0.0650	1.2064
E10 Eaves (insulation at ceiling level)	9.9960	0.0360	0.3599
E16 Corner (normal)	9.9960	0.0280	0.2799
E18 Party wall between dwellings	8.2400	0.3200	2.6368
P1 Party wall - Ground floor	8.2400	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	8.2400	0.0340	0.2802
P4 Party wall - Roof (insulation at ceiling level)			

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.8107 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	43.3655 (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	
	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058	34.9058	(38)
Heat transfer coeff	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712	78.2712	(39)

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Average = Sum(39)m / 12 =

78.2712

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250	0.9250
HLP (average)												0.9250
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5447 (42)
Hot water usage for mixer showers												
66.8860	65.8809	64.4161	61.6136	59.5455	57.2391	55.9281	57.3818	58.9752	61.4516	64.3143	66.6298	(42a)
Hot water usage for baths												
28.8864	28.4574	27.8533	26.7394	25.9053	24.9804	24.4809	25.0808	25.7340	26.7236	27.8604	28.7887	(42b)
Hot water usage for other uses												
40.6903	39.2106	37.7310	36.2514	34.7717	33.2921	33.2921	34.7717	36.2514	37.7310	39.2106	40.6903	(42c)
Average daily hot water use (litres/day)												125.4401 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	136.4627	133.5489	130.0004	124.0044	120.2225	115.5116	113.7011	117.2342	120.9605	125.9062	131.3854	136.1088 (44)
Energy conte	216.1236	190.1719	199.8058	170.5771	161.8426	142.0350	137.5116	145.1605	149.1564	170.8535	187.1825	213.1135 (45)
Energy content (annual)										Total = Sum(45)m =		2083.5339
Distribution loss (46)m = 0.15 x (45)m												
32.4185	28.5258	29.9709	25.5866	24.2764	21.3052	20.6267	21.7741	22.3735	25.6280	28.0774	31.9670	(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	(59)
Combi loss	1.6233	1.4894	1.6428	1.5037	1.5047	1.3942	1.3772	1.3973	1.3747	1.4817	1.5105	1.6090 (61)
Total heat required for water heating calculated for each month												
217.7469	191.6612	201.4486	172.0809	163.3473	143.4291	138.8887	146.5578	150.5311	172.3352	188.6930	214.7225	(62)
WWHRS	-46.9638	-41.5351	-43.4932	-36.0141	-33.5638	-28.7208	-26.9212	-28.6280	-29.7157	-35.0315	-39.6864	-46.0941 (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	170.7832	150.1261	157.9554	136.0668	129.7835	114.7083	111.9676	117.9298	120.8154	137.3037	149.0066	168.6284 (64)
								Total per year (kWh/year) = Sum(64)m =				1665.0748 (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												
72.2669	63.6045	66.8461	57.0928	54.1888	47.5752	46.0669	48.6152	49.9382	57.1792	62.6158	71.2625	(65)

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

Metabolic gains (Table 5), Watts												
(66)m	152.6821	152.6821	152.6821	152.6821	152.6821	152.6821	152.6821	152.6821	152.6821	152.6821	152.6821	152.6821 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
29.8480	26.5107	21.5600	16.3223	12.2011	10.3007	11.1302	14.4675	19.4183	24.6559	28.7771	30.6775	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
341.5299	345.0739	336.1431	317.1305	293.1305	270.5739	255.5047	251.9607	260.8915	279.9041	303.9041	326.4607	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
52.8129	52.8129	52.8129	52.8129	52.8129	52.8129	52.8129	52.8129	52.8129	52.8129	52.8129	52.8129	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	-101.7881	(71)
Water heating gains (Table 5)												
97.1330	94.6495	89.8469	79.2956	72.8345	66.0766	61.9179	65.3430	69.3586	76.8538	86.9664	95.7829	(72)
Total internal gains	575.2178	572.9411	554.2570	519.4553	484.8730	450.6581	432.2597	435.4781	453.3753	488.1208	526.3546	559.6281 (73)

