

Summary for Input Data



Property Reference	SAP 0898 Plot 5		Issued on Date	06/01/2025
Assessment Reference	Rev C	Prop Type Ref		
Property	Plot 5, Wharton's Lane, Southampton			

SAP Rating	90 B	DER	11.38	TER	12.06
Environmental	90 B	% DER < TER			5.64
CO ₂ Emissions (t/year)	0.91	DFEE	38.68	TFEE	42.93
Compliance Check	See BREL	% DFEE < TFEE			9.88
% DPER < TPER	3.19	DPER	61.06	TPER	63.07

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

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

Orientation	Southeast	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	House, 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	168.69	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	No	
Smart gas meter fitted	No	

7.0 Measurements		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground floor:	30.16 m	47.63 m ²	2.67 m
	1st Storey:	31.30 m	48.70 m ²	2.32 m

8.0 Living Area	19.90	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	72.70	56.67	0.00	None	16.03	Calculate Wall Area
Tile Hung	Cavity Wall	Other	0.18	42.22	80.44	70.80	0.00	None	9.64	Enter Gross Area

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Ground Floor Stud	Plasterboard on timber frame	9.00	35.50
First Floor Stud	Plasterboard on timber frame	9.00	95.26
Ground Floor Block	Dense block, plasterboard on dabs	75.00	49.30

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	48.70	48.70	None	0.00	Calculate Wall Area	0.00

Description	Storey	Construction	Area (m ²)
Internal Ceiling 1	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	47.30

Description	Type	Storey Index	Construction	U-Value (W/m ² K)	Shelter Code	Shelter Factor	Kappa (kJ/m ² K)	Area (m ²)
Ground Floor	Ground Floor - Solid	Lowest occupied	Other	0.12	None	0.00	90.00	47.30

Summary for Input Data

Exposed First Floor Exposed Floor - Timber +1 Timber exposed floor, insulation between joists 0.15 None 0.00 20.00 1.07

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
First Floor		Plasterboard ceiling, carpeted chipboard floor	9.00	47.30

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	South East	2.15	0
Front Elevation	Windows	Brick and Block	South East	2.81	0
Front Shaded	Windows	Brick and Block	South East	0.60	0
Side Elevation	Windows	Brick and Block	South West	3.00	0
Rear Elevation	Windows	Brick and Block	North West	6.66	0
Side Elevation	Windows	Brick and Block	North East	0.82	0
Front Tiled	Windows	Tile Hung	South East	3.81	0
Side Tiled	Windows	Tile Hung	South West	3.00	0
Rear Tiled	Windows	Tile Hung	North West	2.83	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)	Non Gov Approved Schemes	18.96	0.03	0.03 Catnic WT-5077	No
E3 Sill	Non Gov Approved Schemes	14.77	0.03	0.03 Knauf P5	No
E4 Jamb	Independently assessed	44.10	0.02	0.02 Knauf P6	No
E5 Ground floor (normal)	Non Gov Approved Schemes	30.16	0.06	0.06 SEES-2242-E5	No
E20 Exposed floor (normal)	Table K1 - Default	3.42	0.32	0.32	No
E10 Eaves (insulation at ceiling level)	Non Gov Approved Schemes	29.10	0.07	0.07 Knauf P16	No
E16 Corner (normal)	Non Gov Approved Schemes	29.59	0.04	0.04 Knauf P23	No
E21 Exposed floor (inverted)	Table K1 - Default	2.07	0.32	0.32 K1	No
E12 Gable (insulation at ceiling level)	Non Gov Approved Schemes	2.20	0.04	0.04 Knauf P21	No
E17 Corner (inverted – internal area greater than external area)	Non Gov Approved Schemes	9.63	-0.08	-0.08 Knauf P24	No

Y-value 0.03 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	500260
Configuration	2
MVHR Duct Insulated	Uninsulated Ducts
Manufacturer SFP	0.26
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	19

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
over Bath	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 West	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 0 0	B 91 0 0

Full SAP Calculation Printout



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Assessment Reference	Rev C			Prop Type Ref			
Property	Plot 5, Wharton's Lane, Southampton						
SAP Rating	90 B		DER	11.38		TER	12.06
Environmental	90 B		% DER < TER				5.64
CO ₂ Emissions (t/year)	0.91		DFEE	38.68		TFEE	42.93
Compliance Check	See BREL		% DFEE < TFEE				9.88
% DPER < TPER	3.19		DPER	61.06		TPER	63.07
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	47.6300 (1b)	x 2.6700 (2b)	= 127.1721 (1b) - (3b)
First floor	48.7000 (1c)	x 2.3200 (2c)	= 112.9840 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	96.3300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 240.1561 (5)

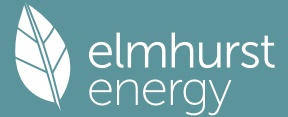
2. Ventilation rate

	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 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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												
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)			23.5300	0.9615	22.6250		(27)
Ground Floor			47.3000	0.1200	5.6760	90.0000	4257.0000 (28a)
Exposed First Floor			1.0700	0.1500	0.1605	20.0000	21.4000 (28b)
Brick and Block	72.7032	16.0400	56.6632	0.1800	10.1994	42.2200	2392.3203 (29a)
Tile Hung	80.4400	9.6400	70.8000	0.1800	12.7440	42.2200	2989.1760 (29a)
Pitched Roof	48.7000		48.7000	0.0900	4.3830	9.0000	438.3000 (30)
Total net area of external elements Aum(A, m ²)			250.2132				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	58.1529		(33)
Ground Floor Stud			35.5000			9.0000	319.5000 (32c)
First Floor Stud			95.2600			9.0000	857.3400 (32c)
Ground Floor Block			49.3000			75.0000	3697.5000 (32c)
First Floor			47.3000			18.0000	851.4000 (32d)
Internal Ceiling 1			47.3000			9.0000	425.7000 (32e)

Full SAP Calculation Printout



Heat capacity $C_m = \text{Sum}(A \times k)$
Thermal mass parameter (TMP = C_m / TFA) in $\text{kJ/m}^2\text{K}$
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	18.9630	0.0300	0.5689
E3 Sill	14.7700	0.0250	0.3693
E4 Jamb	44.1000	0.0190	0.8379
E5 Ground floor (normal)	30.1600	0.0580	1.7493
E20 Exposed floor (normal)	3.4200	0.3200	1.0944
E10 Eaves (insulation at ceiling level)	29.1000	0.0650	1.8915
E16 Corner (normal)	29.5900	0.0360	1.0652
E21 Exposed floor (inverted)	2.0700	0.3200	0.6624
E12 Gable (insulation at ceiling level)	2.2000	0.0400	0.0880
E17 Corner (inverted - internal area greater than external area)	9.6300	-0.0820	-0.7897

Thermal bridges (Sum($L \times \text{Psi}$) calculated using Appendix K)
Point Thermal bridges
Total fabric heat loss

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$
(38)m
Heat transfer coeff
Average = Sum(39)m / 12 =

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0933	1.0933	1.0933	1.0933	1.0933	1.0933	1.0933	1.0933	1.0933	1.0933	1.0933	1.0933
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
Hot water usage for mixer showers
Hot water usage for baths
Hot water usage for other uses
Average daily hot water use (litres/day)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	141.8745	138.8450	135.1556	129.5456	124.9899	120.0922	118.2100	121.8834	125.7575	130.8993	136.5957	141.5065
Energy conte	224.6945	197.7134	207.7292	177.3415	168.2605	147.6673	142.9647	150.9171	155.0716	177.6291	194.6057	221.5650
Energy content (annual)										Total = Sum(45)m =		2166.1594
Distribution loss (46)m = $0.15 \times (45)\text{m}$	33.7042	29.6570	31.1594	26.6012	25.2391	22.1501	21.4447	22.6376	23.2607	26.6444	29.1908	33.2348

Water storage loss:
Total storage loss
If cylinder contains dedicated solar storage
Primary loss
Combi loss
Total heat required for water heating calculated for each month
WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
12Total per year (kWh/year)	177.4227	155.9648	164.1018	141.3666	134.8421	119.1829	116.3371	122.5297	125.5252	142.6517	154.8047	175.1848
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =
Heat gains from water heating, kWh/month

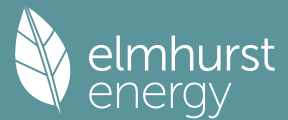
5. Internal gains (see Table 5 and 5a)

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

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	0.8200	11.2829	0.4500	0.7000	0.7700	2.0197 (75)
Southeast	7.2200	36.7938	0.4500	0.7000	0.7700	57.9904 (77)
Southwest	6.0000	36.7938	0.4500	0.7000	0.7700	48.1915 (79)
Northwest	9.4900	11.2829	0.4500	0.7000	0.7700	23.3740 (81)

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Solar gains	131.5755	232.5564	340.5981	459.5703	549.0335	560.1403	533.7606	464.7120	381.4357	263.0652	159.1331	111.6072 (83)
Total gains	675.5375	790.0595	873.0432	971.3279	1032.2842	1021.0481	975.0975	907.0109	838.6585	740.7999	669.1690	643.1246 (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	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595
alpha	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573
util living area	0.9845	0.9712	0.9469	0.8861	0.7728	0.6080	0.4607	0.5109	0.7338	0.9158	0.9729	0.9871 (86)
MIT	19.3385	19.5899	19.9361	20.3717	20.7239	20.9191	20.9785	20.9680	20.8309	20.3667	19.7652	19.2766 (87)
Th 2	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063 (88)
util rest of house	0.9811	0.9650	0.9352	0.8607	0.7239	0.5301	0.3629	0.4101	0.6627	0.8913	0.9659	0.9842 (89)
MIT 2	18.0738	18.3913	18.8251	19.3559	19.7577	19.9515	19.9969	19.9911	19.8772	19.3624	18.6167	17.9952 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.3351	18.6389	19.0546	19.5658	19.9573	20.1514	20.1997	20.1929	20.0742	19.5698	18.8540	18.2599 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.3351	18.6389	19.0546	19.5658	19.9573	20.1514	20.1997	20.1929	20.0742	19.5698	18.8540	18.2599 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9729	0.9535	0.9210	0.8475	0.7212	0.5421	0.3825	0.4298	0.6680	0.8781	0.9549	0.9769 (94)
Useful gains	657.2351	753.3603	804.0380	823.2007	744.4925	553.4873	372.9832	389.8217	560.2407	650.4749	638.9863	628.2843 (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	1478.1174	1446.9228	1322.1991	1123.2749	869.6233	584.6506	379.1036	399.4543	629.1763	944.6661	1237.8785	1480.7343 (97)
Space heating kWh	610.7364	466.0740	385.5119	216.0534	93.0973	0.0000	0.0000	0.0000	0.0000	218.8783	431.2024	634.2228 (98a)
Space heating requirement - total per year (kWh/year)	3055.7765											
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	610.7364	466.0740	385.5119	216.0534	93.0973	0.0000	0.0000	0.0000	0.0000	218.8783	431.2024	634.2228 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	3055.7765											
Space heating per m2	(98c) / (4) = 31.7220 (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	610.7364	466.0740	385.5119	216.0534	93.0973	0.0000	0.0000	0.0000	0.0000	218.8783	431.2024	634.2228 (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)	688.5417	525.4499	434.6244	243.5777	104.9575	0.0000	0.0000	0.0000	0.0000	246.7625	486.1357	715.0200 (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	177.4227	155.9648	164.1018	141.3666	134.8421	119.1829	116.3371	122.5297	125.5252	142.6517	154.8047	175.1848 (64)
Efficiency of water heater	85.5412	85.1959	84.5584	83.2956	80.8538	76.2000	76.2000	76.2000	76.2000	83.3077	85.0159	76.2000 (216)
Fuel for water heating, kWh/month	207.4121	183.0662	194.0692	169.7167	166.7729	156.4080	152.6733	160.8001	164.7312	171.2346	182.0892	204.5148 (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	16.3619	14.7785	16.3619	15.8341	16.3619	15.8341	16.3619	16.3619	15.8341	16.3619	15.8341	16.3619 (231)
Lighting	26.4607	21.2277	19.1132	14.0032	10.8164	8.8371	9.8671	12.8257	16.6593	21.8579	24.6884	27.1961 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-20.2231	-31.0935	-48.9210	-59.8318	-68.3655	-65.2108	-64.3041	-58.6701	-49.2768	-37.4734	-23.0441	-17.1439 (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	-6.5564	-14.8146	-31.9803	-51.6703	-71.4225	-72.8994	-71.7068	-58.9282	-40.7675	-22.0035	-8.9736	-5.0881 (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	3445.0693 (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	2113.4882 (219)											
Space cooling fuel	0.0000 (221)											

Electricity for pumps and fans:
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.3640)

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mechanical ventilation fans (SFP = 0.3640)	106.6485 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	192.6485 (231)
Electricity for lighting (calculated in Appendix L)	213.5527 (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	4964.3893 (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	3445.0693	0.2100	723.4646 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2113.4882	0.2100	443.8325 (264)
Space and water heating			1167.2971 (265)
Pumps, fans and electric keep-hot	192.6485	0.1387	26.7227 (267)
Energy for lighting	213.5527	0.1443	30.8223 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-543.5582	0.1329	-72.2528
PV Unit electricity exported	-456.8113	0.1240	-56.6599
Total			-128.9128 (269)
Total CO2, kg/year			1095.9293 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.3800 (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	3445.0693	1.1300	3892.9283 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2113.4882	1.1300	2388.2417 (278)
Space and water heating			6281.1700 (279)
Pumps, fans and electric keep-hot	192.6485	1.5128	291.4387 (281)
Energy for lighting	213.5527	1.5338	327.5543 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-543.5582	1.4912	-810.5417
PV Unit electricity exported	-456.8113	0.4552	-207.9414
Total			-1018.4831 (283)
Total Primary energy kWh/year			5881.6798 (286)
Dwelling Primary energy Rate (DPER)			61.0600 (287)

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

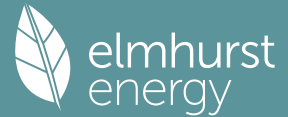
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	47.6300 (1b)	x 2.6700 (2b)	= 127.1721 (1b) - (3b)
First floor	48.7000 (1c)	x 2.3200 (2c)	= 112.9840 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	96.3300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	240.1561 (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) = 0.1249 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3749 (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) = 0.3187 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.4063	0.3984	0.3904	0.3505	0.3426	0.3027	0.3027	0.2948	0.3187	0.3426	0.3585	0.3745 (22b)
	0.5825	0.5793	0.5762	0.5614	0.5587	0.5458	0.5458	0.5434	0.5508	0.5587	0.5643	0.5701 (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)			21.9600	1.1450	25.1450		(27)
Ground Floor			47.3000	0.1300	6.1490		(28a)
Exposed First Floor			1.0700	0.1300	0.1391		(28b)
Brick and Block	72.7032	15.1000	57.6032	0.1800	10.3686		(29a)
Tile Hung	80.4400	9.0100	71.4300	0.1800	12.8574		(29a)
Pitched Roof	48.7000		48.7000	0.1100	5.3570		(30)
Total net area of external elements Aum(A, m2)			250.2132				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	62.1661	(33)

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

168.6872 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	18.9630	0.0500	0.9482
E3 Sill	14.7700	0.0500	0.7385
E4 Jamb	44.1000	0.0500	2.2050
E5 Ground floor (normal)	30.1600	0.1600	4.8256
E20 Exposed floor (normal)	3.4200	0.3200	1.0944
E10 Eaves (insulation at ceiling level)	29.1000	0.0600	1.7460
E16 Corner (normal)	29.5900	0.0900	2.6631
E21 Exposed floor (inverted)	2.0700	0.3200	0.6624
E12 Gable (insulation at ceiling level)	2.2000	0.0600	0.1320
E17 Corner (inverted - internal area greater than external area)	9.6300	-0.0900	-0.8667
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			14.1485 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	76.3146 (37)

