



Land at 16 Swanbourne Road, Littlehampton, BN17

Energy Statement for Planning

Job No: 6082

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Document Prepared By:

Sam Westover

Dated:

10.01.25

Signed:

Document Authorised By:

Jim Westover

Dated:

10.01.25

Signed:

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1.0 Introduction

- 1.1 T16 Design has been appointed to produce this Energy Statement for the proposed development at the land at 16 Swanbourne Road, BN17
- 1.2 The report assesses the predicted energy performance and carbon dioxide emissions of the proposed development in the context of local and nationwide policy requirements and best practice methods.
- 1.3 The methodology used to demonstrate the effects of the proposed energy efficiency measures is SAP10 building regulations.
- 1.4 Emissions reductions are shown for the proposed scheme and the strategy underpinning them is detailed in relevant sections of the report.
- 1.5 The key policy consider within this report is policy EEC/SP2 of the Arun District Council Local Plan:
 - 1.5.1 A minimum 10% total predicted energy requirement via renewable and low carbon technologies

2.0 Project Summary

- 2.1 The proposed development is at the land to the north of 16 Swanbourne Road, Littlehampton, BN17 and it is currently unoccupied.
- 2.2 The proposal is for construction of a one bedroom bungalow.
- 2.3 All the proposed dwellings have been included in the energy calculations to allow for the best understanding of climate impact of the building.
- 2.4 The site location is shown below.



Site Location

3.0 Policy Requirements and Drivers

3.1 The relevant planning policy documents for this site, relating to energy are:

3.1.1 National Planning Policy Framework (NPPF 2023)

- NPPF 11a - Plans should promote sustainable development that seeks to: meet the development needs of their; align growth and infrastructure; improve the environment; mitigate climate change
- NPPF 154 - New development should be planned in ways that can help to avoid increased vulnerability to the range of impacts arising from climate change and reduce greenhouse gas emissions.
- NPPF 155 - Help increase use and supply of renewable and low carbon energy through providing a positive strategy for energy.

3.1.2 Arun District Council Local Plan 2011-2031 (2018)

- Policy ECC SP2 – Energy and Climate Change mitigation

3.2 In light of these policy requirements and through the developer and design team's commitment to reducing the impact of the development on the environment, this report sets out some of the measures that will be adopted to meet the policy target.

4.0 Energy Strategy and Approach

- 4.1 The Local Plan states that proposals should must produce at least 10% of the total predicted energy requirements from renewable or low carbon energy generation on site.
- 4.2 This will be undertaken in two stages Baseline, and Renewable and Low Carbon Technology.
- 4.3 Firstly, the energy demand of the proposed dwelling will need to be established this is done using the approved SAP10 methodology software.
- 4.4 The final stage is the addition, where feasible to introduce renewable technology, which includes Heat pumps (Air and Ground), PV panel, Solar Hot Water panels and Wind Power.
- 4.5 These calculations are done using SAP (Standard Assessment Procedure) for the residential elements.

5.0 Baseline Emissions

- 5.1 The baseline energy demand on which reduction figures are based are calculated using SAP for the residential units.
- 5.2 SAP calculates a notional building using the baseline Building Regulations parameters and represents the minimum allowable standard for the energy performance of the building to meet Part L.
- 5.3 The energy demand of the dwelling is shown below

Baseline Emissions	
Unit	Energy Demand kWh/m ²
16 Swanbourne Road	11.37

Table 1 – Baseline Energy

6.0 Energy Efficiency Strategy

- 6.1 The next stage, once the baseline has been established, is to make improvements within the energy efficient measure category. This includes improving the U Values and the reduction of thermal bridging..
- 6.2 Electrical lighting also represents a significant energy use within a building it is proposed the lighting for the residential dwelling would have an efficacy of no lower than 110.
- 6.3 Improved thermal bridging is proposed it is proposed the government approved PSI values will be use for most junctions and where this is not feasible they will be calculated by a relevant person.
- 6.4 The proposed U-values, with the relevant Part L backstop are shown below

Energy Efficiency Strategy		
Element or system	Notional Value	Proposed Value
Proposed External Walls	U = 0.18 W/(m ² k)	U = 0.17 W/(m ² k)
Floors	U = 0.13 W/(m ² k)	U = 0.10 W/(m ² k)
Roof	U = 0.11 W/(m ² k)	U = 0.09 W/(m ² k)
Windows and rooflights	U = 1.2 W/(m ² k)	U = 1.2 W/(m ² k) (G-Value 0.57)
Air Permeability	5 m ³ /(hm ²) at 50 Pa	5.01m ³ /(hm ²) at 50 Pa
Lighting	Efficacy of all fixed lighting = 80 lm/W	Efficacy of all fixed lighting = 110 lm/W