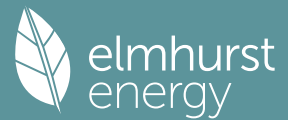
6. Solar gains

[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		
Northeast				0.7200	15.0428	0.4500		0.7000		0.7700	2.3643 (75)		
Southeast				6.9700	46.3896	0.4500		0.7000		0.7700	70.5825 (77)		
Northwest				3.8100	15.0428	0.4500		0.7000		0.7700	12.5112 (81)		
Solar gains		85.4580	128.7397	186.8110	255.6814	290.9626	320.8257	298.5776	266.1024	221.4662	153.7947	102.3337	69.2698 (83)
Total gains		660.6758	701.6808	741.0679	775.1367	775.8356	771.4839	730.8373	701.5806	674.8415	641.9154	628.6883	628.8979 (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	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	58.5919	
alpha	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	4.9061	
util living area	0.9768	0.9686	0.9432	0.8834	0.7554	0.5523	0.3937	0.4096	0.6554	0.8746	0.9572	0.9804 (86)	
MIT	20.0715	20.1647	20.3978	20.6653	20.8849	20.9802	20.9970	20.9964	20.9559	20.7441	20.3799	20.0377 (87)	
Th 2	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463	20.1463 (88)	
util rest of house													
	0.9712	0.9612	0.9295	0.8557	0.7017	0.4745	0.3042	0.3168	0.5768	0.8379	0.9452	0.9756 (89)	
MIT 2	19.3197	19.4104	19.6356	19.8847	20.0718	20.1376	20.1456	20.1454	20.1245	19.9602	19.6219	19.2869 (90)	
Living area fraction									fLA = Living area / (4) =				0.1452 (91)
MIT	19.4289	19.5199	19.7463	19.9981	20.1899	20.2600	20.2692	20.2690	20.2452	20.0740	19.7320	19.3959 (92)	
Temperature adjustment												0.0000	

Full SAP Calculation Printout



adjusted MIT 19.4289 19.5199 19.7463 19.9981 20.1899 20.2600 20.2692 20.2690 20.2452 20.0740 19.7320 19.3959 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9653	0.9544	0.9219	0.8503	0.7047	0.4852	0.3172	0.3303	0.5864	0.8343	0.9381	0.9701	(94)
Useful gains	637.7712	669.7121	683.2198	659.0806	546.7149	374.2971	231.8317	231.7015	395.7233	535.5732	589.7608	610.1097	(95)
Ext temp.	5.4000	5.7000	7.3000	9.6000	12.6000	15.4000	17.3000	17.3000	15.0000	11.8000	8.4000	5.5000	(96)
Heat loss rate W	1098.0563	1081.7017	974.1869	813.8723	594.0676	380.3964	232.4063	232.3899	410.5497	647.6174	886.9676	1087.6521	(97)
Space heating kWh	342.4521	276.8570	216.4795	111.4500	35.2304	0.0000	0.0000	0.0000	0.0000	83.3609	213.9889	355.2916	(98a)
Space heating requirement - total per year (kWh/year)												1635.1105	
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	342.4521	276.8570	216.4795	111.4500	35.2304	0.0000	0.0000	0.0000	0.0000	83.3609	213.9889	355.2916	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1635.1105	
Space heating per m2										(98c) / (4) =		19.3230	(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 %)													88.7000 (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	342.4521	276.8570	216.4795	111.4500	35.2304	0.0000	0.0000	0.0000	0.0000	83.3609	213.9889	355.2916	(98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000	(210)
Space heating fuel (main heating system)	386.0790	312.1274	244.0580	125.6483	39.7186	0.0000	0.0000	0.0000	0.0000	93.9807	241.2502	400.5542	(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	170.7832	150.1261	157.9554	136.0668	129.7835	114.7083	111.9676	117.9298	120.8154	137.3037	149.0066	168.6284	(64)
Efficiency of water heater (217)m	84.1088	83.8631	82.9591	81.3628	78.5638	76.2000	76.2000	76.2000	76.2000	80.4848	83.1040	76.2000	(216)
Fuel for water heating, kWh/month	203.0503	179.0134	190.4014	167.2346	165.1950	150.5359	146.9390	154.7636	158.5505	170.5958	179.3014	200.1485	(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	19.8862	17.9617	19.8862	19.2447	19.8862	19.2447	19.8862	19.8862	19.2447	19.8862	19.2447	19.8862	(231)
Lighting	26.1258	20.9591	18.8713	13.8259	10.6795	8.7253	9.7422	12.6633	16.4484	21.5812	24.3759	26.8519	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-25.0765	-33.4766	-51.8766	-63.4265	-69.8136	-69.5642	-67.7076	-62.9770	-53.8914	-41.8086	-28.1341	-20.5216	(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	-9.8918	-17.7833	-37.8873	-62.2596	-80.4514	-91.0144	-86.6802	-73.5166	-51.9492	-28.4185	-13.3030	-7.1894	(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												1843.4165	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												76.2000	
Water heating fuel used												2065.7294	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.5740)													
mechanical ventilation fans (SFP = 0.5740)													148.1442 (230a)
central heating pump													41.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													234.1442 (231)
Electricity for lighting (calculated in Appendix L)													210.8498 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-1148.6188 (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													3205.5212 (238)