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

(38)m	Jan 46.1678	Feb 45.9137	Mar 45.6647	Apr 44.4952	May 44.2763	Jun 43.2577	Jul 43.2577	Aug 43.0690	Sep 43.6501	Oct 44.2763	Nov 44.7190	Dec 45.1818 (38)
Heat transfer coeff	122.4823	122.2283	121.9793	120.8097	120.5909	119.5722	119.5722	119.3836	119.9646	120.5909	121.0336	121.4964 (39)
Average = Sum(39)m / 12 =												120.8087

HLP	Jan 1.2715	Feb 1.2688	Mar 1.2663	Apr 1.2541	May 1.2519	Jun 1.2413	Jul 1.2413	Aug 1.2393	Sep 1.2454	Oct 1.2519	Nov 1.2564	Dec 1.2613 (40)
HLP (average)												1.2541
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7029 (42)
Hot water usage for mixer showers	69.5378	68.4928	66.9700	64.0564	61.9062	59.5084	58.1454	59.6567	61.3133	63.8879	66.8641	69.2713 (42a)
Hot water usage for baths	30.0267	29.5808	28.9528	27.7950	26.9279	25.9666	25.4473	26.0709	26.7498	27.7785	28.9603	29.9252 (42b)
Hot water usage for other uses	42.3099	40.7714	39.2329	37.6943	36.1558	34.6172	34.6172	36.1558	37.6943	39.2329	40.7714	42.3099 (42c)
Average daily hot water use (litres/day)												130.4146 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	141.8745	138.8450	135.1556	129.5456	124.9899	120.0922	118.2100	121.8834	125.7575	130.8993	136.5957	141.5065 (44)
Distribution loss (46)m = 0.15 x (45)m	224.6945	197.7134	207.7292	177.3415	168.2605	147.6673	142.9647	150.9171	155.0716	177.6291	194.6057	221.5650 (45)
Total = Sum(45)m =											2166.1594	
Water storage loss:	33.7042	29.6570	31.1594	26.6012	25.2391	22.1501	21.4447	22.6376	23.2607	26.6444	29.1908	33.2348 (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	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												
WWHRS	275.6534	243.7408	258.6881	226.6566	219.2194	196.9824	193.9236	201.8760	204.3866	228.5880	243.9207	272.5239 (62)
PV diverter	-31.7898	-28.1151	-29.4405	-24.3779	-22.7194	-19.4411	-18.2229	-19.3783	-20.1145	-23.7128	-26.8637	-31.2011 (63a)
Solar input	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
12Total per year (kWh/year)	243.8636	215.6256	229.2475	202.2786	196.5000	177.5413	175.7007	182.4977	184.2721	204.8752	217.0570	241.3228 (64)
Electric shower(s)	Total per year (kWh/year) = Sum(64)m =											2470.7821 (64)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000 (64a)
Heat gains from water heating, kWh/month	87.4506	77.2465	81.8097	71.2948	68.6863	61.4282	60.2755	62.9196	63.8901	71.8014	77.0351	86.4101 (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	135.1428	135.1428	135.1428	135.1428	135.1428	135.1428	135.1428	135.1428	135.1428	135.1428	135.1428	135.1428 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	126.1989	139.7202	126.1989	130.4055	126.1989	130.4055	126.1989	126.1989	130.4055	126.1989	130.4055	126.1989 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	250.2545	252.8514	246.3074	232.3760	214.7901	198.2618	187.2199	184.6231	191.1671	205.0985	222.6844	239.2126 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												

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Pumps, fans	36.5143	36.5143	36.5143	36.5143	36.5143	36.5143	36.5143	36.5143	36.5143	36.5143	36.5143	36.5143 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142 (71)
Total internal gains	117.5412	114.9502	109.9592	99.0206	92.3203	85.3169	81.0154	84.5694	88.7362	96.5073	106.9933	116.1426 (72)
	560.5374	574.0646	549.0083	528.3449	499.8521	477.5270	457.9771	458.9342	473.8516	494.3474	526.6260	548.0969 (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					0.7600	11.2829		0.6300	0.7000	0.7700		2.6206 (75)
Southeast					6.7400	36.7938		0.6300	0.7000	0.7700		75.7891 (77)
Southwest					5.6000	36.7938		0.6300	0.7000	0.7700		62.9702 (79)
Northwest					8.8600	11.2829		0.6300	0.7000	0.7700		30.5512 (81)

Solar gains	171.9311	303.8806	445.0493	600.4931	717.3779	731.8854	697.4194	607.2071	498.4060	343.7438	207.9404	145.8388 (83)
Total gains	732.4685	877.9452	994.0577	1128.8380	1217.2300	1209.4124	1155.3964	1066.1413	972.2576	838.0913	734.5663	693.9357 (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	36.8526	36.9292	37.0045	37.3628	37.4306	37.7495	37.7495	37.8091	37.6260	37.4306	37.2937	37.1516	
alpha	3.4568	3.4619	3.4670	3.4909	3.4954	3.5166	3.5166	3.5206	3.5084	3.4954	3.4862	3.4768	
util living area	0.9814	0.9652	0.9357	0.8655	0.7447	0.5795	0.4393	0.4897	0.7119	0.9031	0.9679	0.9844 (86)	
MIT	19.0702	19.3690	19.7787	20.2918	20.6857	20.9057	20.9728	20.9603	20.8015	20.2732	19.5819	19.0197 (87)	
Th 2	19.8632	19.8653	19.8674	19.8769	19.8787	19.8871	19.8871	19.8887	19.8839	19.8787	19.8751	19.8713 (88)	
util rest of house	0.9771	0.9574	0.9212	0.8353	0.6898	0.4958	0.3351	0.3818	0.6336	0.8743	0.9594	0.9808 (89)	
MIT 2	17.6410	18.0188	18.5314	19.1588	19.6037	19.8259	19.8760	19.8710	19.7377	19.1545	18.2987	17.5821 (90)	
Living area fraction	17.9363	18.2978	18.7890	19.3928	19.8272	20.0490	20.1026	20.0960	fL = Living area / (4) =				0.2066 (91)
MIT	17.9363	18.2978	18.7890	19.3928	19.8272	20.0490	20.1026	20.0960	19.9574	19.3856	18.5638	17.8791 (92)	
Temperature adjustment												0.0000	
adjusted MIT	17.9363	18.2978	18.7890	19.3928	19.8272	20.0490	20.1026	20.0960	19.9574	19.3856	18.5638	17.8791 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9667	0.9429	0.9035	0.8201	0.6870	0.5087	0.3559	0.4028	0.6393	0.8586	0.9456	0.9715 (94)
Useful gains	708.0462	827.7840	898.1378	925.7216	836.2517	615.1830	411.2092	429.4407	621.5606	719.5956	694.6135	674.1373 (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	1670.2028	1637.5840	1499.0059	1267.6354	980.0716	651.5454	418.8153	441.2417	702.6862	1059.4683	1387.5058	1661.9615 (97)
Space heating kWh	715.8445	544.1856	447.0459	246.1779	107.0020	0.0000	0.0000	0.0000	0.0000	252.8653	498.8825	734.9412 (98a)
Space heating requirement - total per year (kWh/year)												3546.9450
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	715.8445	544.1856	447.0459	246.1779	107.0020	0.0000	0.0000	0.0000	0.0000	252.8653	498.8825	734.9412 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3546.9450
Space heating per m ²										(98c) / (4) =		36.8208 (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	715.8445	544.1856	447.0459	246.1779	107.0020	0.0000	0.0000	0.0000	0.0000	252.8653	498.8825	734.9412 (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)	774.7235	588.9455	483.8159	266.4263	115.8030	0.0000	0.0000	0.0000	0.0000	273.6637	539.9161	795.3910 (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 requirement	243.8636	215.6256	229.2475	202.2786	196.5000	177.5413	175.7007	182.4977	184.2721	204.8752	217.0570	241.3228 (64)
Efficiency of water heater (217)m	86.5448	86.2777	85.7857	84.8034	83.1354	80.3000	80.3000	80.3000	80.3000	84.8335	86.1042	80.3000 (216)
Fuel for water heating, kWh/month	281.7774	249.9204	267.2330	238.5266	236.3614	221.0975	218.8053	227.2698	229.4796	241.5027	252.0864	278.6407 (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	26.2216	21.0360	18.9406	13.8767	10.7187	8.7573	9.7780	12.7098	16.5088	21.6604	24.4654	26.9504 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-43.8274	-61.4188	-87.7600	-98.0596	-105.2034	-97.9712	-96.7121	-91.5268	-82.3471	-69.8867	-48.0318	-37.9308 (233a)

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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	-25.9123	-54.3719	-107.8274	-161.6206	-213.4101	-214.3545	-211.8774	-179.5727	-131.8252	-77.7032	-34.5756	-20.5055	(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												3838.6850	(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												2942.7007	(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)												211.6236	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2354.2321	(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												4724.7772	(238)

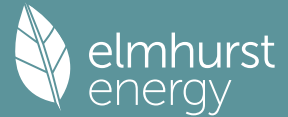
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3838.6850	0.2100	806.1239 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2942.7007	0.2100	617.9671 (264)
Space and water heating			1424.0910 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	211.6236	0.1443	30.5438 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-920.6756	0.1347	-124.0366
PV Unit electricity exported	-1433.5565	0.1260	-180.5584
Total			-304.5949 (269)
Total CO2, kg/year			1161.9692 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.0600 (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	3838.6850	1.1300	4337.7141 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2942.7007	1.1300	3325.2518 (278)
Space and water heating			7662.9659 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	211.6236	1.5338	324.5954 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-920.6756	1.4979	-1379.1009
PV Unit electricity exported	-1433.5565	0.4623	-662.7765
Total			-2041.8774 (283)
Total Primary energy kWh/year			6075.7847 (286)
Target Primary Energy Rate (TPER)			63.0700 (287)

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Property Reference	SAP 0898 Plot 5				Issued on Date	06/01/2025		
Assessment Reference	Rev C			Prop Type Ref				
Property	Plot 5, Wharton's Lane, Southampton							
SAP Rating	90 B		DER	11.38		TER	12.06	
Environmental	90 B		% DER < TER				5.64	
CO ₂ Emissions (t/year)	0.91		DFEE	38.68		TFEE	42.93	
Compliance Check	See BREL		% DFEE < TFEE				9.88	
% DPER < TPER	3.19		DPER	61.06		TPER	63.07	
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	47.6300 (1b)	x 2.6700 (2b)	= 127.1721 (1b) - (3b)
First floor	48.7000 (1c)	x 2.3200 (2c)	= 112.9840 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	96.3300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 240.1561 (5)

2. Ventilation rate

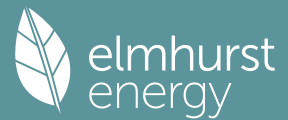
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1249 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3249 (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) = 0.2762 (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	0.3521	0.3452	0.3383	0.3038	0.2969	0.2624	0.2624	0.2555	0.2762	0.2969	0.3107	0.3245 (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	0.5620	0.5596	0.5572	0.5461	0.5441	0.5344	0.5344	0.5326	0.5381	0.5441	0.5483	0.5527 (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)			23.5300	0.9615	22.6250		(27)
Ground Floor			47.3000	0.1200	5.6760	90.0000	4257.0000 (28a)
Exposed First Floor			1.0700	0.1500	0.1605	20.0000	21.4000 (28b)
Brick and Block	72.7032	16.0400	56.6632	0.1800	10.1994	42.2200	2392.3203 (29a)
Tile Hung	80.4400	9.6400	70.8000	0.1800	12.7440	42.2200	2989.1760 (29a)
Pitched Roof	48.7000		48.7000	0.0900	4.3830	9.0000	438.3000 (30)
Total net area of external elements Aum(A, m ²)			250.2132				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	58.1529		(33)
Ground Floor Stud			35.5000			9.0000	319.5000 (32c)
First Floor Stud			95.2600			9.0000	857.3400 (32c)
Ground Floor Block			49.3000			75.0000	3697.5000 (32c)
First Floor			47.3000			18.0000	851.4000 (32d)
Internal Ceiling 1			47.3000			9.0000	425.7000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	16249.6363 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							168.6872 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	18.9630	0.0300	0.5689
E3 Sill	14.7700	0.0250	0.3693
E4 Jamb	44.1000	0.0190	0.8379
E5 Ground floor (normal)	30.1600	0.0580	1.7493
E20 Exposed floor (normal)	3.4200	0.3200	1.0944
E10 Eaves (insulation at ceiling level)	29.1000	0.0650	1.8915
E16 Corner (normal)	29.5900	0.0360	1.0652
E21 Exposed floor (inverted)	2.0700	0.3200	0.6624
E12 Gable (insulation at ceiling level)	2.2000	0.0400	0.0880
E17 Corner (inverted - internal area greater than external area)	9.6300	-0.0820	-0.7897
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.5372 (36)
Point Thermal bridges			0.0000 (36a) =
Total fabric heat loss			65.6901 (37) (33) + (36) + (36a) =

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	44.5392	44.3484	44.1614	43.2830	43.1186	42.3536	42.3536	42.2119	42.6482	43.1186	43.4511	43.7987 (38)
Heat transfer coeff	110.2293	110.0385	109.8515	108.9730	108.8087	108.0436	108.0436	107.9020	108.3383	108.8087	109.1412	109.4888 (39)
Average = Sum(39)m / 12 =												108.9723
HLP	1.1443	1.1423	1.1404	1.1312	1.1295	1.1216	1.1216	1.1201	1.1247	1.1295	1.1330	1.1366 (40)
HLP (average)												1.1312
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7029 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	30.0267	29.5808	28.9528	27.7950	26.9279	25.9666	25.4473	26.0709	26.7498	27.7785	28.9603	29.9252 (42b)
Hot water usage for other uses	42.3099	40.7714	39.2329	37.6943	36.1558	34.6172	34.6172	36.1558	37.6943	39.2329	40.7714	42.3099 (42c)
Average daily hot water use (litres/day)												66.3031 (43)
Daily hot water use	72.3367	70.3522	68.1857	65.4893	63.0837	60.5838	60.0645	62.2266	64.4442	67.0114	69.7317	72.2352 (44)
Energy conte	114.5636	100.1806	104.7988	89.6515	84.9228	74.4949	72.6428	77.0496	79.4661	90.9338	99.3455	113.1028 (45)
Energy content (annual)										Total = Sum(45)m =		1101.1529
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	97.3791	85.1535	89.0790	76.2038	72.1844	63.3206	61.7464	65.4921	67.5462	77.2938	84.4437	96.1374 (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	97.3791	85.1535	89.0790	76.2038	72.1844	63.3206	61.7464	65.4921	67.5462	77.2938	84.4437	96.1374 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		935.9800 (64)
Electric shower(s)	55.6882	49.6186	54.1816	51.7049	52.6751	50.2469	51.9218	52.6751	51.7049	54.1816	53.1628	55.6882 (64a)
												633.4496 (64a)
Heat gains from water heating, kWh/month	38.2668	33.6930	35.8152	31.9772	31.2149	28.3919	28.4171	29.5418	29.8128	32.8688	34.4016	37.9564 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	135.1428	135.1428	135.1428	135.1428	135.1428	135.1428	135.1428	135.1428	135.1428	135.1428	135.1428	135.1428 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	126.2247	139.7487	126.2247	130.4322	126.2247	130.4322	126.2247	126.2247	130.4322	126.2247	130.4322	126.2247 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	250.2545	252.8514	246.3074	232.3760	214.7901	198.2618	187.2199	184.6231	191.1671	205.0985	222.6844	239.2126 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.5143	36.5143	36.5143	36.5143	36.5143	36.5143	36.5143	36.5143	36.5143	36.5143	36.5143	36.5143 (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)	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142 (71)
Water heating gains (Table 5)	51.4339	50.1384	48.1387	44.4127	41.9555	39.4332	38.1950	39.7067	41.4066	44.1786	47.7800	51.0167 (72)
Total internal gains	491.4559	506.2814	484.2135	470.7637	446.5130	431.6700	415.1824	414.0973	426.5487	439.0445	464.4394	479.9968 (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				0.8200	11.2829	0.4500	0.7000					2.0197 (75)
Southeast				7.2200	36.7938	0.4500	0.7000			0.7700		57.9904 (77)
Southwest				6.0000	36.7938	0.4500	0.7000			0.7700		48.1915 (79)
Northwest				9.4900	11.2829	0.4500	0.7000			0.7700		23.3740 (81)
Solar gains	131.5755	232.5564	340.5981	459.5703	549.0335	560.1403	533.7606	464.7120	381.4357	263.0652	159.1331	111.6072 (83)