Table 2 – Fabric Specification

7.0 Renewable Energy Strategy

- 7.1 The renewable section of the strategy requires the consideration of renewable technologies to provide energy demand.
- 7.2 The technologies that are considered here are wind power and solar panels (photovoltaic (PV) or Solar Thermal) and heat pumps (ground, air and water)
- 7.3 Wind power is not suitable in a location such as this. Wind turbines tend to perform poorly in built-up areas.
- 7.4 Any wind that is received on the site would be too intermittent and turbulent to provide any meaningful reduction in emissions.
- 7.5 Ground Source Heat pumps are also unlikely to be a viable proposition due to the ground disturbance required in their installation.
- 7.6 Air Source Heat Pumps (ASHP) however are a suitable solution in this instance and provide substantial improvements in CO₂ emissions when combined with a high-performing fabric such as proposed here.
- 7.7 It is proposed that individual 250% efficient heat pumps will provide heating and hot water for the dwellings.

8.0 Summary of Results

- 8.1 The tables below show the % of energy demand provided by renewable or low carbon energy
- 8.2 The proposed dwelling will be provided with increased U values and ASHPs.
- 8.3 The figures below have been calculated using an approved SAP10 calculation tool.

Energy			
Unit	Total Energy Demand kWh/m ²	Energy from Low Carbon Technology kWh/m ²	% Energy Demand from Low Carbon Technology
Land at 16 Swanbourne Road	4035.67	1888.96	46.81%

Table 3 – Residential Carbon emissions savings

9.0 Conclusions

- 9.1 This energy statement has been produced to accompany an application for the redevelopment of the site at the Land at 16 Swanbourne Road, Littlehampton, BN17 to show how the proposal will comply with local renewable and energy standards.
- 9.2 In doing so, preliminary SAP calculations have been undertaken using the information available and sensible assumptions on construction and M&E parameters.
- 9.3 The baseline figures have been calculated and improvements made to the fabric and plant proposed for the scheme.
- 9.4 The passive design measures can be summarised as:
- Significant fabric improvements
 - Good air tightness.
 - Improved thermal bridging.
- 9.5 The renewable measures can be summarised as:
- Air Source Heat Pumps with an Efficiency of 250%
- 9.6 The results in Section 10 show that 46.81% of the proposal's energy demand will be provided by a renewable or low carbon technology.



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Appendix A – SAPs Calculations

Summary for Input Data



Property Reference	Swanbourne Road	Issued on Date	10/01/2025
Assessment Reference	Swanbourne Road	Prop Type Ref	
Property			

SAP Rating	78 C	DER	7.30	TER	16.80
Environmental	96 A	% DER < TER			56.55
CO ₂ Emissions (t/year)	0.26	DFEE	57.11	TFEE	57.23
Compliance Check	See BREL	% DFEE < TFEE			0.21
% DPER < TPER	14.80	DPER	76.51	TPER	89.80

Assessor Details	Mr. Samuel Westover	Assessor ID	AX13-0001
Client			

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

Orientation	West
Property Tenure	ND
Transaction Type	6
Terrain Type	Suburban
1.0 Property Type	Bungalow, Detached
Which Floor	0
2.0 Number of Storeys	1
3.0 Date Built	2025
3.0 Property Age Band	L
4.0 Sheltered Sides	1
5.0 Sunlight/Shade	Average or unknown
6.0 Thermal Mass Parameter	Precise calculation
Thermal Mass	186.82 kJ/m ² K
7.0 Electricity Tariff	Standard
Smart electricity meter fitted	Yes
Smart gas meter fitted	Yes

7.0 Measurements		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground floor:	26.90 m	39.00 m ²	2.50 m

8.0 Living Area	23.10 m ²
-----------------	----------------------

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
EW	Cavity Wall	Cavity wall : dense plaster, AAC block, filled cavity, any outside structure	0.17	70.00	67.25	51.05	0.00	None	16.20	Calculate Wall Area

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Internal Wall 1	Plasterboard on timber frame	9.00	48.50