10a. Fuel costs - using BEDF prices (556)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1843.4165	5.6000	103.2313 (240)
Total CO2 associated with community systems			0.0000 (473)

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Water heating (other fuel)	2065.7294	5.6000	115.6808 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	234.1442	26.0600	61.0180 (249)
Energy for lighting	210.8498	26.0600	54.9475 (250)
Additional standing charges			99.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-588.2741	26.0600	-153.3042
PV Unit electricity exported	-560.3447	5.8100	-32.5560
Total			-185.8603 (252)
Total energy cost			248.0174 (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	1843.4165	0.2100	387.1175 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2065.7294	0.2100	433.8032 (264)
Space and water heating			820.9206 (265)
Pumps, fans and electric keep-hot	234.1442	0.1387	32.4787 (267)
Energy for lighting	210.8498	0.1443	30.4321 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-588.2741	0.1333	-78.4369
PV Unit electricity exported	-560.3447	0.1242	-69.6117
Total			-148.0485 (269)
Total CO2, kg/year			735.7829 (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	1843.4165	1.1300	2083.0607 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2065.7294	1.1300	2334.2742 (278)
Space and water heating			4417.3349 (279)
Pumps, fans and electric keep-hot	234.1442	1.5128	354.2134 (281)
Energy for lighting	210.8498	1.5338	323.4085 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-588.2741	1.4927	-878.1129
PV Unit electricity exported	-560.3447	0.4559	-255.4404
Total			-1133.5533 (283)
Total Primary energy kWh/year			3961.4035 (286)

Predicted Energy Assessment



Plot 15, Wharton's Lane, Southampton

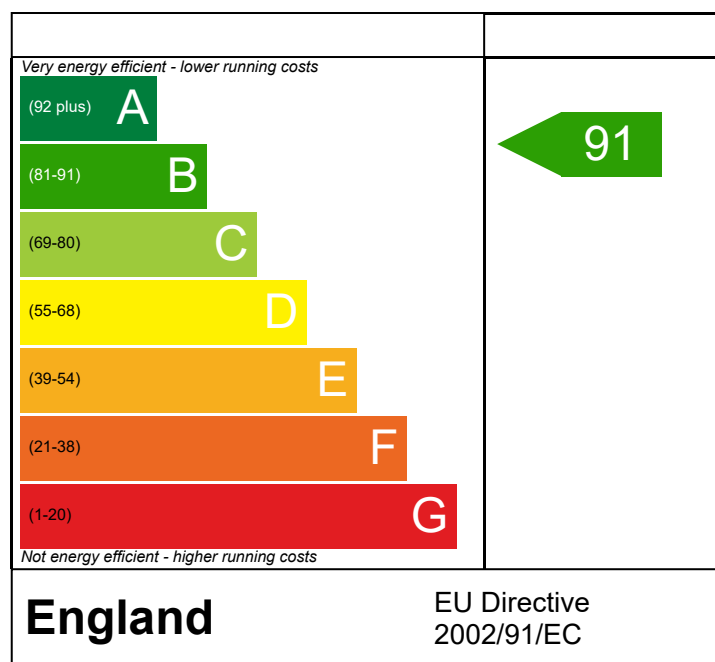
Dwelling type:
Date of assessment:
Produced by:
Total floor area:
DRRN:

House, Semi-Detached
06/01/2025
Tobias Whiting
84.62 m²
1776-2509-0750

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

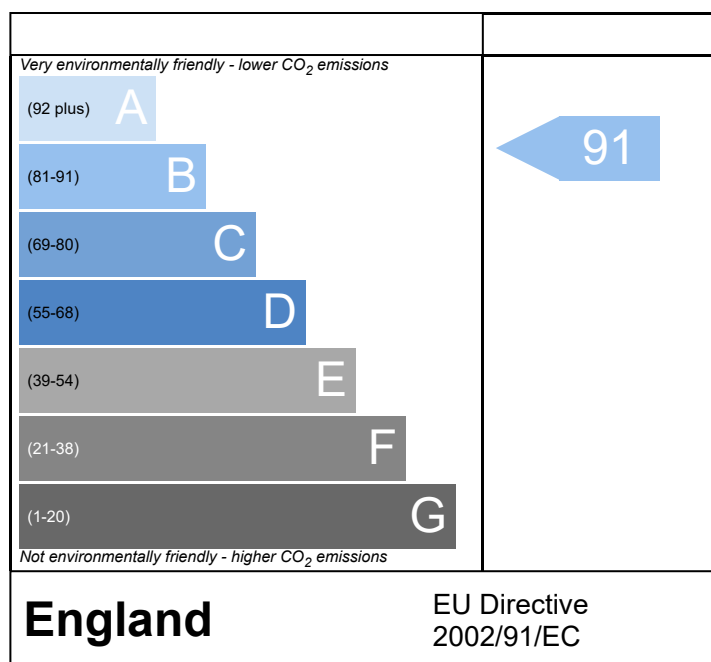
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.

Energy Efficiency Rating



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

Environmental Impact (CO₂) Rating



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

Thermal Bridging

Property Reference	SAP 0898 Plot 15	Issued on Date	06/01/2025
Assessment Reference	Rev C	Prop Type Ref	Semi-Detached House
Property	Plot 15, Wharton's Lane, Southampton		

SAP Rating	91 B	DER	10.44	TER	11.06
Environmental	91 B	% DER < TER			5.61
CO ₂ Emissions (t/year)	0.74	DFEE	31.72	TFEE	34.30
Compliance Check	See BREL	% DFEE < TFEE			7.54
% DPER < TPER	2.16	DPER	56.48	TPER	57.73

Assessor Details	Mr. Tobias Whiting	Assessor ID	E477-0001
Client			

	Junction details	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.030	9.87	0.30	Catnic
External wall	E3 Sill	Independently assessed	0.025	7.27	0.18	Knauf P5
External wall	E4 Jamb	Independently assessed	0.019	24.00	0.46	Knauf P6
External wall	E5 Ground floor (normal)	Independently assessed	0.058	18.56	1.08	SEES-2242-E5
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.002	18.56	0.04	Knauf P14
External wall	E10 Eaves (insulation at ceiling level)	Non Gov Approved Schemes	0.065	18.56	1.21	Knauf P16
External wall	E16 Corner (normal)	Independently assessed	0.036	10.00	0.36	Knauf P23
External wall	E18 Party wall between dwellings	Independently assessed	0.028	10.00	0.28	Knauf P25 Halved
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.320	8.24	2.64	K1
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	8.24	0.00	K1
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.034	8.24	0.28	Knauf P29 Halved

Total: 141.54 W/mK:
Y-Value: 0.04 W/m²K:

Energy Report



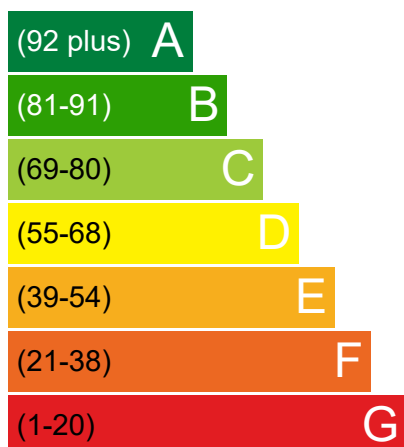
Dwelling Address	Plot 15, Wharton's Lane, Southampton
Reference	SAP 0898 Plot 15-Rev C
Assessment Date	08/10/2024
Submission Date	06/01/2025
Property Type	House, Semi-Detached
Total Floor Area	85