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Total gains 623.0314 738.8378 824.8116 930.3340 995.5466 991.8103 948.9430 878.8093 807.9843 702.1097 623.5725 591.6040 (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	40.9491	41.0201	41.0899	41.4211	41.4837	41.7775	41.7775	41.8323	41.6638	41.4837	41.3573	41.2260	
alpha	3.7299	3.7347	3.7393	3.7614	3.7656	3.7852	3.7852	3.7888	3.7776	3.7656	3.7572	3.7484	
util living area	0.9883	0.9774	0.9569	0.9021	0.7966	0.6316	0.4820	0.5346	0.7589	0.9299	0.9788	0.9903 (86)	
MIT	19.1623	19.4249	19.7935	20.2787	20.6704	20.9019	20.9729	20.9600	20.7975	20.2793	19.6361	19.1160 (87)	
Th 2	19.9648	19.9664	19.9680	19.9754	19.9768	19.9832	19.9832	19.9844	19.9807	19.9768	19.9740	19.9711 (88)	
util rest of house	0.9856	0.9723	0.9469	0.8788	0.7489	0.5515	0.3787	0.4289	0.6884	0.9082	0.9732	0.9881 (89)	
MIT 2	18.2958	18.5564	18.9192	19.3895	19.7433	19.9310	19.9740	19.9696	19.8588	19.4007	18.7732	18.2544 (90)	
Living area fraction									fLA = Living area / (4) =				0.2066 (91)
MIT	18.4748	18.7358	19.0998	19.5732	19.9349	20.1316	20.1803	20.1742	20.0527	19.5822	18.9515	18.4324 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.4748	18.7358	19.0998	19.5732	19.9349	20.1316	20.1803	20.1742	20.0527	19.5822	18.9515	18.4324 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9803	0.9643	0.9362	0.8680	0.7467	0.5640	0.3994	0.4496	0.6939	0.8978	0.9655	0.9834 (94)	
Useful gains	610.7332	712.4246	772.1827	807.5448	743.3613	559.3442	379.0524	395.0797	560.6709	630.3705	602.0787	581.7771 (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	1562.4745	1522.4731	1384.1094	1163.0894	896.0237	597.6550	386.8314	407.2393	644.9048	977.3439	1293.4838	1558.2886 (97)	
Space heating kWh	708.0955	544.3526	455.2735	255.9921	113.5809	0.0000	0.0000	0.0000	0.0000	258.1482	497.8116	726.5246 (98a)	
Space heating requirement - total per year (kWh/year)												3559.7790	
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	708.0955	544.3526	455.2735	255.9921	113.5809	0.0000	0.0000	0.0000	0.0000	258.1482	497.8116	726.5246 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												3559.7790	
Space heating per m2												36.9540 (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	1015.6101	799.5229	820.0548	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8243	0.8863	0.8559	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	837.2074	708.5889	701.8570	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1109.0770	1061.4144	981.9223	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	195.7461	262.5022	208.3686	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	48.9365	65.6255	52.0922	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												166.6542 (107)
Energy for space heating												36.9540 (99)
Energy for space cooling												1.7300 (108)
Total												38.6840 (109)
Fabric Energy Efficiency (DFEE)												38.7 (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	47.6300 (1b)	x	2.6700 (2b)	=	127.1721 (1b) - (3b)	
First floor	48.7000 (1c)	x	2.3200 (2c)	=	112.9840 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	96.3300				(4)	
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)... (3n)	=	240.1561 (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)

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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)
Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1249 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3749	(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) =	0.3187 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000	(22)
Wind factor	Jan 1.2750 Feb 1.2500 Mar 1.2250 Apr 1.1000 May 1.0750 Jun 0.9500 Jul 0.9500 Aug 0.9250 Sep 1.0000 Oct 1.0750 Nov 1.1250 Dec 1.1750	(22a)
Adj infilt rate	Jan 0.4063 Feb 0.3984 Mar 0.3904 Apr 0.3505 May 0.3426 Jun 0.3027 Jul 0.3027 Aug 0.2948 Sep 0.3187 Oct 0.3426 Nov 0.3585 Dec 0.3745	(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	Jan 0.5825 Feb 0.5793 Mar 0.5762 Apr 0.5614 May 0.5587 Jun 0.5458 Jul 0.5458 Aug 0.5434 Sep 0.5508 Oct 0.5587 Nov 0.5643 Dec 0.5701	(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)			21.9600	1.1450	25.1450		(27)
Ground Floor			47.3000	0.1300	6.1490		(28a)
Exposed First Floor			1.0700	0.1300	0.1391		(28b)
Brick and Block	72.7032	15.1000	57.6032	0.1800	10.3686		(29a)
Tile Hung	80.4400	9.0100	71.4300	0.1800	12.8574		(29a)
Pitched Roof	48.7000		48.7000	0.1100	5.3570		(30)
Total net area of external elements Aum(A, m2)			250.2132				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 62.1661		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							168.6872 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	18.9630	0.0500	0.9482
E3 Sill	14.7700	0.0500	0.7385
E4 Jamb	44.1000	0.0500	2.2050
E5 Ground floor (normal)	30.1600	0.1600	4.8256
E20 Exposed floor (normal)	3.4200	0.3200	1.0944
E10 Eaves (insulation at ceiling level)	29.1000	0.0600	1.7460
E16 Corner (normal)	29.5900	0.0900	2.6631
E21 Exposed floor (inverted)	2.0700	0.3200	0.6624
E12 Gable (insulation at ceiling level)	2.2000	0.0600	0.1320
E17 Corner (inverted - internal area greater than external area)	9.6300	-0.0900	-0.8667
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			14.1485 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 76.3146 (37)

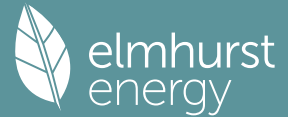
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	46.1678	45.9137	45.6647	44.4952	44.2763	43.2577	43.2577	43.0690	43.6501	44.2763	44.7190	45.1818
Heat transfer coeff	122.4823	122.2283	121.9793	120.8097	120.5909	119.5722	119.5722	119.3836	119.9646	120.5909	121.0336	121.4964
Average = Sum(39)m / 12 =												120.8087
HLP	1.2715	1.2688	1.2663	1.2541	1.2519	1.2413	1.2413	1.2393	1.2454	1.2519	1.2564	1.2613
HLP (average)												1.2541
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7029 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	30.0267	29.5808	28.9528	27.7950	26.9279	25.9666	25.4473	26.0709	26.7498	27.7785	28.9603	29.9252 (42b)
Hot water usage for other uses	42.3099	40.7714	39.2329	37.6943	36.1558	34.6172	34.6172	36.1558	37.6943	39.2329	40.7714	42.3099 (42c)
Average daily hot water use (litres/day)												66.3031 (43)
Daily hot water use	Jan 72.3367 Feb 70.3522 Mar 68.1857 Apr 65.4893 May 63.0837 Jun 60.5838 Jul 60.0645 Aug 62.2266 Sep 64.4442 Oct 67.0114 Nov 69.7317 Dec 72.2352											(44)
Energy conte	114.5636	100.1806	104.7988	89.6515	84.9228	74.4949	72.6428	77.0496	79.4661	90.9338	99.3455	113.1028 (45)
Energy content (annual)												Total = Sum(45)m = 1101.1529
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	97.3791	85.1535	89.0790	76.2038	72.1844	63.3206	61.7464	65.4921	67.5462	77.2938	84.4437	96.1374 (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	97.3791	85.1535	89.0790	76.2038	72.1844	63.3206	61.7464	65.4921	67.5462	77.2938	84.4437	96.1374 (64)
12Total per year (kWh/year)												935.9800 (64)
Electric shower(s)												936 (64)

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	55.6882	49.6186	54.1816	51.7049	52.6751	50.2469	51.9218	52.6751	51.7049	54.1816	53.1628	55.6882 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											633.4496 (64a)
Heat gains from water heating, kWh/month	38.2668	33.6930	35.8152	31.9772	31.2149	28.3919	28.4171	29.5418	29.8128	32.8688	34.4016	37.9564 (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
	135.1428	135.1428	135.1428	135.1428	135.1428	135.1428	135.1428	135.1428	135.1428	135.1428	135.1428	135.1428 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	126.1989	139.7202	126.1989	130.4055	126.1989	130.4055	126.1989	126.1989	130.4055	126.1989	130.4055	126.1989 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	250.2545	252.8514	246.3074	232.3760	214.7901	198.2618	187.2199	184.6231	191.1671	205.0985	222.6844	239.2126 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.5143	36.5143	36.5143	36.5143	36.5143	36.5143	36.5143	36.5143	36.5143	36.5143	36.5143	36.5143 (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)	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142 (71)
Water heating gains (Table 5)	51.4339	50.1384	48.1387	44.4127	41.9555	39.4332	38.1950	39.7067	41.4066	44.1786	47.7800	51.0167 (72)
Total internal gains	491.4301	506.2528	484.1877	470.7370	446.4873	431.6433	415.1566	414.0715	426.5220	439.0187	464.4127	479.9710 (73)

6. Solar gains

[Jan]				Area	Solar flux		g		FF		Access		Gains		
				m2	Table 6a		Specific data		Specific data		factor		W		
					W/m2		or Table 6b		or Table 6c		Table 6d				
Northeast				0.7600	11.2829		0.6300		0.7000		0.7700		2.6206 (75)		
Southeast				6.7400	36.7938		0.6300		0.7000		0.7700		75.7891 (77)		
Southwest				5.6000	36.7938		0.6300		0.7000		0.7700		62.9702 (79)		
Northwest				8.8600	11.2829		0.6300		0.7000		0.7700		30.5512 (81)		
Solar gains				171.9311	303.8806	445.0493	600.4931	717.3779	731.8854	697.4194	607.2071	498.4060	343.7438	207.9404	145.8388 (83)
Total gains				663.3612	810.1334	929.2371	1071.2302	1163.8651	1163.5287	1112.5760	1021.2786	924.9280	782.7626	672.3531	625.8098 (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)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	36.8526	36.9292	37.0045	37.3628	37.4306	37.7495	37.7495	37.8091	37.6260	37.4306	37.2937	37.1516
util living area	3.4568	3.4619	3.4670	3.4909	3.4954	3.5166	3.5166	3.5206	3.5084	3.4954	3.4862	3.4768
	0.9861	0.9722	0.9460	0.8800	0.7629	0.5970	0.4544	0.5079	0.7332	0.9178	0.9751	0.9886 (86)
MIT	18.9762	19.2821	19.7043	20.2418	20.6587	20.8965	20.9698	20.9554	20.7810	20.2170	19.5010	18.9257 (87)
Th 2	19.8632	19.8653	19.8674	19.8769	19.8787	19.8871	19.8871	19.8887	19.8839	19.8787	19.8751	19.8713 (88)
util rest of house	0.9829	0.9659	0.9334	0.8520	0.7093	0.5123	0.3473	0.3974	0.6561	0.8922	0.9682	0.9859 (89)
MIT 2	18.0388	18.3418	18.7558	19.2731	19.6438	19.8342	19.8774	19.8730	19.7565	19.2641	18.5682	17.9946 (90)
Living area fraction									FLA = Living area / (4) =			0.2066 (91)
MIT	18.2324	18.5360	18.9517	19.4732	19.8535	20.0537	20.1031	20.0966	19.9681	19.4610	18.7609	18.1869 (92)
Temperature adjustment												0.0000
adjusted MIT	18.2324	18.5360	18.9517	19.4732	19.8535	20.0537	20.1031	20.0966	19.9681	19.4610	18.7609	18.1869 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9763	0.9559	0.9205	0.8402	0.7080	0.5258	0.3688	0.4190	0.6625	0.8804	0.9591	0.9802 (94)
Ext temp.	647.6592	774.4429	855.3360	900.0412	823.9983	611.7413	410.3560	427.9506	612.7996	689.1082	644.8249	613.4049 (95)
Heat loss rate W	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)
Space heating kWh	1706.4769	1666.7089	1518.8498	1277.3455	983.2357	652.1089	418.8734	441.3170	703.9657	1068.5516	1411.3618	1699.3600 (97)
Space heating requirement - total per year (kWh/year)	787.7604	599.6028	493.6543	271.6591	118.4727	0.0000	0.0000	0.0000	0.0000	282.3059	551.9066	807.9506 (98a)
Solar heating kWh												3913.3123
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Space heating kWh	787.7604	599.6028	493.6543	271.6591	118.4727	0.0000	0.0000	0.0000	0.0000	282.3059	551.9066	807.9506 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3913.3123
Space heating per m2										(98c) / (4) =		40.6240 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8340	0.8908	0.8603	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	937.3776	788.2257	780.5428	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1309.8158	1252.7015	1148.4718	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	268.1555	345.5700	273.7391	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction									fc = cooled area / (4) =			0.0000 (104)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	67.0389	86.3925	68.4348	0.0000	0.0000	0.0000	0.0000 (106)
												0.0000 (107)

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Space cooling requirement	221.8662 (107)
Energy for space heating	40.6240 (99)
Energy for space cooling	2.3032 (108)
Total	42.9272 (109)
Fabric Energy Efficiency (TFEE)	42.9 (109)

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Property Reference	SAP 0898 Plot 5				Issued on Date	06/01/2025
Assessment Reference	Rev C		Prop Type Ref			
Property	Plot 5, Wharton's Lane, Southampton					
SAP Rating	90 B	DER	11.38	TER	12.06	
Environmental	90 B	% DER < TER				5.64
CO ₂ Emissions (t/year)	0.91	DFEE	38.68	TFEE	42.93	
Compliance Check	See BREL	% DFEE < TFEE				9.88
% DPER < TPER	3.19	DPER	61.06	TPER	63.07	
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	47.6300 (1b)	x 2.6700 (2b)	= 127.1721 (1b) - (3b)
First floor	48.7000 (1c)	x 2.3200 (2c)	= 112.9840 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	96.3300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 240.1561 (5)