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
External Roof 1	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	39.00	39.00	None	0.00	Enter Gross Area	0.00

Description	Type	Storey Index	Construction	U-Value (W/m ² K)	Shelter Code	Shelter Factor	Kappa (kJ/m ² K)	Area (m ²)
Heatloss Floor 1	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.10	None	0.00	75.00	39.00

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m ² K)
Windows	Manufacturer	Window	Triple Low-E Soft 0.05			0.57		0.70	1.20
Front Door	Manufacturer	Solid Door				0.00			1.00

Summary for Input Data

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m ²)	Pitch
W	Windows	EW	West	3.80	0
N	Windows	EW	North	4.00	0
E	Windows	EW	East	6.20	0
Front Door	Front Door	EW	West	2.20	0

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E5 Ground floor (normal)	Gov Approved Scheme	26.90	0.06	0.06	Yes
E16 Corner (normal)	Gov Approved Scheme	12.50	0.04	0.04	No
E2 Other lintels (including other steel lintels)	Gov Approved Scheme	9.50	0.36	0.36	No
E3 Sill	Gov Approved Scheme	4.90	0.02	0.02	No
E4 Jamb	Gov Approved Scheme	20.60	0.02	0.02	No
E10 Eaves (insulation at ceiling level)	Gov Approved Scheme	26.90	0.06	0.06	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	2.50	-0.09	-0.09	No

Y-value W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys

Number of open flues

Number of chimneys/flues attached to closed fire

Number of flues attached to solid fuel boiler

Number of flues attached to other heater

Number of blocked chimneys

Number of intermittent extract fans

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
Lighting 1	110.00	5.00	550.00	25

24.0 Main Heating 1

Percentage of Heat %

Database Ref. No.

Fuel Type

SAP Code

In Winter

In Summer

Controls SAP Code

Delayed Start Stat

HETAS approved System

Summary for Input Data

Is MHS Pumped	Pump in heated space
Heating Pump Age	2013 or later
Heat Emitter	Underfloor
Underfloor Heating	Yes - Pipes in thin screed
Flow Temperature	Enter value
Flow Temperature Value	35.00

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

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
S1	Vented hot water system + pump	12.00		Yes	Instantaneous System 1

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder

Cylinder Stat	No
Cylinder In Heated Space	No
Independent Time Control	No
In Airing Cupboard	No

31.0 Thermal Store

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	SAP rating	Ratings after improvement
Solar water heating	£4,000 - £6,000 £3,500 - £5,500	£80 £188	B 81 B 89 0	A 96 A 98 0

Full SAP Calculation Printout



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Compliance Check	See BREL	% DFEE < TFEE				0.21
% DPER < TPER	14.80	DPER	76.51	TPER	89.80	
Assessor Details	Mr. Samuel Westover				Assessor ID	AX13-0001
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	39.0000 (1b)	2.5000 (2b)	97.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.0000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	97.5000 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	20.0000 / (5) = 0.2051 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0100 (17)
Infiltration rate	0.4556 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.4215 (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	0.5374	0.5268	0.5163	0.4636	0.4531	0.4004	0.4004	0.3898	0.4215	0.4531	0.4741	0.4952 (22b)
Effective ac	0.6444	0.6388	0.6333	0.6075	0.6026	0.5802	0.5802	0.5760	0.5888	0.6026	0.6124	0.6226 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.20)			14.0000	1.1450	16.0305		(27)
Front Door			2.2000	1.0000	2.2000		(26)
Heatloss Floor 1			39.0000	0.1000	3.9000	75.0000	2925.0000 (28a)
EW	67.2500	16.2000	51.0500	0.1700	8.6785	70.0000	3573.5000 (29a)
External Roof 1	39.0000		39.0000	0.0900	3.5100	9.0000	351.0000 (30)
Total net area of external elements Aum(A, m ²)			145.2500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.3190		(33)
Internal Wall 1			48.5000			9.0000	436.5000 (32c)

Heat capacity Cm = Sum (A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
(28)...(30) + (32) + (32a)...(32e) = 7286.0000 (34)
186.8205 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	26.9000	0.0610	1.6409
E16 Corner (normal)	12.5000	0.0420	0.5250
E2 Other lintels (including other steel lintels)	9.5000	0.3610	3.4295
E3 Sill	4.9000	0.0220	0.1078
E4 Jamb	20.6000	0.0170	0.3502
E10 Eaves (insulation at ceiling level)	26.9000	0.0570	1.5333
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0850	-0.2125