This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

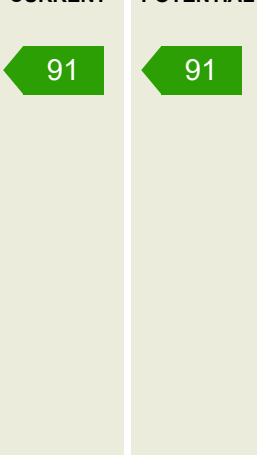
This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

Energy Efficiency Rating

Most energy efficient - lower running costs

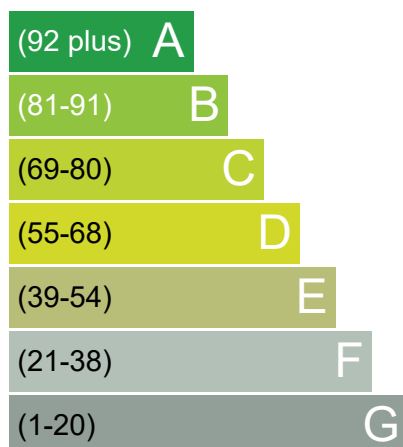


CURRENT POTENTIAL

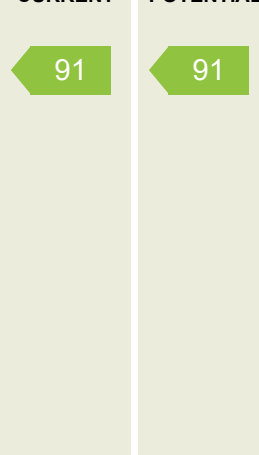


Carbon Dioxide (CO2) Emissions Rating

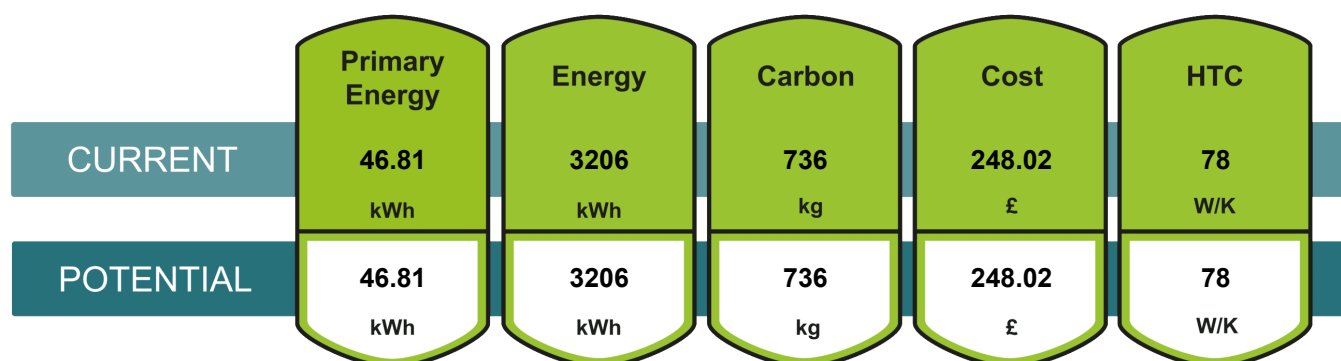
Very environmentally friendly - lower CO2 emissions



CURRENT POTENTIAL



Additional ratings for your home



Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good
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Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.18 W/m ² K	Very Good
Roof	Average thermal transmittance 0.09 W/m ² K	Very Good
Floor	Average thermal transmittance 0.12 W/m ² K	Very Good
Windows	High performance glazing	Very Good
Main heating	Boiler and radiators, mains gas	Very Good
Main heating controls	Programmer, room thermostat and TRVs	Good
Secondary heating	None	
Hot water	From main system, waste water heat recovery	Very Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 4.0 m ³ /h.m ² (assumed)	Good

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling. To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed. Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
Solar water heating	£27	B 91			A 93

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

		Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting		£55	£55	
Heating		£263	£263	
Hot Water		£116	£116	
New Technologies e.g. Impact of PV		-(£186)	-(£186)	
TOTAL		£248	£248	

Estimated energy use and potential savings



Space Heating

1843

kWh per year



Water Heating

2066

kWh per year

About this document

Created by:
Company/Trading name:
Phone number:
Email address:

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g. heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO ₂)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.