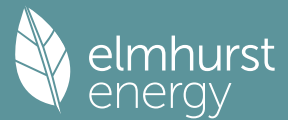
2. Ventilation rate

	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 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 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	
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)			23.5300	0.9615	22.6250		(27)
Ground Floor			47.3000	0.1200	5.6760	90.0000	4257.0000 (28a)
Exposed First Floor			1.0700	0.1500	0.1605	20.0000	21.4000 (28b)
Brick and Block	72.7032	16.0400	56.6632	0.1800	10.1994	42.2200	2392.3203 (29a)
Tile Hung	80.4400	9.6400	70.8000	0.1800	12.7440	42.2200	2989.1760 (29a)
Pitched Roof	48.7000		48.7000	0.0900	4.3830	9.0000	438.3000 (30)
Total net area of external elements Aum(A, m ²)			250.2132				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	58.1529		(33)
Ground Floor Stud			35.5000			9.0000	319.5000 (32c)
First Floor Stud			95.2600			9.0000	857.3400 (32c)
Ground Floor Block			49.3000			75.0000	3697.5000 (32c)
First Floor			47.3000			18.0000	851.4000 (32d)
Internal Ceiling 1			47.3000			9.0000	425.7000 (32e)

Full SAP Calculation Printout



Heat capacity $C_m = \text{Sum}(A \times k)$
Thermal mass parameter (TMP = C_m / TFA) in $\text{kJ/m}^2\text{K}$
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	18.9630	0.0300	0.5689
E3 Sill	14.7700	0.0250	0.3693
E4 Jamb	44.1000	0.0190	0.8379
E5 Ground floor (normal)	30.1600	0.0580	1.7493
E20 Exposed floor (normal)	3.4200	0.3200	1.0944
E10 Eaves (insulation at ceiling level)	29.1000	0.0650	1.8915
E16 Corner (normal)	29.5900	0.0360	1.0652
E21 Exposed floor (inverted)	2.0700	0.3200	0.6624
E12 Gable (insulation at ceiling level)	2.2000	0.0400	0.0880
E17 Corner (inverted - internal area greater than external area)	9.6300	-0.0820	-0.7897

Thermal bridges (Sum($L \times \text{Psi}$) calculated using Appendix K)
Point Thermal bridges
Total fabric heat loss

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$
(38)m
Heat transfer coeff
Average = Sum(39)m / 12 =

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0933	1.0933	1.0933	1.0933	1.0933	1.0933	1.0933	1.0933	1.0933	1.0933	1.0933	1.0933
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
Hot water usage for mixer showers
Hot water usage for baths
Hot water usage for other uses
Average daily hot water use (litres/day)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	141.8745	138.8450	135.1556	129.5456	124.9899	120.0922	118.2100	121.8834	125.7575	130.8993	136.5957	141.5065
Energy conte	224.6945	197.7134	207.7292	177.3415	168.2605	147.6673	142.9647	150.9171	155.0716	177.6291	194.6057	221.5650
Energy content (annual)										Total = Sum(45)m =		2166.1594
Distribution loss (46)m = $0.15 \times (45)\text{m}$	33.7042	29.6570	31.1594	26.6012	25.2391	22.1501	21.4447	22.6376	23.2607	26.6444	29.1908	33.2348

Water storage loss:
Total storage loss
If cylinder contains dedicated solar storage
Primary loss
Combi loss
Total heat required for water heating calculated for each month
WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
12Total per year (kWh/year)	177.4227	155.9648	164.1018	141.3666	134.8421	119.1829	116.3371	122.5297	125.5252	142.6517	154.8047	175.1848
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =
Heat gains from water heating, kWh/month

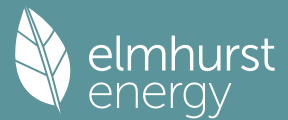
5. Internal gains (see Table 5 and 5a)

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

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	0.8200	11.2829	0.4500	0.7000	0.7700	2.0197 (75)
Southeast	7.2200	36.7938	0.4500	0.7000	0.7700	57.9904 (77)
Southwest	6.0000	36.7938	0.4500	0.7000	0.7700	48.1915 (79)
Northwest	9.4900	11.2829	0.4500	0.7000	0.7700	23.3740 (81)

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Solar gains	131.5755	232.5564	340.5981	459.5703	549.0335	560.1403	533.7606	464.7120	381.4357	263.0652	159.1331	111.6072 (83)
Total gains	675.5375	790.0595	873.0432	971.3279	1032.2842	1021.0481	975.0975	907.0109	838.6585	740.7999	669.1690	643.1246 (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	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595
alpha	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573
util living area	0.9845	0.9712	0.9469	0.8861	0.7728	0.6080	0.4607	0.5109	0.7338	0.9158	0.9729	0.9871 (86)
MIT	19.3385	19.5899	19.9361	20.3717	20.7239	20.9191	20.9785	20.9680	20.8309	20.3667	19.7652	19.2766 (87)
Th 2	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063 (88)
util rest of house	0.9811	0.9650	0.9352	0.8607	0.7239	0.5301	0.3629	0.4101	0.6627	0.8913	0.9659	0.9842 (89)
MIT 2	18.0738	18.3913	18.8251	19.3559	19.7577	19.9515	19.9969	19.9911	19.8772	19.3624	18.6167	17.9952 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.3351	18.6389	19.0546	19.5658	19.9573	20.1514	20.1997	20.1929	20.0742	19.5698	18.8540	18.2599 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.3351	18.6389	19.0546	19.5658	19.9573	20.1514	20.1997	20.1929	20.0742	19.5698	18.8540	18.2599 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9729	0.9535	0.9210	0.8475	0.7212	0.5421	0.3825	0.4298	0.6680	0.8781	0.9549	0.9769 (94)
Useful gains	657.2351	753.3603	804.0380	823.2007	744.4925	553.4873	372.9832	389.8217	560.2407	650.4749	638.9863	628.2843 (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	1478.1174	1446.9228	1322.1991	1123.2749	869.6233	584.6506	379.1036	399.4543	629.1763	944.6661	1237.8785	1480.7343 (97)
Space heating kWh	610.7364	466.0740	385.5119	216.0534	93.0973	0.0000	0.0000	0.0000	0.0000	218.8783	431.2024	634.2228 (98a)
Space heating requirement - total per year (kWh/year)												3055.7765 (88)
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	610.7364	466.0740	385.5119	216.0534	93.0973	0.0000	0.0000	0.0000	0.0000	218.8783	431.2024	634.2228 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3055.7765
Space heating per m2												(98c) / (4) = 31.7220 (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	610.7364	466.0740	385.5119	216.0534	93.0973	0.0000	0.0000	0.0000	0.0000	218.8783	431.2024	634.2228 (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)	688.5417	525.4499	434.6244	243.5777	104.9575	0.0000	0.0000	0.0000	0.0000	246.7625	486.1357	715.0200 (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	177.4227	155.9648	164.1018	141.3666	134.8421	119.1829	116.3371	122.5297	125.5252	142.6517	154.8047	175.1848 (64)
Efficiency of water heater (217)m	85.5412	85.1959	84.5584	83.2956	80.8538	76.2000	76.2000	76.2000	76.2000	83.3077	85.0159	76.2000 (216)
Fuel for water heating, kWh/month	207.4121	183.0662	194.0692	169.7167	166.7729	156.4080	152.6733	160.8001	164.7312	171.2346	182.0892	85.6587 (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	16.3619	14.7785	16.3619	15.8341	16.3619	15.8341	16.3619	16.3619	15.8341	16.3619	15.8341	16.3619 (231)
Lighting	26.4607	21.2277	19.1132	14.0032	10.8164	8.8371	9.8671	12.8257	16.6593	21.8579	24.6884	27.1961 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-20.2231	-31.0935	-48.9210	-59.8318	-68.3655	-65.2108	-64.3041	-58.6701	-49.2768	-37.4734	-23.0441	-17.1439 (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	-6.5564	-14.8146	-31.9803	-51.6703	-71.4225	-72.8994	-71.7068	-58.9282	-40.7675	-22.0035	-8.9736	-5.0881 (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												3445.0693 (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												2113.4882 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.3640)

Full SAP Calculation Printout



mechanical ventilation fans (SFP = 0.3640)	106.6485 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	192.6485 (231)
Electricity for lighting (calculated in Appendix L)	213.5527 (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	4964.3893 (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	3445.0693	0.2100	723.4646 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2113.4882	0.2100	443.8325 (264)
Space and water heating			1167.2971 (265)
Pumps, fans and electric keep-hot	192.6485	0.1387	26.7227 (267)
Energy for lighting	213.5527	0.1443	30.8223 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-543.5582	0.1329	-72.2528
PV Unit electricity exported	-456.8113	0.1240	-56.6599
Total			-128.9128 (269)
Total CO2, kg/year			1095.9293 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.3800 (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	3445.0693	1.1300	3892.9283 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2113.4882	1.1300	2388.2417 (278)
Space and water heating			6281.1700 (279)
Pumps, fans and electric keep-hot	192.6485	1.5128	291.4387 (281)
Energy for lighting	213.5527	1.5338	327.5543 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-543.5582	1.4912	-810.5417
PV Unit electricity exported	-456.8113	0.4552	-207.9414
Total			-1018.4831 (283)
Total Primary energy kWh/year			5881.6798 (286)
Dwelling Primary energy Rate (DPER)			61.0600 (287)

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

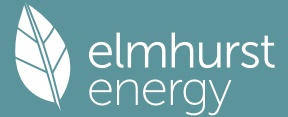
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	47.6300 (1b)	x 2.6700 (2b)	= 127.1721 (1b) - (3b)
First floor	48.7000 (1c)	x 2.3200 (2c)	= 112.9840 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	96.3300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	240.1561 (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) = 0.1249 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3749 (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) = 0.3187 (21)

Full SAP Calculation Printout



Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.4063	0.3984	0.3904	0.3505	0.3426	0.3027	0.3027	0.2948	0.3187	0.3426	0.3585	0.3745 (22b)
	0.5825	0.5793	0.5762	0.5614	0.5587	0.5458	0.5458	0.5434	0.5508	0.5587	0.5643	0.5701 (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)			21.9600	1.1450	25.1450		(27)
Ground Floor			47.3000	0.1300	6.1490		(28a)
Exposed First Floor			1.0700	0.1300	0.1391		(28b)
Brick and Block	72.7032	15.1000	57.6032	0.1800	10.3686		(29a)
Tile Hung	80.4400	9.0100	71.4300	0.1800	12.8574		(29a)
Pitched Roof	48.7000		48.7000	0.1100	5.3570		(30)
Total net area of external elements Aum(A, m2)			250.2132				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	62.1661	(33)

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

168.6872 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	18.9630	0.0500	0.9482
E3 Sill	14.7700	0.0500	0.7385
E4 Jamb	44.1000	0.0500	2.2050
E5 Ground floor (normal)	30.1600	0.1600	4.8256
E20 Exposed floor (normal)	3.4200	0.3200	1.0944
E10 Eaves (insulation at ceiling level)	29.1000	0.0600	1.7460
E16 Corner (normal)	29.5900	0.0900	2.6631
E21 Exposed floor (inverted)	2.0700	0.3200	0.6624
E12 Gable (insulation at ceiling level)	2.2000	0.0600	0.1320
E17 Corner (inverted - internal area greater than external area)	9.6300	-0.0900	-0.8667
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			14.1485 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	76.3146 (37)

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

(38)m	Jan 46.1678	Feb 45.9137	Mar 45.6647	Apr 44.4952	May 44.2763	Jun 43.2577	Jul 43.2577	Aug 43.0690	Sep 43.6501	Oct 44.2763	Nov 44.7190	Dec 45.1818 (38)
Heat transfer coeff	122.4823	122.2283	121.9793	120.8097	120.5909	119.5722	119.5722	119.3836	119.9646	120.5909	121.0336	121.4964 (39)
Average = Sum(39)m / 12 =												120.8087

HLP	Jan 1.2715	Feb 1.2688	Mar 1.2663	Apr 1.2541	May 1.2519	Jun 1.2413	Jul 1.2413	Aug 1.2393	Sep 1.2454	Oct 1.2519	Nov 1.2564	Dec 1.2613 (40)
HLP (average)												1.2541
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7029 (42)
Hot water usage for mixer showers													
69.5378	68.4928	66.9700	64.0564	61.9062	59.5084	58.1454	59.6567	61.3133	63.8879	66.8641	69.2713	(42a)	
Hot water usage for baths													
30.0267	29.5808	28.9528	27.7950	26.9279	25.9666	25.4473	26.0709	26.7498	27.7785	28.9603	29.9252	(42b)	
Hot water usage for other uses													
42.3099	40.7714	39.2329	37.6943	36.1558	34.6172	34.6172	36.1558	37.6943	39.2329	40.7714	42.3099	(42c)	
Average daily hot water use (litres/day)												130.4146 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	141.8745	138.8450	135.1556	129.5456	124.9899	120.0922	118.2100	121.8834	125.7575	130.8993	136.5957	141.5065 (44)	
Energy content	224.6945	197.7134	207.7292	177.3415	168.2605	147.6673	142.9647	150.9171	155.0716	177.6291	194.6057	221.5650 (45)	
Energy content (annual)										Total = Sum(45)m =		2166.1594	
Distribution loss (46)m = 0.15 x (45)m													
33.7042	29.6570	31.1594	26.6012	25.2391	22.1501	21.4447	22.6376	23.2607	26.6444	29.1908	33.2348	(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	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													
275.6534	243.7408	258.6881	226.6566	219.2194	196.9824	193.9236	201.8760	204.3866	228.5880	243.9207	272.5239	(62)	
WWHRS	-31.7898	-28.1151	-29.4405	-24.3779	-22.7194	-19.4411	-18.2229	-19.3783	-20.1145	-23.7128	-26.8637	-31.2011 (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	243.8636	215.6256	229.2475	202.2786	196.5000	177.5413	175.7007	182.4977	184.2721	204.8752	217.0570	241.3228 (64)	
										Total per year (kWh/year) = Sum(64)m =		2470.7821 (64)	
12Total per year (kWh/year)												2471 (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	87.4506	77.2465	81.8097	71.2948	68.6863	61.4282	60.2755	62.9196	63.8901	71.8014	77.0351	86.4101 (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	135.1428	135.1428	135.1428	135.1428	135.1428	135.1428	135.1428	135.1428	135.1428	135.1428	135.1428	135.1428 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	126.1989	139.7202	126.1989	130.4055	126.1989	130.4055	126.1989	126.1989	130.4055	126.1989	130.4055	126.1989 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	250.2545	252.8514	246.3074	232.3760	214.7901	198.2618	187.2199	184.6231	191.1671	205.0985	222.6844	239.2126 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												

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Pumps, fans	36.5143	36.5143	36.5143	36.5143	36.5143	36.5143	36.5143	36.5143	36.5143	36.5143	36.5143	36.5143	(69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Water heating gains (Table 5)	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	(71)
Total internal gains	117.5412	114.9502	109.9592	99.0206	92.3203	85.3169	81.0154	84.5694	88.7362	96.5073	106.9933	116.1426	(72)
	560.5374	574.0646	549.0083	528.3449	499.8521	477.5270	457.9771	458.9342	473.8516	494.3474	526.6260	548.0969	(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					0.7600	11.2829		0.6300	0.7000	0.7700		2.6206 (75)				
Southeast					6.7400	36.7938		0.6300	0.7000	0.7700		75.7891 (77)				
Southwest					5.6000	36.7938		0.6300	0.7000	0.7700		62.9702 (79)				
Northwest					8.8600	11.2829		0.6300	0.7000	0.7700		30.5512 (81)				