Full SAP Calculation Printout



Thermal bridges (Sum(L x Psi) calculated using Appendix K)
 Point Thermal bridges
 Total fabric heat loss (33) + (36) + (36a) = 41.6932 (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	20.7328	20.5524	20.3756	19.5451	19.3898	18.6664	18.6664	18.5325	18.9450	19.3898	19.7041	20.0327	(38)
Heat transfer coeff	62.4260	62.2456	62.0688	61.2384	61.0830	60.3597	60.3597	60.2257	60.6383	61.0830	61.3973	61.7259	(39)
Average = Sum(39)m / 12 =												61.2376	
HLP	1.6007	1.5960	1.5915	1.5702	1.5662	1.5477	1.5477	1.5442	1.5548	1.5662	1.5743	1.5827	(40)
HLP (average)												1.5702	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.3800 (42)
Hot water usage for mixer showers	71.0366	69.9691	68.4135	65.4371	63.2406	60.7911	59.3988	60.9426	62.6349	65.2650	68.3053	70.7645	(42a)
Hot water usage for baths	20.4886	20.1843	19.7558	18.9658	18.3742	17.7182	17.3639	17.7894	18.2526	18.9546	19.7609	20.4194	(42b)
Hot water usage for other uses	28.7628	27.7168	26.6709	25.6250	24.5791	23.5332	23.5332	24.5791	25.6250	26.6709	27.7168	28.7628	(42c)
Average daily hot water use (litres/day)												110.6376	(43)
Daily hot water use	120.2880	117.8703	114.8403	110.0279	106.1938	102.0424	100.2958	103.3110	106.5126	110.8905	115.7831	119.9466	(44)
Energy conte	190.5068	167.8457	176.5052	150.6227	142.9573	125.4731	121.2991	127.9207	131.3407	150.4773	164.9542	187.8074	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m	28.5760	25.1769	26.4758	22.5934	21.4436	18.8210	18.1949	19.1881	19.7011	22.5716	24.7431	28.1711	(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	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													
WWHRS	190.5068	167.8457	176.5052	150.6227	142.9573	125.4731	121.2991	127.9207	131.3407	150.4773	164.9542	187.8074	(62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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	190.5068	167.8457	176.5052	150.6227	142.9573	125.4731	121.2991	127.9207	131.3407	150.4773	164.9542	187.8074	(64)
Total per year (kWh/year)												1837.7101	(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	63.3435	55.8087	58.6880	50.0820	47.5333	41.7198	40.3319	42.5336	43.6708	50.0337	54.8473	62.4460	(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	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	60.0354	66.4678	60.0354	62.0366	60.0354	62.0366	60.0354	60.0354	62.0366	60.0354	62.0366	60.0354	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	119.0269	120.2620	117.1495	110.5234	102.1592	94.2979	89.0462	87.8110	90.9235	97.5496	105.9139	113.7751	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	(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)	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	(71)
Water heating gains (Table 5)	85.1391	83.0487	78.8817	69.5584	63.8889	57.9442	54.2096	57.1688	60.6539	67.2496	76.1768	83.9327	(72)
Total internal gains	310.9017	316.4787	302.7669	288.8186	272.7837	257.9789	246.9914	248.7155	257.3142	271.5349	290.8275	304.4435	(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
North			4.0000		10.6334		0.5700		0.7000		0.7700		11.7608 (74)
East			6.2000		19.6403		0.5700		0.7000		0.7700		33.6702 (76)
West			3.8000		19.6403		0.5700		0.7000		0.7700		20.6365 (80)
Solar gains	66.0675	128.7110	213.1461	316.5062	395.3469	408.5797	387.3556	327.3135	249.3980	152.8115	82.2226		54.4636 (83)
Total gains	376.9692	445.1897	515.9129	605.3248	668.1306	666.5586	634.3470	576.0290	506.7122	424.3464	373.0501		358.9071 (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	32.4206	32.5145	32.6072	33.0494	33.1334	33.5305	33.5305	33.6051	33.3764	33.1334	32.9638	32.7883	
alpha	3.1614	3.1676	3.1738	3.2033	3.2089	3.2354	3.2354	3.2403	3.2251	3.2089	3.1976	3.1859	
util living area													