Solar gains					171.9311	303.8806	445.0493	600.4931	717.3779	731.8854	697.4194	607.2071	498.4060	343.7438	207.9404	145.8388 (83)
Total gains					732.4685	877.9452	994.0577	1128.8380	1217.2300	1209.4124	1155.3964	1066.1413	972.2576	838.0913	734.5663	693.9357 (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	36.8526	36.9292	37.0045	37.3628	37.4306	37.7495	37.7495	37.8091	37.6260	37.4306	37.2937	37.1516	
alpha	3.4568	3.4619	3.4670	3.4909	3.4954	3.5166	3.5166	3.5206	3.5084	3.4954	3.4862	3.4768	
util living area	0.9814	0.9652	0.9357	0.8655	0.7447	0.5795	0.4393	0.4897	0.7119	0.9031	0.9679	0.9844	(86)
MIT	19.0702	19.3690	19.7787	20.2918	20.6857	20.9057	20.9728	20.9603	20.8015	20.2732	19.5819	19.0197	(87)
Th 2	19.8632	19.8653	19.8674	19.8769	19.8787	19.8871	19.8871	19.8887	19.8839	19.8787	19.8751	19.8713	(88)
util rest of house	0.9771	0.9574	0.9212	0.8353	0.6898	0.4958	0.3351	0.3818	0.6336	0.8743	0.9594	0.9808	(89)
MIT 2	17.6410	18.0188	18.5314	19.1588	19.6037	19.8259	19.8760	19.8710	19.7377	19.1545	18.2987	17.5821	(90)
Living area fraction	17.9363	18.2978	18.7890	19.3928	19.8272	20.0490	20.1026	20.0960	19.9574	19.3856	18.5638	17.8791	(91)
MIT	17.9363	18.2978	18.7890	19.3928	19.8272	20.0490	20.1026	20.0960	19.9574	19.3856	18.5638	17.8791	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9363	18.2978	18.7890	19.3928	19.8272	20.0490	20.1026	20.0960	19.9574	19.3856	18.5638	17.8791	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9667	0.9429	0.9035	0.8201	0.6870	0.5087	0.3559	0.4028	0.6393	0.8586	0.9456	0.9715	(94)
Ext temp.	708.0462	827.7840	898.1378	925.7216	836.2517	615.1830	411.2092	429.4407	621.5606	719.5956	694.6135	674.1373	(95)
Heat loss rate W	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)
Space heating kWh	1670.2028	1637.5840	1499.0059	1267.6354	980.0716	651.5454	418.8153	441.2417	702.6862	1059.4683	1387.5058	1661.9615	(97)
Space heating requirement - total per year (kWh/year)	715.8445	544.1856	447.0459	246.1779	107.0020	0.0000	0.0000	0.0000	0.0000	252.8653	498.8825	734.9412	(98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98c)
Space heating kWh	715.8445	544.1856	447.0459	246.1779	107.0020	0.0000	0.0000	0.0000	0.0000	252.8653	498.8825	734.9412	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3546.9450	
Space heating per m ²												(98c) / (4) =	36.8208 (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)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating efficiency (main heating system 1)	715.8445	544.1856	447.0459	246.1779	107.0020	0.0000	0.0000	0.0000	0.0000	252.8653	498.8825	734.9412	(98)
Space heating fuel (main heating system)	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 efficiency (main heating system 2)	774.7235	588.9455	483.8159	266.4263	115.8030	0.0000	0.0000	0.0000	0.0000	273.6637	539.9161	795.3910	(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)
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 requirement	243.8636	215.6256	229.2475	202.2786	196.5000	177.5413	175.7007	182.4977	184.2721	204.8752	217.0570	241.3228	(64)
Efficiency of water heater (217)m	86.5448	86.2777	85.7857	84.8034	83.1354	80.3000	80.3000	80.3000	80.3000	84.8335	86.1042	86.6072	(216)
Fuel for water heating, kWh/month	281.7774	249.9204	267.2330	238.5266	236.3614	221.0975	218.8053	227.2698	229.4796	241.5027	252.0864	278.6407	(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	26.2216	21.0360	18.9406	13.8767	10.7187	8.7573	7.7780	12.7098	16.5088	21.6604	24.4654	26.9504	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-43.8274	-61.4188	-87.7600	-98.0596	-105.2034	-97.9712	-96.7121	-91.5268	-82.3471	-69.8867	-48.0318	-37.9308	(233a)

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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	-25.9123	-54.3719	-107.8274	-161.6206	-213.4101	-214.3545	-211.8774	-179.5727	-131.8252	-77.7032	-34.5756	-20.5055	(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												3838.6850	(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												2942.7007	(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)												211.6236	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2354.2321	(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												4724.7772	(238)

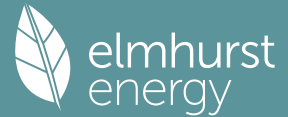
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3838.6850	0.2100	806.1239 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2942.7007	0.2100	617.9671 (264)
Space and water heating			1424.0910 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	211.6236	0.1443	30.5438 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-920.6756	0.1347	-124.0366
PV Unit electricity exported	-1433.5565	0.1260	-180.5584
Total			-304.5949 (269)
Total CO2, kg/year			1161.9692 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.0600 (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	3838.6850	1.1300	4337.7141 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2942.7007	1.1300	3325.2518 (278)
Space and water heating			7662.9659 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	211.6236	1.5338	324.5954 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-920.6756	1.4979	-1379.1009
PV Unit electricity exported	-1433.5565	0.4623	-662.7765
Total			-2041.8774 (283)
Total Primary energy kWh/year			6075.7847 (286)
Target Primary Energy Rate (TPER)			63.0700 (287)

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Property Reference	SAP 0898 Plot 5				Issued on Date	06/01/2025
Assessment Reference	Rev C		Prop Type Ref			
Property	Plot 5, Wharton's Lane, Southampton					
SAP Rating	90 B	DER	11.38	TER	12.06	
Environmental	90 B	% DER < TER				5.64
CO ₂ Emissions (t/year)	0.91	DFEE	38.68	TFEE	42.93	
Compliance Check	See BREL	% DFEE < TFEE				9.88
% DPER < TPER	3.19	DPER	61.06	TPER	63.07	
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	47.6300 (1b)	x 2.6700 (2b)	= 127.1721 (1b) - (3b)
First floor	48.7000 (1c)	x 2.3200 (2c)	= 112.9840 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	96.3300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 240.1561 (5)

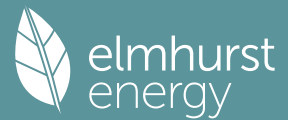
2. Ventilation rate

	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 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 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	
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)			23.5300	0.9615	22.6250		(27)
Ground Floor			47.3000	0.1200	5.6760	90.0000	4257.0000 (28a)
Exposed First Floor			1.0700	0.1500	0.1605	20.0000	21.4000 (28b)
Brick and Block	72.7032	16.0400	56.6632	0.1800	10.1994	42.2200	2392.3203 (29a)
Tile Hung	80.4400	9.6400	70.8000	0.1800	12.7440	42.2200	2989.1760 (29a)
Pitched Roof	48.7000		48.7000	0.0900	4.3830	9.0000	438.3000 (30)
Total net area of external elements Aum(A, m ²)			250.2132				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	58.1529		(33)
Ground Floor Stud			35.5000			9.0000	319.5000 (32c)
First Floor Stud			95.2600			9.0000	857.3400 (32c)
Ground Floor Block			49.3000			75.0000	3697.5000 (32c)
First Floor			47.3000			18.0000	851.4000 (32d)
Internal Ceiling 1			47.3000			9.0000	425.7000 (32e)

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Heat capacity $C_m = \text{Sum}(A \times k)$
Thermal mass parameter (TMP = C_m / TFA) in $\text{kJ/m}^2\text{K}$
List of Thermal Bridges

(28)...(30) + (32) + (32a)...(32e) = 16249.6363 (34)
168.6872 (35)

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	18.9630	0.0300	0.5689
E3 Sill	14.7700	0.0250	0.3693
E4 Jamb	44.1000	0.0190	0.8379
E5 Ground floor (normal)	30.1600	0.0580	1.7493
E20 Exposed floor (normal)	3.4200	0.3200	1.0944
E10 Eaves (insulation at ceiling level)	29.1000	0.0650	1.8915
E16 Corner (normal)	29.5900	0.0360	1.0652
E21 Exposed floor (inverted)	2.0700	0.3200	0.6624
E12 Gable (insulation at ceiling level)	2.2000	0.0400	0.0880
E17 Corner (inverted - internal area greater than external area)	9.6300	-0.0820	-0.7897
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.5372 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	65.6901 (37)

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$												
(38)m	Jan 39.6258	Feb 39.6258	Mar 39.6258	Apr 39.6258	May 39.6258	Jun 39.6258	Jul 39.6258	Aug 39.6258	Sep 39.6258	Oct 39.6258	Nov 39.6258	Dec 39.6258 (38)
Heat transfer coeff	105.3158	105.3158	105.3158	105.3158	105.3158	105.3158	105.3158	105.3158	105.3158	105.3158	105.3158	105.3158 (39)
Average = Sum(39)m / 12 =												105.3158
HLP	Jan 1.0933	Feb 1.0933	Mar 1.0933	Apr 1.0933	May 1.0933	Jun 1.0933	Jul 1.0933	Aug 1.0933	Sep 1.0933	Oct 1.0933	Nov 1.0933	Dec 1.0933 (40)
HLP (average)												1.0933
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7029 (42)
Hot water usage for mixer showers	69.5378	68.4928	66.9700	64.0564	61.9062	59.5084	58.1454	59.6567	61.3133	63.8879	66.8641	69.2713 (42a)
Hot water usage for baths	30.0267	29.5808	28.9528	27.7950	26.9279	25.9666	25.4473	26.0709	26.7498	27.7785	28.9603	29.9252 (42b)
Hot water usage for other uses	42.3099	40.7714	39.2329	37.6943	36.1558	34.6172	34.6172	36.1558	37.6943	39.2329	40.7714	42.3099 (42c)
Average daily hot water use (litres/day)												130.4146 (43)
Daily hot water use	Jan 141.8745	Feb 138.8450	Mar 135.1556	Apr 129.5456	May 124.9899	Jun 120.0922	Jul 118.2100	Aug 121.8834	Sep 125.7575	Oct 130.8993	Nov 136.5957	Dec 141.5065 (44)
Energy conte	224.6945	197.7134	207.7292	177.3415	168.2605	147.6673	142.9647	150.9171	155.0716	177.6291	194.6057	221.5650 (45)
Energy content (annual)										Total = Sum(45)m =		2166.1594
Distribution loss (46)m = $0.15 \times (45)\text{m}$	33.7042	29.6570	31.1594	26.6012	25.2391	22.1501	21.4447	22.6376	23.2607	26.6444	29.1908	33.2348 (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	1.5539	1.4332	1.5901	1.4670	1.4762	1.3751	1.3609	1.3756	1.3474	1.4429	1.4589	1.5413 (61)
Total heat required for water heating calculated for each month												
WWHRS	226.2484	199.1466	209.3193	178.8085	169.7366	149.0424	144.3256	152.2926	156.4189	179.0720	196.0645	223.1063 (62)
FV diverter	-48.8257	-43.1818	-45.2175	-37.4419	-34.8945	-29.8595	-27.9885	-29.7630	-30.8938	-36.4203	-41.2598	-47.9215 (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	177.4227	155.9648	164.1018	141.3666	134.8421	119.1829	116.3371	122.5297	125.5252	142.6517	154.8047	175.1848 (64)
								Total per year (kWh/year) = Sum(64)m =				1729.9140 (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	75.0994	66.0980	69.4675	59.3328	56.3156	49.4432	47.8760	50.5238	51.8981	59.4224	65.0711	74.0557 (65)

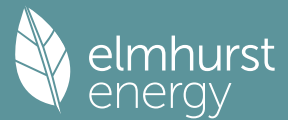
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	162.1713	162.1713	162.1713	162.1713	162.1713	162.1713	162.1713	162.1713	162.1713	162.1713	162.1713	162.1713 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.2306	26.8505	21.8363	16.5315	12.3575	10.4327	11.2729	14.6530	19.6672	24.9720	29.1460	31.0708 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	373.5142	377.3901	367.6230	346.8298	320.5822	295.9132	279.4327	275.5568	285.3240	306.1171	332.3647	357.0338 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.9200	53.9200	53.9200	53.9200	53.9200	53.9200	53.9200	53.9200	53.9200	53.9200	53.9200	53.9200 (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)	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142 (71)
Water heating gains (Table 5)	100.9400	98.3601	93.3703	82.4066	75.6931	68.6710	64.3494	67.9084	72.0807	79.8688	90.3765	99.5372 (72)
Total internal gains	615.6619	613.5779	593.8067	556.7451	519.6099	482.9940	463.0322	466.0952	485.0490	521.9350	562.8644	598.6189 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	0.8200	11.2829	0.4500	0.7000	0.7700	2.0197 (75)
Southeast	7.2200	36.7938	0.4500	0.7000	0.7700	57.9904 (77)
Southwest	6.0000	36.7938	0.4500	0.7000	0.7700	48.1915 (79)
Northwest	9.4900	11.2829	0.4500	0.7000	0.7700	23.3740 (81)

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Solar gains	131.5755	232.5564	340.5981	459.5703	549.0335	560.1403	533.7606	464.7120	381.4357	263.0652	159.1331	111.6072 (83)
Total gains	747.2374	846.1343	934.4047	1016.3154	1068.6434	1043.1343	996.7928	930.8073	866.4847	785.0002	721.9975	710.2261 (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	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595
alpha	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573
util living area	0.9785	0.9645	0.9357	0.8731	0.7582	0.5980	0.4516	0.4995	0.7192	0.9022	0.9657	0.9821 (86)
MIT	19.4390	19.6639	20.0084	20.4122	20.7429	20.9236	20.9799	20.9703	20.8428	20.4120	19.8354	19.3718 (87)
Th 2	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063 (88)
util rest of house	0.9739	0.9570	0.9220	0.8459	0.7082	0.5205	0.3554	0.4003	0.6474	0.8750	0.9572	0.9782 (89)
MIT 2	18.2005	18.4836	18.9130	19.4021	19.7765	19.9548	19.9976	19.9923	19.8873	19.4142	18.7039	18.1157 (90)
Living area fraction	18.4563	18.7274	19.1393	19.6107	19.9761	20.1550	20.2005	20.1944	20.0847	19.6204	18.9376	0.2066 (91)
MIT	18.4563	18.7274	19.1393	19.6107	19.9761	20.1550	20.2005	20.1944	20.0847	19.6204	18.9376	18.3752 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4563	18.7274	19.1393	19.6107	19.9761	20.1550	20.2005	20.1944	20.0847	19.6204	18.9376	18.3752 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9640	0.9444	0.9073	0.8333	0.7066	0.5327	0.3747	0.4198	0.6536	0.8623	0.9449	0.9693 (94)
Useful gains	720.3422	799.1097	847.7483	846.9363	755.0925	555.6507	373.4901	390.7210	566.3124	676.8766	682.2455	688.4287 (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	1490.8858	1456.2468	1331.1195	1128.0104	871.6056	585.0254	379.1899	399.6076	630.2796	949.9877	1246.6894	1492.8705 (97)
Space heating kWh	573.2845	441.5961	359.6282	202.3734	86.6857	0.0000	0.0000	0.0000	0.0000	203.1947	406.3996	598.5047 (98a)
Space heating requirement - total per year (kWh/year)												2871.6668
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	573.2845	441.5961	359.6282	202.3734	86.6857	0.0000	0.0000	0.0000	0.0000	203.1947	406.3996	598.5047 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2871.6668
Space heating per m2										(98c) / (4) =		29.8107 (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	573.2845	441.5961	359.6282	202.3734	86.6857	0.0000	0.0000	0.0000	0.0000	203.1947	406.3996	598.5047 (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)	646.3185	497.8535	405.4433	228.1549	97.7291	0.0000	0.0000	0.0000	0.0000	229.0808	458.1732	674.7516 (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	177.4227	155.9648	164.1018	141.3666	134.8421	119.1829	116.3371	122.5297	125.5252	142.6517	154.8047	175.1848 (64)
Efficiency of water heater	85.3895	85.0582	84.3637	83.0941	80.6473	76.2000	76.2000	76.2000	76.2000	83.0787	84.8601	76.2000 (216)
Fuel for water heating, kWh/month	207.7806	183.3624	194.5170	170.1282	167.1998	156.4080	152.6733	160.8001	164.7312	171.7067	182.4234	85.5233 (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	16.3619	14.7785	16.3619	15.8341	16.3619	15.8341	16.3619	16.3619	15.8341	16.3619	15.8341	16.3619 (231)
Lighting	26.4607	21.2277	19.1132	14.0032	10.8164	8.8371	9.8671	12.8257	16.6593	21.8579	24.6884	27.1961 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-20.2231	-31.0935	-48.9210	-59.8318	-68.3655	-65.2108	-64.3041	-58.6701	-49.2768	-37.4734	-23.0441	-17.1439 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-6.5564	-14.8146	-31.9803	-51.6703	-71.4225	-72.8994	-71.7068	-58.9282	-40.7675	-22.0035	-8.9736	-5.0881 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												3237.5048 (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												2116.5694 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:												
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.3640)												
mechanical ventilation fans (SFP = 0.3640)												106.6485 (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	192.6485 (231)
Electricity for lighting (calculated in Appendix L)	213.5527 (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	4759.9059 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3237.5048	3.6400	117.8452 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2116.5694	3.6400	77.0431 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	192.6485	16.4900	31.7677 (249)
Energy for lighting	213.5527	16.4900	35.2148 (250)
Additional standing charges			92.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-543.5582	16.4900	-89.6327
PV Unit electricity exported	-456.8113	5.5900	-25.5358
Total			-115.1685 (252)
Total energy cost			238.7024 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.6080 (257)
SAP value		90.1438
SAP rating (Section 12)		90 (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	3237.5048	0.2100	679.8760 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2116.5694	0.2100	444.4796 (264)
Space and water heating			1124.3556 (265)
Pumps, fans and electric keep-hot	192.6485	0.1387	26.7227 (267)
Energy for lighting	213.5527	0.1443	30.8223 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-543.5582	0.1329	-72.2528
PV Unit electricity exported	-456.8113	0.1240	-56.6599
Total			-128.9128 (269)
Total CO2, kg/year			1052.9878 (272)
CO2 emissions per m2			10.9300 (273)
EI value			90.0162
EI rating			90 (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

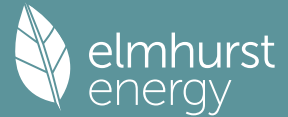
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	47.6300 (1b)	x 2.6700 (2b)	= 127.1721 (1b) - (3b)
First floor	48.7000 (1c)	x 2.3200 (2c)	= 112.9840 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	96.3300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	240.1561 (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)

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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) =
Pressure test
Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered

Air changes per hour
0.0000 / (5) = 0.0000 (8)
Yes
Blower Door
4.0000 (17)
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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	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 m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		
Windows (Uw = 1.00)			23.5300	0.9615	22.6250		
Ground Floor			47.3000	0.1200	5.6760	90.0000	4257.0000 (28a)
Exposed First Floor			1.0700	0.1500	0.1605	20.0000	21.4000 (28b)
Brick and Block	72.7032	16.0400	56.6632	0.1800	10.1994	42.2200	2392.3203 (29a)
Tile Hung	80.4400	9.6400	70.8000	0.1800	12.7440	42.2200	2989.1760 (29a)
Pitched Roof	48.7000		48.7000	0.0900	4.3830	9.0000	438.3000 (30)
Total net area of external elements Aum(A, m2)			250.2132				
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		58.1529		
Ground Floor Stud			35.5000			9.0000	319.5000 (32c)
First Floor Stud			95.2600			9.0000	857.3400 (32c)
Ground Floor Block			49.3000			75.0000	3697.5000 (32c)
First Floor			47.3000			18.0000	851.4000 (32d)
Internal Ceiling 1			47.3000			9.0000	425.7000 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	18.9630	0.0300	0.5689
E3 Sill	14.7700	0.0250	0.3693
E4 Jamb	44.1000	0.0190	0.8379
E5 Ground floor (normal)	30.1600	0.0580	1.7493
E20 Exposed floor (normal)	3.4200	0.3200	1.0944
E10 Eaves (insulation at ceiling level)	29.1000	0.0650	1.8915
E16 Corner (normal)	29.5900	0.0360	1.0652
E21 Exposed floor (inverted)	2.0700	0.3200	0.6624
E12 Gable (insulation at ceiling level)	2.2000	0.0400	0.0880
E17 Corner (inverted - internal area greater than external area)	9.6300	-0.0820	-0.7897
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.5372 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 65.6901 (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	39.6258	39.6258	39.6258	39.6258	39.6258	39.6258	39.6258	39.6258	39.6258	39.6258	39.6258	39.6258 (38)
Heat transfer coeff	105.3158	105.3158	105.3158	105.3158	105.3158	105.3158	105.3158	105.3158	105.3158	105.3158	105.3158	105.3158 (39)
Average = Sum(39)m / 12 =												105.3158

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0933	1.0933	1.0933	1.0933	1.0933	1.0933	1.0933	1.0933	1.0933	1.0933	1.0933	1.0933 (40)
HLP (average)												1.0933
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.7029 (42)

Hot water usage for mixer showers 69.5378 68.4928 66.9700 64.0564 61.9062 59.5084 58.1454 59.6567 61.3133 63.8879 66.8641 69.2713 (42a)

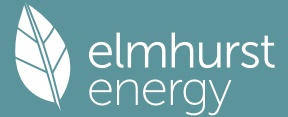
Hot water usage for baths 30.0267 29.5808 28.9528 27.7950 26.9279 25.9666 25.4473 26.0709 26.7498 27.7785 28.9603 29.9252 (42b)

Hot water usage for other uses 42.3099 40.7714 39.2329 37.6943 36.1558 34.6172 34.6172 36.1558 37.6943 39.2329 40.7714 42.3099 (42c)

Average daily hot water use (litres/day) 130.4146 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	141.8745	138.8450	135.1556	129.5456	124.9899	120.0922	118.2100	121.8834	125.7575	130.8993	136.5957	141.5065 (44)
Energy conte	224.6945	197.7134	207.7292	177.3415	168.2605	147.6673	142.9647	150.9171	155.0716	177.6291	194.6057	221.5650 (45)
Energy content (annual)												Total = Sum(45)m = 2166.1594
Distribution loss (46)m = 0.15 x (45)m	33.7042	29.6570	31.1594	26.6012	25.2391	22.1501	21.4447	22.6376	23.2607	26.6444	29.1908	33.2348 (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												
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 (57)
Combi loss	1.5539	1.4332	1.5901	1.4670	1.4762	1.3751	1.3609	1.3756	1.3474	1.4429	1.4589	1.5413 (61)
Total heat required for water heating calculated for each month	226.2484	199.1466	209.3193	178.8085	169.7366	149.0424	144.3256	152.2926	156.4189	179.0720	196.0645	223.1063 (62)
WWHRS	-48.8257	-43.1818	-45.2175	-37.4419	-34.8945	-29.8595	-27.9885	-29.7630	-30.8938	-36.4203	-41.2598	-47.9215 (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)

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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	177.4227	155.9648	164.1018	141.3666	134.8421	119.1829	116.3371	122.5297	125.5252	142.6517	154.8047	175.1848 (64)
	Total per year (kWh/year) = Sum(64)m =											1729.9140 (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	75.0994	66.0980	69.4675	59.3328	56.3156	49.4432	47.8760	50.5238	51.8981	59.4224	65.0711	74.0557 (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	162.1713	162.1713	162.1713	162.1713	162.1713	162.1713	162.1713	162.1713	162.1713	162.1713	162.1713	162.1713	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.2306	26.8505	21.8363	16.5315	12.3575	10.4327	11.2729	14.6530	19.6672	24.9720	29.1460	31.0708	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	373.5142	377.3901	367.6230	346.8298	320.5822	295.9132	279.4327	275.5568	285.3240	306.1171	332.3647	357.0338	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.9200	53.9200	53.9200	53.9200	53.9200	53.9200	53.9200	53.9200	53.9200	53.9200	53.9200	53.9200	(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)	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	(71)
Water heating gains (Table 5)	100.9400	98.3601	93.3703	82.4066	75.6931	68.6710	64.3494	67.9084	72.0807	79.8688	90.3765	99.5372	(72)
Total internal gains	615.6619	613.5779	593.8067	556.7451	519.6099	482.9940	463.0322	466.0952	485.0490	521.9350	562.8644	598.6189	(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					0.8200	15.0428		0.4500	0.7000		0.7700	2.6927 (75)	
Southeast					7.2200	46.3896		0.4500	0.7000		0.7700	73.1142 (77)	
Southwest					6.0000	46.3896		0.4500	0.7000		0.7700	60.7597 (79)	
Northwest					9.4900	15.0428		0.4500	0.7000		0.7700	31.1630 (81)	

Solar gains	167.7296	254.0612	372.0989	514.5796	589.6895	652.0015	606.0831	537.2726	443.0075	304.5019	201.1456	135.7726 (83)	
Total gains	783.3915	867.6391	965.9056	1071.3246	1109.2993	1134.9955	1069.1153	1003.3678	928.0565	826.4370	764.0100	734.3915 (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	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	
alpha	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	
util living area	0.9691	0.9554	0.9180	0.8367	0.6963	0.4988	0.3597	0.3821	0.6225	0.8521	0.9459	0.9742 (86)	
MIT	19.6575	19.8115	20.1552	20.5379	20.8295	20.9641	20.9923	20.9905	20.9177	20.5978	20.0819	19.6071 (87)	
Th 2	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063 (88)	
util rest of house	0.9622	0.9458	0.9005	0.8030	0.6377	0.4180	0.2654	0.2825	0.5385	0.8115	0.9318	0.9683 (89)	
MIT 2	18.4772	18.6690	19.0932	19.5470	19.8647	19.9856	20.0038	20.0032	19.9528	19.6289	19.0114	18.4145 (90)	
Living area fraction	fLA = Living area / (4) =												0.2066 (91)
MIT	18.7210	18.9050	19.3126	19.7517	20.0640	20.1877	20.2080	20.2072	20.1521	19.8291	19.2326	18.6609 (92)	
Temperature adjustment													0.0000
adjusted MIT	18.7210	18.9050	19.3126	19.7517	20.0640	20.1877	20.2080	20.2072	20.1521	19.8291	19.2326	18.6609 (93)	

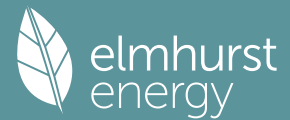
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9504	0.9322	0.8857	0.7933	0.6413	0.4332	0.2848	0.3030	0.5516	0.8031	0.9179	0.9575	(94)
Ext temp.	744.5480	808.8076	855.4551	849.8948	711.3988	491.7256	304.4983	303.9790	511.9060	663.7290	701.3204	703.1699	(95)
Heat loss rate W	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)
Space heating kWh	1402.9116	1390.6988	1265.1195	1069.1372	786.0794	504.2229	306.2614	306.1707	542.5986	845.5909	1140.8421	1386.0462	(97)
Space heating requirement - total per year (kWh/year)	489.8225	391.0309	304.7903	157.8546	55.5624	0.0000	0.0000	0.0000	0.0000	135.3053	316.4556	508.0599	(98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)	489.8225	391.0309	304.7903	157.8546	55.5624	0.0000	0.0000	0.0000	0.0000	135.3053	316.4556	508.0599	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2358.8813	(98c)
Space heating per m2												24.4875	(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	489.8225	391.0309	304.7903	157.8546	55.5624	0.0000	0.0000	0.0000	0.0000	135.3053	316.4556	508.0599	(98)
Space heating efficiency (main heating system 1)													

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Space heating fuel (main heating system)	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 efficiency (main heating system 2)	552.2238	440.8465	343.6192	177.9645	62.6408	0.0000	0.0000	0.0000	0.0000	152.5426	356.7707	572.7846	(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)
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 requirement	177.4227	155.9648	164.1018	141.3666	134.8421	119.1829	116.3371	122.5297	125.5252	142.6517	154.8047	175.1848	(64)
Efficiency of water heater (217)m	84.9927	84.7366	83.8841	82.3201	79.4680	76.2000	76.2000	76.2000	76.2000	81.8123	84.1647	76.2000	(216)
Fuel for water heating, kWh/month	208.7506	184.0583	195.6292	171.7279	169.6810	156.4080	152.6733	160.8001	164.7312	174.3645	183.9307	205.8096	(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	16.3619	14.7785	16.3619	15.8341	16.3619	15.8341	16.3619	16.3619	15.8341	16.3619	15.8341	16.3619	(231)
Lighting	26.4607	21.2277	19.1132	14.0032	10.8164	8.8371	9.8671	12.8257	16.6593	21.8579	24.6884	27.1961	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-25.3459	-33.9429	-52.8108	-64.8451	-71.5382	-71.3981	-69.4243	-64.4521	-54.9916	-42.4719	-28.4735	-20.7174	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-9.6225	-17.3170	-36.9531	-60.8410	-78.7268	-89.1804	-84.9634	-72.0415	-50.8490	-27.7551	-12.9636	-6.9936	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2659.3927	(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												2128.5646	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.3640)													
mechanical ventilation fans (SFP = 0.3640)												106.6485	(230a)
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												192.6485	(231)
Electricity for lighting (calculated in Appendix L)												213.5527	(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												4045.5398	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2659.3927	5.6000	148.9260	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2128.5646	5.6000	119.1996	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	192.6485	26.0600	50.2042	(249)
Energy for lighting	213.5527	26.0600	55.6518	(250)
Additional standing charges			99.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-600.4118	26.0600	-156.4673	
PV Unit electricity exported	-548.2070	5.8100	-31.8508	
Total			-188.3181	(252)
Total energy cost			284.6635	(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	2659.3927	0.2100	558.4725	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2128.5646	0.2100	446.9986	(264)
Space and water heating			1005.4710	(265)
Pumps, fans and electric keep-hot	192.6485	0.1387	26.7227	(267)
Energy for lighting	213.5527	0.1443	30.8223	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-600.4118	0.1333	-80.0123	
PV Unit electricity exported	-548.2070	0.1242	-68.0693	
Total			-148.0815	(269)
Total CO2, kg/year			914.9345	(272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
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Space heating - main system 1	2659.3927	1.1300	3005.1138 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2128.5646	1.1300	2405.2780 (278)
Space and water heating			5410.3918 (279)
Pumps, fans and electric keep-hot	192.6485	1.5128	291.4387 (281)
Energy for lighting	213.5527	1.5338	327.5543 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-600.4118	1.4924	-896.0695
PV Unit electricity exported	-548.2070	0.4556	-249.7780
Total			-1145.8475 (283)
Total Primary energy kWh/year			4883.5372 (286)

SAP 10 EPC IMPROVEMENTS

Rev C

Current energy efficiency rating: B 90
Current environmental impact rating: B 90

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	+ 0.5	-£ 28	-167 kg (18.3%)
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Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 90
Potential environmental impact rating: B 90

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	£106	£106	£0
Mains gas	£367	£367	£0
Space heating	£298	£298	£0
Water heating	£119	£119	£0
Lighting	£56	£56	£0
Generated (PV)	-£188	-£188	£0
Total cost of fuels	£285	£285	£0
Total cost of uses	£285	£285	£0
Delivered energy	42 kWh/m²	42 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.9 tonnes	0.0 tonnes
CO2 emissions per m²	9 kg/m²	9 kg/m²	0 kg/m²
Primary energy	51 kWh/m²	51 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