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	0.9740	0.9560	0.9191	0.8327	0.6973	0.5332	0.4037	0.4566	0.6858	0.8887	0.9588	0.9775 (86)
MIT	19.3248	19.5545	19.9063	20.3469	20.6638	20.8320	20.8826	20.8719	20.7374	20.2967	19.7392	19.2943 (87)
Th 2	19.6128	19.6162	19.6196	19.6352	19.6382	19.6519	19.6519	19.6545	19.6466	19.6382	19.6322	19.6260 (88)
util rest of house												
	0.9674	0.9450	0.8989	0.7925	0.6297	0.4370	0.2866	0.3334	0.5914	0.8515	0.9466	0.9717 (89)
MIT 2	17.7154	18.0053	18.4422	18.9760	19.3214	19.4885	19.5227	19.5206	19.4134	18.9392	18.2538	17.6863 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	18.6687	18.9229	19.3094	19.7880	20.1165	20.2843	20.3281	20.3210	20.1976	19.7432	19.1336	18.6387 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6687	18.9229	19.3094	19.7880	20.1165	20.2843	20.3281	20.3210	20.1976	19.7432	19.1336	18.6387 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9615	0.9382	0.8935	0.7975	0.6550	0.4837	0.3466	0.3962	0.6327	0.8548	0.9410	0.9663	(94)
Useful gains	362.4717	417.6748	460.9689	482.7670	437.5929	322.4395	219.8869	228.2154	320.5946	362.7464	351.0279	346.8163	(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	896.9796	872.8647	795.0648	666.7646	514.1046	343.1009	225.0297	236.1441	369.7496	558.4969	738.8316	891.2435	(97)
Space heating kWh	397.6739	305.8876	248.5673	132.4782	56.9248	0.0000	0.0000	0.0000	0.0000	145.6384	279.2186	405.0538	(98a)
Space heating requirement - total per year (kWh/year)												1971.4427	
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	397.6739	305.8876	248.5673	132.4782	56.9248	0.0000	0.0000	0.0000	0.0000	145.6384	279.2186	405.0538	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1971.4427	
Space heating per m2										(98c) / (4) =		50.5498	(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 %)													249.9000 (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	397.6739	305.8876	248.5673	132.4782	56.9248	0.0000	0.0000	0.0000	0.0000	145.6384	279.2186	405.0538	(98)
Space heating efficiency (main heating system 1)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000	(210)
Space heating fuel (main heating system)	159.1332	122.4040	99.4667	53.0125	22.7790	0.0000	0.0000	0.0000	0.0000	58.2787	111.7321	162.0864	(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	190.5068	167.8457	176.5052	150.6227	142.9573	125.4731	121.2991	127.9207	131.3407	150.4773	164.9542	187.8074	(64)
Efficiency of water heater	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(216)
Fuel for water heating, kWh/month	108.7989	95.8571	100.8025	86.0209	81.6433	71.6579	69.2742	73.0558	75.0090	85.9379	94.2057	107.2572	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	11.5076	9.2318	8.3122	6.0899	4.7040	3.8432	4.2912	5.5778	7.2450	9.5059	10.7368	11.8274	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1													788.8926 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													175.1000
Water heating fuel used													1049.5204 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year													0.0000 (231)
Electricity for lighting (calculated in Appendix L)													92.8729 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													0.0000 (233)
Wind generation													0.0000 (234)
Hydro-electric generation (Appendix N)													0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (235)
Appendix Q - special features													
Energy saved or generated													-0.0000 (236)
Energy used													0.0000 (237)
Total delivered energy for all uses													1931.2859 (238)

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

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	788.8926	0.1553	122.5469 (261)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating (other fuel)	1049.5204	0.1416	148.5893 (264)
Space and water heating			271.1362 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	92.8729	0.1443	13.4044 (268)
Total CO ₂ , kg/year			284.5406 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			7.3000 (273)

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

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	788.8926	1.5751	1242.5827 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	1049.5204	1.5235	1598.9852 (278)
Space and water heating			2841.5679 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	92.8729	1.5338	142.4515 (282)
Total Primary energy kWh/year			2984.0194 (286)
Dwelling Primary energy Rate (DPER)			76.5100 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	39.0000 (1b)	x 2.5000 (2b)	= 97.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 97.5000 (5)