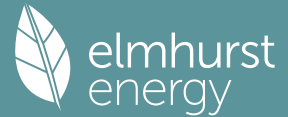
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	47.6300 (1b)	x 2.6700 (2b)	= 127.1721 (1b) - (3b)
First floor	48.7000 (1c)	x 2.3200 (2c)	= 112.9840 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	96.3300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 240.1561 (5)

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)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 0.0000 / (5) = 0.0000 (8)

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Pressure test
Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered
Shelter factor
Infiltration rate adjusted to include shelter factor

Yes
Blower Door
4.0000 (17)
0.2000 (18)
2 (19)

(20) = 1 - [0.075 x (19)] = 0.8500 (20)
(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 m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.00)			23.5300	0.9615	22.6250		(27)
Ground Floor			47.3000	0.1200	5.6760	90.0000	4257.0000 (28a)
Exposed First Floor			1.0700	0.1500	0.1605	20.0000	21.4000 (28b)
Brick and Block	72.7032	16.0400	56.6632	0.1800	10.1994	42.2200	2392.3203 (29a)
Tile Hung	80.4400	9.6400	70.8000	0.1800	12.7440	42.2200	2989.1760 (29a)
Pitched Roof	48.7000		48.7000	0.0900	4.3830	9.0000	438.3000 (30)
Total net area of external elements Aum (A, m2)			250.2132				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	58.1529		(33)
Ground Floor Stud			35.5000			9.0000	319.5000 (32c)
First Floor Stud			95.2600			9.0000	857.3400 (32c)
Ground Floor Block			49.3000			75.0000	3697.5000 (32c)
First Floor			47.3000			18.0000	851.4000 (32d)
Internal Ceiling 1			47.3000			9.0000	425.7000 (32e)

Heat capacity Cm = Sum(A x K)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
List of Thermal Bridges

(28)...(30) + (32) + (32a)...(32e) = 16249.6363 (34)
168.6872 (35)

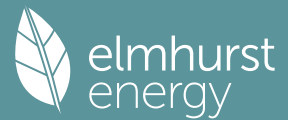
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	18.9630	0.0300	0.5689
E3 Sill	14.7700	0.0250	0.3693
E4 Jamb	44.1000	0.0190	0.8379
E5 Ground floor (normal)	30.1600	0.0580	1.7493
E20 Exposed floor (normal)	3.4200	0.3200	1.0944
E10 Eaves (insulation at ceiling level)	29.1000	0.0650	1.8915
E16 Corner (normal)	29.5900	0.0360	1.0652
E21 Exposed floor (inverted)	2.0700	0.3200	0.6624
E12 Gable (insulation at ceiling level)	2.2000	0.0400	0.0880
E17 Corner (inverted - internal area greater than external area)	9.6300	-0.0820	-0.7897
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.5372 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 65.6901 (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	39.6258	39.6258	39.6258	39.6258	39.6258	39.6258	39.6258	39.6258	39.6258	39.6258	39.6258	39.6258 (38)
Average = Sum(39)m / 12 =	105.3158	105.3158	105.3158	105.3158	105.3158	105.3158	105.3158	105.3158	105.3158	105.3158	105.3158	105.3158 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0933	1.0933	1.0933	1.0933	1.0933	1.0933	1.0933	1.0933	1.0933	1.0933	1.0933	1.0933 (40)
HLP (average)												1.0933
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7029 (42)
Hot water usage for mixer showers												69.2713 (42a)
Hot water usage for baths												29.9252 (42b)
Hot water usage for other uses												42.3099 (42c)
Average daily hot water use (litres/day)												130.4146 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	141.8745	138.8450	135.1556	129.5456	124.9899	120.0922	118.2100	121.8834	125.7575	130.8993	136.5957	141.5065 (44)
Energy content (annual)	224.6945	197.7134	207.7292	177.3415	168.2605	147.6673	142.9647	150.9171	155.0716	177.6291	194.6057	221.5650 (45)
Distribution loss (46)m = 0.15 x (45)m												2166.1594
Water storage loss:												
Total storage loss	33.7042	29.6570	31.1594	26.6012	25.2391	22.1501	21.4447	22.6376	23.2607	26.6444	29.1908	33.2348 (46)
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 (56)
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 (57)
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 (59)
Total heat required for water heating calculated for each month	1.5539	1.4332	1.5901	1.4670	1.4762	1.3751	1.3609	1.3756	1.3474	1.4429	1.4589	1.5413 (61)
WWHRS	226.2484	199.1466	209.3193	178.8085	169.7366	149.0424	144.3256	152.2926	156.4189	179.0720	196.0645	223.1063 (62)
PV diverter	-48.8257	-43.1818	-45.2175	-37.4419	-34.8945	-29.8595	-27.9885	-29.7630	-30.8938	-36.4203	-41.2598	-47.9215 (63a)
Solar input	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Total per year (kWh/year) = Sum(64)m =	177.4227	155.9648	164.1018	141.3666	134.8421	119.1829	116.3371	122.5297	125.5252	142.6517	154.8047	175.1848 (64)

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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	75.0994	66.0980	69.4675	59.3328	56.3156	49.4432	47.8760	50.5238	51.8981	59.4224	65.0711	74.0557 (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	162.1713	162.1713	162.1713	162.1713	162.1713	162.1713	162.1713	162.1713	162.1713	162.1713	162.1713	162.1713	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.2306	26.8505	21.8363	16.5315	12.3575	10.4327	11.2729	14.6530	19.6672	24.9720	29.1460	31.0708	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	373.5142	377.3901	367.6230	346.8298	320.5822	295.9132	279.4327	275.5568	285.3240	306.1171	332.3647	357.0338	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.9200	53.9200	53.9200	53.9200	53.9200	53.9200	53.9200	53.9200	53.9200	53.9200	53.9200	53.9200	(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)	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	(71)
Water heating gains (Table 5)	100.9400	98.3601	93.3703	82.4066	75.6931	68.6710	64.3494	67.9084	72.0807	79.8688	90.3765	99.5372	(72)
Total internal gains	615.6619	613.5779	593.8067	556.7451	519.6099	482.9940	463.0322	466.0952	485.0490	521.9350	562.8644	598.6189	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Northeast				0.8200	11.2829		0.4500		0.7000		0.7700		2.0197 (75)
Southeast				7.2200	36.7938		0.4500		0.7000		0.7700		57.9904 (77)
Southwest				6.0000	36.7938		0.4500		0.7000		0.7700		48.1915 (79)
Northwest				9.4900	11.2829		0.4500		0.7000		0.7700		23.3740 (81)
Solar gains	131.5755	232.5564	340.5981	459.5703	549.0335	560.1403	533.7606	464.7120	381.4357	263.0652	159.1331	111.6072	(83)
Total gains	747.2374	846.1343	934.4047	1016.3154	1068.6434	1043.1343	996.7928	930.8073	866.4847	785.0002	721.9975	710.2261	(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	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	
alpha	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	
util living area	0.9785	0.9645	0.9357	0.8731	0.7582	0.5980	0.4516	0.4995	0.7192	0.9022	0.9657	0.9821	(86)
MIT	19.4390	19.6639	20.0084	20.4122	20.7429	20.9236	20.9799	20.9703	20.8428	20.4120	19.8354	19.3718	(87)
Th 2	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	(88)
util rest of house	0.9739	0.9570	0.9220	0.8459	0.7082	0.5205	0.3554	0.4003	0.6474	0.8750	0.9572	0.9782	(89)
MIT 2	18.2005	18.4836	18.9130	19.4021	19.7765	19.9548	19.9976	19.9923	19.8873	19.4142	18.7039	18.1157	(90)
Living area fraction	18.2005	18.4836	18.9130	19.4021	19.7765	19.9548	19.9976	19.9923	19.8873	19.4142	18.7039	18.1157	(91)
MIT	18.4563	18.7274	19.1393	19.6107	19.9761	20.1550	20.2005	20.1944	20.0847	19.6204	18.9376	18.3752	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4563	18.7274	19.1393	19.6107	19.9761	20.1550	20.2005	20.1944	20.0847	19.6204	18.9376	18.3752	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9640	0.9444	0.9073	0.8333	0.7066	0.5327	0.3747	0.4198	0.6536	0.8623	0.9449	0.9693	(94)
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	(95)
Heat loss rate W	1490.8858	1456.2468	1331.1195	1128.0104	871.6056	585.0254	379.1899	399.6076	630.2796	949.9877	1246.6894	1492.8705	(97)
Space heating kWh	573.2845	441.5961	359.6282	202.3734	86.6857	0.0000	0.0000	0.0000	0.0000	203.1947	406.3996	598.5047	(98a)
Space heating requirement - total per year (kWh/year)												2871.6668	
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	573.2845	441.5961	359.6282	202.3734	86.6857	0.0000	0.0000	0.0000	0.0000	203.1947	406.3996	598.5047	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2871.6668	
Space heating per m ²										(98c) / (4) =		29.8107	(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)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
573.2845	441.5961	359.6282	202.3734	86.6857	0.0000	0.0000	0.0000	0.0000	0.0000	203.1947	406.3996	598.5047	(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)	646.3185	497.8535	405.4433	228.1549	97.7291	0.0000	0.0000	0.0000	0.0000	229.0808	458.1732	674.7516	(211)
Space heating efficiency (main heating system 2)													

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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	(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	(213)
	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	177.4227	155.9648	164.1018	141.3666	134.8421	119.1829	116.3371	122.5297	125.5252	142.6517	154.8047	175.1848 (64)
Efficiency of water heater (217)m	85.3895	85.0582	84.3637	83.0941	80.6473	76.2000	76.2000	76.2000	76.2000	83.0787	84.8601	76.2000 (216)
Fuel for water heating, kWh/month	207.7806	183.3624	194.5170	170.1282	167.1998	156.4080	152.6733	160.8001	164.7312	171.7067	182.4234	85.5233 (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	16.3619	14.7785	16.3619	15.8341	16.3619	15.8341	16.3619	16.3619	15.8341	16.3619	15.8341	16.3619 (231)
Lighting	26.4607	21.2277	19.1132	14.0032	10.8164	8.8371	9.8671	12.8257	16.6593	21.8579	24.6884	27.1961 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-20.2231	-31.0935	-48.9210	-59.8318	-68.3655	-65.2108	-64.3041	-58.6701	-49.2768	-37.4734	-23.0441	-17.1439 (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	-6.5564	-14.8146	-31.9803	-51.6703	-71.4225	-72.8994	-71.7068	-58.9282	-40.7675	-22.0035	-8.9736	-5.0881 (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												3237.5048 (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												2116.5694 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.3640)												
mechanical ventilation fans (SFP = 0.3640)												106.6485 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												192.6485 (231)
Electricity for lighting (calculated in Appendix L)												213.5527 (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												4759.9059 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3237.5048	3.6400	117.8452	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2116.5694	3.6400	77.0431	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	192.6485	16.4900	31.7677	(249)
Energy for lighting	213.5527	16.4900	35.2148	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-543.5582	16.4900	-89.6327	
PV Unit electricity exported	-456.8113	5.5900	-25.5358	
Total			-115.1685	(252)
Total energy cost			238.7024	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		0.6080	(257)
SAP value	$[(255) \times (256)] / [(4) + 45.0] =$	90.1438	
SAP rating (Section 12)		90	(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	3237.5048	0.2100	679.8760	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2116.5694	0.2100	444.4796	(264)
Space and water heating			1124.3556	(265)
Pumps, fans and electric keep-hot	192.6485	0.1387	26.7227	(267)
Energy for lighting	213.5527	0.1443	30.8223	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-543.5582	0.1329	-72.2528	
PV Unit electricity exported	-456.8113	0.1240	-56.6599	
Total			-128.9128	(269)
Total CO2, kg/year			1052.9878	(272)
CO2 emissions per m2			10.9300	(273)

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EI value 90.0162
EI rating 90 (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 FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	47.6300 (1b)	x 2.6700 (2b)	= 127.1721 (1b) - (3b)
First floor	48.7000 (1c)	x 2.3200 (2c)	= 112.9840 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	96.3300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	240.1561 (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	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)			23.5300	0.9615	22.6250			(27)
Ground Floor			47.3000	0.1200	5.6760	90.0000	4257.0000	(28a)
Exposed First Floor			1.0700	0.1500	0.1605	20.0000	21.4000	(28b)
Brick and Block	72.7032	16.0400	56.6632	0.1800	10.1994	42.2200	2392.3203	(29a)
Tile Hung	80.4400	9.6400	70.8000	0.1800	12.7440	42.2200	2989.1760	(29a)
Pitched Roof	48.7000		48.7000	0.0900	4.3830	9.0000	438.3000	(30)
Total net area of external elements Aum(A, m ²)			250.2132					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	58.1529			(33)
Ground Floor Stud			35.5000			9.0000	319.5000	(32c)
First Floor Stud			95.2600			9.0000	857.3400	(32c)
Ground Floor Block			49.3000			75.0000	3697.5000	(32c)
First Floor			47.3000			18.0000	851.4000	(32d)
Internal Ceiling 1			47.3000			9.0000	425.7000	(32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
(28)...(30) + (32) + (32a)...(32e) = 16249.6363 (34)
168.6872 (35)

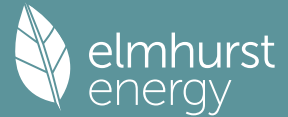
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	18.9630	0.0300	0.5689
E3 Sill	14.7700	0.0250	0.3693
E4 Jamb	44.1000	0.0190	0.8379
E5 Ground floor (normal)	30.1600	0.0580	1.7493
E20 Exposed floor (normal)	3.4200	0.3200	1.0944
E10 Eaves (insulation at ceiling level)	29.1000	0.0650	1.8915
E16 Corner (normal)	29.5900	0.0360	1.0652
E21 Exposed floor (inverted)	2.0700	0.3200	0.6624
E12 Gable (insulation at ceiling level)	2.2000	0.0400	0.0880
E17 Corner (inverted - internal area greater than external area)	9.6300	-0.0820	-0.7897

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 65.6901 (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

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(38)m 39.6258 39.6258 39.6258 39.6258 39.6258 39.6258 39.6258 39.6258 39.6258 39.6258 39.6258 39.6258 (38)
Heat transfer coeff 105.3158 105.3158 105.3158 105.3158 105.3158 105.3158 105.3158 105.3158 105.3158 105.3158 105.3158 105.3158 (39)
Average = Sum(39)m / 12 = 105.3158