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.2051 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4551	(18)
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.4210 (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	0.5368	0.5262	0.5157	0.4631	0.4526	0.3999	0.3999	0.3894	0.4210	0.4526	0.4736	0.4947 (22b)
Effective ac	0.6441	0.6385	0.6330	0.6072	0.6024	0.5800	0.5800	0.5758	0.5886	0.6024	0.6122	0.6223 (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
TER Opaque door			2.2000	1.0000	2.2000		(26)
TER Opening Type (U _w = 1.20)			7.5500	1.1450	8.6450		(27)
Heatloss Floor 1			39.0000	0.1300	5.0700		(28a)
EW	67.2500	9.7500	57.5000	0.1800	10.3500		(29a)
External Roof 1	39.0000		39.0000	0.1100	4.2900		(30)
Total net area of external elements A _{um} (A, m ²)			145.2500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.5550		(33)

Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K			186.8205 (35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	26.9000	0.1600	4.3040
E16 Corner (normal)	12.5000	0.0900	1.1250
E2 Other lintels (including other steel lintels)	9.5000	0.0500	0.4750
E3 Sill	4.9000	0.0500	0.2450

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E4 Jamb	20.6000	0.0500	1.0300
E10 Eaves (insulation at ceiling level)	26.9000	0.0600	1.6140
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.5680 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	39.1230 (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	20.7226	20.5426	20.3662	19.5375	19.3825	18.6608	18.6608	18.5271	18.9388	19.3825	19.6961	20.0240	(38)
Heat transfer coeff	59.8456	59.6657	59.4892	58.6606	58.5055	57.7838	57.7838	57.6502	58.0618	58.5055	58.8192	59.1471	(39)
Average = Sum(39)m / 12 =												58.6598	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.5345	1.5299	1.5254	1.5041	1.5001	1.4816	1.4816	1.4782	1.4888	1.5001	1.5082	1.5166	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.3800 (42)
Hot water usage for mixer showers	47.3578	46.6461	45.6090	43.6247	42.1604	40.5274	39.5992	40.6284	41.7566	43.5100	45.5369	47.1763 (42a)	
Hot water usage for baths	20.4886	20.1843	19.7558	18.9658	18.3742	17.7182	17.3639	17.7894	18.2526	18.9546	19.7609	20.4194 (42b)	
Hot water usage for other uses	28.7628	27.7168	26.6709	25.6250	24.5791	23.5332	23.5332	24.5791	25.6250	26.6709	27.7168	28.7628 (42c)	
Average daily hot water use (litres/day)												88.8064 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	96.6092	94.5473	92.0358	88.2155	85.1137	81.7787	80.4962	82.9968	85.6343	89.1355	93.0146	96.3584 (44)	
Distribution loss (46)m = 0.15 x (45)m	153.0053	134.6340	141.4555	120.7626	114.5793	100.5565	97.3532	102.7674	105.5956	120.9560	132.5164	150.8740 (45)	
Total = Sum (45)m =	22.9508	20.1951	21.2183	18.1144	17.1869	15.0835	14.6030	15.4151	15.8393	18.1434	19.8775	22.6311 (46)	
Water storage loss:													
Store volume												150.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												0.7527 (55)	
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)	
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month	199.6002	176.7197	188.0504	165.8545	161.1742	145.6483	143.9481	149.3623	150.6875	167.5509	177.6082	197.4689 (62)	
WWHRS	-21.6500	-19.1474	-20.0501	-16.6023	-15.4727	-13.2401	-12.4105	-13.1973	-13.6987	-16.1493	-18.2952	-21.2491 (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	177.9502	157.5723	168.0004	149.2522	145.7015	132.4082	131.5376	136.1650	136.9887	151.4016	159.3131	176.2199 (64)	
12Total per year (kWh/year)												1822.5107 (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	88.1502	78.4344	84.3099	76.2270	75.3736	69.5085	69.6459	71.4461	71.1840	77.4938	80.1352	87.4415 (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	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	60.6839	67.1858	60.6839	62.7067	60.6839	62.7067	60.6839	60.6839	62.7067	60.6839	62.7067	60.6839	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	119.0269	120.2620	117.1495	110.5234	102.1592	94.2979	89.0462	87.8110	90.9235	97.5496	105.9139	113.7751	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	(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)													
	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	(71)
Water heating gains (Table 5)													
	118.4814	116.7178	113.3197	105.8709	101.3085	96.5396	93.6100	96.0297	98.8667	104.1583	111.2989	117.5289	(72)
Total internal gains													
	344.8925	350.8659	337.8534	325.8013	310.8519	297.2445	287.0404	288.2249	296.1972	309.0921	326.6197	338.6882	(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	
North					2.1600	10.6334	0.6300	0.7000	0.7700		7.0194 (74)	
East					3.3400	19.6403	0.6300	0.7000	0.7700		20.0477 (76)	
West					2.0500	19.6403	0.6300	0.7000	0.7700		12.3048 (80)	
Solar gains	39.3719	76.7027	127.0212	188.6222	235.6141	243.5037	230.8533	195.0651	148.6263	91.0650	48.9991	32.4568 (83)
Total gains	384.2643	427.5686	464.8746	514.4235	546.4660	540.7482	517.8936	483.2900	444.8235	400.1571	375.6188	371.1450 (84)

7. Mean internal temperature (heating season)

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Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	33.8185	33.9205	34.0211	34.5017	34.5931	35.0252	35.0252	35.1064	34.8575	34.5931	34.4087	34.2179
alpha	3.2546	3.2614	3.2681	3.3001	3.3062	3.3350	3.3350	3.3404	3.3238	3.3062	3.2939	3.2812
util living area	0.9721	0.9591	0.9341	0.8731	0.7661	0.6085	0.4665	0.5127	0.7270	0.8975	0.9568	0.9749 (86)
MIT	19.0232	19.2595	19.6445	20.1714	20.6009	20.8698	20.9596	20.9444	20.7537	20.2068	19.5448	18.9968 (87)
Th 2	19.6617	19.6652	19.6685	19.6844	19.6874	19.7013	19.7013	19.7039	19.6959	19.6874	19.6814	19.6751 (88)
util rest of house	0.9651	0.9489	0.9172	0.8397	0.7045	0.5098	0.3394	0.3833	0.6371	0.8630	0.9442	0.9686 (89)
MIT 2	17.4388	17.7372	18.2189	18.8660	19.3514	19.6230	19.6872	19.6824	19.5261	18.9268	18.1109	17.4139 (90)
Living area fraction	fLA = Living area / (4) =											0.5923 (91)
MIT	18.3772	18.6389	19.0633	19.6392	20.0915	20.3615	20.4409	20.4299	20.2532	19.6850	18.9602	18.3515 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3772	18.6389	19.0633	19.6392	20.0915	20.3615	20.4409	20.4299	20.2532	19.6850	18.9602	18.3515 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9562	0.9389	0.9078	0.8384	0.7251	0.5622	0.4137	0.4582	0.6786	0.8630	0.9354	0.9602 (94)
Useful gains	367.4276	401.4521	421.9900	431.2989	396.2401	304.0080	214.2293	221.4258	301.8485	345.3209	351.3574	356.3624 (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	842.4621	819.7388	747.3813	629.9693	490.9491	332.9201	221.9399	232.3231	357.2666	531.5213	697.6058	837.0196 (97)
Space heating kWh	353.4257	281.0887	242.0912	143.0426	70.4635	0.0000	0.0000	0.0000	0.0000	138.5331	249.2988	357.6090 (98a)
Space heating requirement - total per year (kWh/year)												1835.5527
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	353.4257	281.0887	242.0912	143.0426	70.4635	0.0000	0.0000	0.0000	0.0000	138.5331	249.2988	357.6090 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1835.5527
Space heating per m2												(98c) / (4) = 47.0655 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	353.4257	281.0887	242.0912	143.0426	70.4635	0.0000	0.0000	0.0000	0.0000	138.5331	249.2988	357.6090 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	382.9097	304.5381	262.2873	154.9758	76.3418	0.0000	0.0000	0.0000	0.0000	150.0901	270.0963	387.4420 (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	177.9502	157.5723	168.0004	149.2522	145.7015	132.4082	131.5376	136.1650	136.9887	151.4016	159.3131	176.2199 (64)
Efficiency of water heater (217)m	85.5682	85.3425	84.8784	83.9646	82.5265	79.8000	79.8000	79.8000	79.8000	83.8611	85.0597	79.8000 (216)
Fuel for water heating, kWh/month	207.9631	184.6351	197.9307	177.7562	176.5513	165.9251	164.8341	170.6329	171.6651	180.5386	187.2955	205.8339 (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	12.6089	10.1153	9.1077	6.6727	5.1542	4.2110	4.7018	6.1116	7.9384	10.4156	11.7644	12.9594 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-31.5454	-42.1733	-57.5889	-61.5147	-63.8719	-58.9124	-58.3039	-56.2763	-52.2840	-46.7752	-33.9115	-27.5650 (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	-25.5583	-52.6374	-102.5604	-151.1145	-197.0125	-196.8236	-194.3727	-165.7031	-123.0828	-74.0732	-33.7284	-20.2833 (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												1988.6811 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.8000
Water heating fuel used												2191.5614 (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)												101.7612 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1927.6727 (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												