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0933	1.0933	1.0933	1.0933	1.0933	1.0933	1.0933	1.0933	1.0933	1.0933	1.0933	1.0933	(40)
HLP (average)												1.0933	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.7029 (42)
Hot water usage for mixer showers 69.5378 68.4928 66.9700 64.0564 61.9062 59.5084 58.1454 59.6567 61.3133 63.8879 66.8641 69.2713 (42a)
Hot water usage for baths 30.0267 29.5808 28.9528 27.7950 26.9279 25.9666 25.4473 26.0709 26.7498 27.7785 28.9603 29.9252 (42b)
Hot water usage for other uses 42.3099 40.7714 39.2329 37.6943 36.1558 34.6172 34.6172 36.1558 37.6943 39.2329 40.7714 42.3099 (42c)
Average daily hot water use (litres/day) 130.4146 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	141.8745	138.8450	135.1556	129.5456	124.9899	120.0922	118.2100	121.8834	125.7575	130.8993	136.5957	141.5065	(44)
Energy conte	224.6945	197.7134	207.7292	177.3415	168.2605	147.6673	142.9647	150.9171	155.0716	177.6291	194.6057	221.5650	(45)
Energy content (annual)										Total = Sum(45)m =		2166.1594	
Distribution loss (46)m = 0.15 x (45)m	33.7042	29.6570	31.1594	26.6012	25.2391	22.1501	21.4447	22.6376	23.2607	26.6444	29.1908	33.2348	(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													
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	(57)
Combi loss	1.5539	1.4332	1.5901	1.4670	1.4762	1.3751	1.3609	1.3756	1.3474	1.4429	1.4589	1.5413	(61)
Total heat required for water heating calculated for each month													
WWHRS	226.2484	199.1466	209.3193	178.8085	169.7366	149.0424	144.3256	152.2926	156.4189	179.0720	196.0645	223.1063	(62)
PV diverter	-48.8257	-43.1818	-45.2175	-37.4419	-34.8945	-29.8595	-27.9885	-29.7630	-30.8938	-36.4203	-41.2598	-47.9215	(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	177.4227	155.9648	164.1018	141.3666	134.8421	119.1829	116.3371	122.5297	125.5252	142.6517	154.8047	175.1848	(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	75.0994	66.0980	69.4675	59.3328	56.3156	49.4432	47.8760	50.5238	51.8981	59.4224	65.0711	74.0557	(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	162.1713	162.1713	162.1713	162.1713	162.1713	162.1713	162.1713	162.1713	162.1713	162.1713	162.1713	162.1713	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.2306	26.8505	21.8363	16.5315	12.3575	10.4327	11.2729	14.6530	19.6672	24.9720	29.1460	31.0708	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	373.5142	377.3901	367.6230	346.8298	320.5822	295.9132	279.4327	275.5568	285.3240	306.1171	332.3647	357.0338	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.9200	53.9200	53.9200	53.9200	53.9200	53.9200	53.9200	53.9200	53.9200	53.9200	53.9200	53.9200	(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)	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	-108.1142	(71)
Water heating gains (Table 5)	100.9400	98.3601	93.3703	82.4066	75.6931	68.6710	64.3494	67.9084	72.0807	79.8688	90.3765	99.5372	(72)
Total internal gains	615.6619	613.5779	593.8067	556.7451	519.6099	482.9940	463.0322	466.0952	485.0490	521.9350	562.8644	598.6189	(73)

6. Solar gains

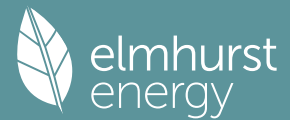
[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W							
Northeast	0.8200	15.0428	0.4500	0.7000	0.7700	2.6927	(75)						
Southeast	7.2200	46.3896	0.4500	0.7000	0.7700	73.1142	(77)						
Southwest	6.0000	46.3896	0.4500	0.7000	0.7700	60.7597	(79)						
Northwest	9.4900	15.0428	0.4500	0.7000	0.7700	31.1630	(81)						
Solar gains	167.7296	254.0612	372.0989	514.5796	589.6895	652.0015	606.0831	537.2726	443.0075	304.5019	201.1456	135.7726	(83)
Total gains	783.3915	867.6391	965.9056	1071.3246	1109.2993	1134.9955	1069.1153	1003.3678	928.0565	826.4370	764.0100	734.3915	(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	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	42.8595	
alpha	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	3.8573	
util living area	0.9691	0.9554	0.9180	0.8367	0.6963	0.4988	0.3597	0.3821	0.6225	0.8521	0.9459	0.9742	(86)
MIT	19.6575	19.8115	20.1552	20.5379	20.8295	20.9641	20.9923	20.9905	20.9177	20.5978	20.0819	19.6071	(87)
Th 2	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	20.0063	(88)
util rest of house	0.9622	0.9458	0.9005	0.8030	0.6377	0.4180	0.2654	0.2825	0.5385	0.8115	0.9318	0.9683	(89)

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MIT 2	18.4772	18.6690	19.0932	19.5470	19.8647	19.9856	20.0038	20.0032	19.9528	19.6289	19.0114	18.4145 (90)
Living area fraction									FLA = Living area / (4) =			0.2066 (91)
MIT	18.7210	18.9050	19.3126	19.7517	20.0640	20.1877	20.2080	20.2072	20.1521	19.8291	19.2326	18.6609 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7210	18.9050	19.3126	19.7517	20.0640	20.1877	20.2080	20.2072	20.1521	19.8291	19.2326	18.6609 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9504	0.9322	0.8857	0.7933	0.6413	0.4332	0.2848	0.3030	0.5516	0.8031	0.9179	0.9575	(94)
Useful gains	744.5480	808.8076	855.4551	849.8948	711.3988	491.7256	304.4983	303.9790	511.9060	663.7290	701.3204	703.1699	(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	1402.9116	1390.6988	1265.1195	1069.1372	786.0794	504.2229	306.2614	306.1707	542.5986	845.5909	1140.8421	1386.0462	(97)
Space heating kWh	489.8225	391.0309	304.7903	157.8546	55.5624	0.0000	0.0000	0.0000	0.0000	135.3053	316.4556	508.0599	(98a)
Space heating requirement - total per year (kWh/year)												2358.8813	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	489.8225	391.0309	304.7903	157.8546	55.5624	0.0000	0.0000	0.0000	0.0000	135.3053	316.4556	508.0599	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2358.8813	
Space heating per m2											(98c) / (4) =	24.4875	(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	489.8225	391.0309	304.7903	157.8546	55.5624	0.0000	0.0000	0.0000	0.0000	135.3053	316.4556	508.0599 (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)	552.2238	440.8465	343.6192	177.9645	62.6408	0.0000	0.0000	0.0000	0.0000	152.5426	356.7707	572.7846 (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	177.4227	155.9648	164.1018	141.3666	134.8421	119.1829	116.3371	122.5297	125.5252	142.6517	154.8047	175.1848 (64)	
Efficiency of water heater												76.2000 (216)	
(217)m	84.9927	84.7366	83.8841	82.3201	79.4680	76.2000	76.2000	76.2000	76.2000	81.8123	84.1647	85.1198 (217)	
Fuel for water heating, kWh/month	208.7506	184.0583	195.6292	171.7279	169.6810	156.4080	152.6733	160.8001	164.7312	174.3645	183.9307	205.8096 (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	16.3619	14.7785	16.3619	15.8341	16.3619	15.8341	16.3619	16.3619	15.8341	16.3619	15.8341	16.3619 (231)	
Lighting	26.4607	21.2277	19.1132	14.0032	10.8164	8.8371	9.8671	12.8257	16.6593	21.8579	24.6884	27.1961 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-25.3459	-33.9429	-52.8108	-64.8451	-71.5382	-71.3981	-69.4243	-64.4521	-54.9916	-42.4719	-28.4735	-20.7174 (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	-9.6225	-17.3170	-36.9531	-60.8410	-78.7268	-89.1804	-84.9634	-72.0415	-50.8490	-27.7551	-12.9636	-6.9936 (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													2659.3927 (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													2128.5646 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.3640)													
mechanical ventilation fans (SFP = 0.3640)													106.6485 (230a)
central heating pump													41.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													192.6485 (231)
Electricity for lighting (calculated in Appendix L)													213.5527 (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													4045.5398 (238)

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

Full SAP Calculation Printout



	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2659.3927	5.6000	148.9260 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2128.5646	5.6000	119.1996 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	192.6485	26.0600	50.2042 (249)
Energy for lighting	213.5527	26.0600	55.6518 (250)
Additional standing charges			99.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-600.4118	26.0600	-156.4673
PV Unit electricity exported	-548.2070	5.8100	-31.8508
Total			-188.3181 (252)
Total energy cost			284.6635 (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	2659.3927	0.2100	558.4725 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2128.5646	0.2100	446.9986 (264)
Space and water heating			1005.4710 (265)
Pumps, fans and electric keep-hot	192.6485	0.1387	26.7227 (267)
Energy for lighting	213.5527	0.1443	30.8223 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-600.4118	0.1333	-80.0123
PV Unit electricity exported	-548.2070	0.1242	-68.0693
Total			-148.0815 (269)
Total CO2, kg/year			914.9345 (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	2659.3927	1.1300	3005.1138 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2128.5646	1.1300	2405.2780 (278)
Space and water heating			5410.3918 (279)
Pumps, fans and electric keep-hot	192.6485	1.5128	291.4387 (281)
Energy for lighting	213.5527	1.5338	327.5543 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-600.4118	1.4924	-896.0695
PV Unit electricity exported	-548.2070	0.4556	-249.7780
Total			-1145.8475 (283)
Total Primary energy kWh/year			4883.5372 (286)

Predicted Energy Assessment



Plot 5, Wharton's Lane, Southampton

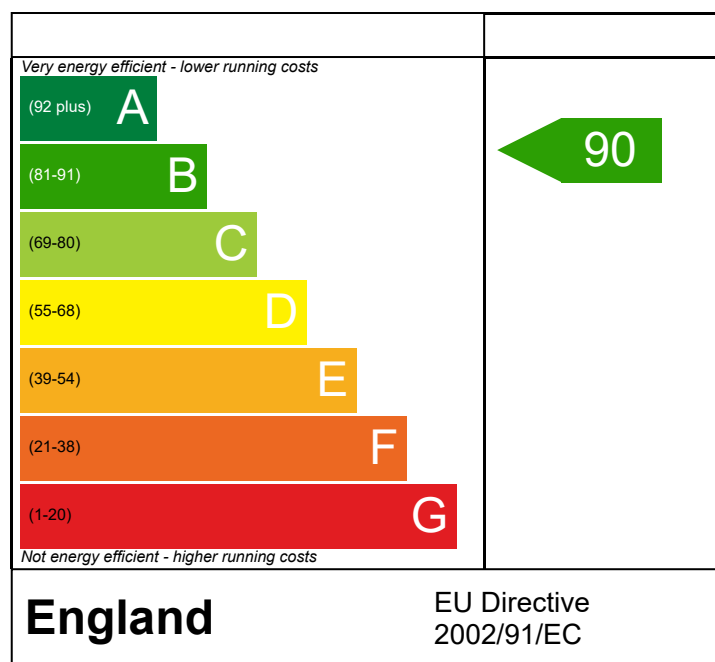
Dwelling type:
Date of assessment:
Produced by:
Total floor area:
DRRN:

House, Detached
06/01/2025
Tobias Whiting
96.33 m²
3205-2993-6041

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.

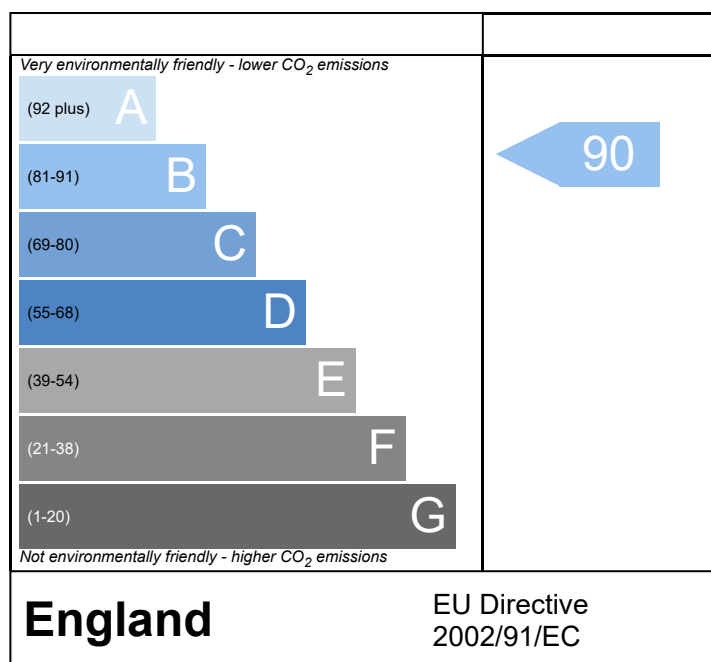
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.

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 5	Issued on Date	06/01/2025
Assessment Reference	Rev C	Prop Type Ref	Detached House
Property	Plot 5, Wharton's Lane, Southampton		

SAP Rating	90 B	DER	11.38	TER	12.06
Environmental	90 B	% DER < TER			5.64
CO ₂ Emissions (t/year)	0.91	DFEE	38.68	TFEE	42.93
Compliance Check	See BREL	% DFEE < TFEE			9.88
% DPER < TPER	3.19	DPER	61.06	TPER	63.07

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)	Non Gov Approved Schemes	0.030	18.96	0.57	Catnic WT-5077
External wall	E3 Sill	Non Gov Approved Schemes	0.025	14.77	0.37	Knauf P5
External wall	E4 Jamb	Independently assessed	0.019	44.10	0.84	Knauf P6
External wall	E5 Ground floor (normal)	Non Gov Approved Schemes	0.058	30.16	1.75	SEES-2242-E5
External wall	E20 Exposed floor (normal)	Table K1 - Default	0.320	3.42	1.09	
External wall	E10 Eaves (insulation at ceiling level)	Non Gov Approved Schemes	0.065	29.10	1.89	Knauf P16
External wall	E16 Corner (normal)	Non Gov Approved Schemes	0.036	29.59	1.07	Knauf P23
External wall	E21 Exposed floor (inverted)	Table K1 - Default	0.320	2.07	0.66	K1
External wall	E12 Gable (insulation at ceiling level)	Non Gov Approved Schemes	0.040	2.20	0.09	Knauf P21
External wall	E17 Corner (inverted – internal area greater than external area)	Non Gov Approved Schemes	-0.082	9.63	-0.79	Knauf P24

Total: 184.00 W/mK:
Y-Value: 0.03 W/m²K:

Energy Report



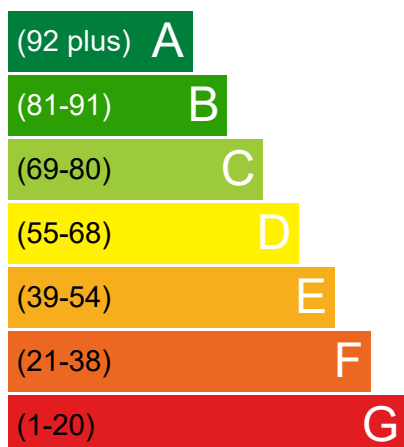
Dwelling Address	Plot 5, Wharton's Lane, Southampton
Reference	SAP 0898 Plot 5-Rev C
Assessment Date	06/01/2025
Submission Date	06/01/2025
Property Type	House, Detached
Total Floor Area	96

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

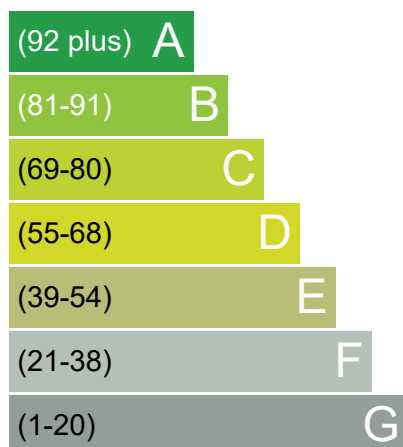


CURRENT POTENTIAL

90 90

Carbon Dioxide (CO2) Emissions Rating

Very environmentally friendly - lower CO2 emissions



CURRENT POTENTIAL

90 90

Additional ratings for your home

	Primary Energy	Energy	Carbon	Cost	HTC
CURRENT	50.70 kWh	4046 kWh	915 kg	284.66 £	105 W/K
POTENTIAL	50.70 kWh	4046 kWh	915 kg	284.66 £	105 W/K

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	Time and temperature zone control	Very 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	£28	B 91			B 91

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		£56	£56	
Heating		£298	£298	
Hot Water		£119	£119	
New Technologies e.g. Impact of PV		-(£188)	-(£188)	
TOTAL		£285	£285	

Estimated energy use and potential savings



Space Heating

2659

kWh per year



Water Heating

2129

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.