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Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	2440.3310 (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	1988.6811	0.2100	417.6230 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2191.5614	0.2100	460.2279 (264)
Space and water heating			877.8509 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	101.7612	0.1443	14.6873 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-590.7225	0.1356	-80.1264
PV Unit electricity exported	-1336.9502	0.1265	-169.1068
Total			-249.2332 (269)
Total CO2, kg/year			655.2343 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.8000 (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	1988.6811	1.1300	2247.2097 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2191.5614	1.1300	2476.4644 (278)
Space and water heating			4723.6741 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	101.7612	1.5338	156.0847 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-590.7225	1.5014	-886.8896
PV Unit electricity exported	-1336.9502	0.4643	-620.7757
Total			-1507.6654 (283)
Total Primary energy kWh/year			3502.1942 (286)
Target Primary Energy Rate (TPER)			89.8000 (287)

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Property Reference	Swanbourne Road				Issued on Date	10/01/2025	
Assessment Reference	Swanbourne Road			Prop Type Ref			
Property							
SAP Rating	78 C		DER	7.30		TER	16.80
Environmental	96 A		% DER < TER				56.55
CO ₂ Emissions (t/year)	0.26		DFEE	57.11		TFEE	57.23
Compliance Check	See BREL		% DFEE < TFEE				0.21
% DPER < TPER	14.80		DPER	76.51		TPER	89.80
Assessor Details	Mr. Samuel Westover					Assessor ID	AX13-0001
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	39.0000 (1b)	2.5000 (2b)	97.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.0000		
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 97.5000 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	20.0000 / (5) = 0.2051 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0100 (17)
Infiltration rate	0.4556 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.4215 (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	0.5374	0.5268	0.5163	0.4636	0.4531	0.4004	0.4004	0.3898	0.4215	0.4531	0.4741	0.4952 (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	0.6444	0.6388	0.6333	0.6075	0.6026	0.5802	0.5802	0.5760	0.5888	0.6026	0.6124	0.6226 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.20)			14.0000	1.1450	16.0305		(27)
Front Door			2.2000	1.0000	2.2000		(26)
Heatloss Floor 1			39.0000	0.1000	3.9000	75.0000	2925.0000 (28a)
EW	67.2500	16.2000	51.0500	0.1700	8.6785	70.0000	3573.5000 (29a)
External Roof 1	39.0000		39.0000	0.0900	3.5100	9.0000	351.0000 (30)
Total net area of external elements Aum(A, m ²)			145.2500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.3190		(33)
Internal Wall 1			48.5000			9.0000	436.5000 (32c)
Heat capacity Cm = Sum (A x k)						(28)...(30) + (32) + (32a)...(32e) =	7286.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							186.8205 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E5 Ground floor (normal)				26.9000	0.0610	1.6409	
E16 Corner (normal)				12.5000	0.0420	0.5250	
E2 Other lintels (including other steel lintels)				9.5000	0.3610	3.4295	
E3 Sill				4.9000	0.0220	0.1078	
E4 Jamb				20.6000	0.0170	0.3502	

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E10 Eaves (insulation at ceiling level)	26.9000	0.0570	1.5333	
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0850	-0.2125	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				7.3742 (36)
Point Thermal bridges				0.0000
Total fabric heat loss			(33) + (36) + (36a) =	41.6932 (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	20.7328	20.5524	20.3756	19.5451	19.3898	18.6664	18.6664	18.5325	18.9450	19.3898	19.7041	20.0327 (38)
Average = Sum(39)m / 12 =	62.4260	62.2456	62.0688	61.2384	61.0830	60.3597	60.3597	60.2257	60.6383	61.0830	61.3973	61.7259 (39)
												61.2376
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.6007	1.5960	1.5915	1.5702	1.5662	1.5477	1.5477	1.5442	1.5548	1.5662	1.5743	1.5827 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.3800 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths												20.4886 (42b)
Hot water usage for other uses												28.7628 (42c)
Average daily hot water use (litres/day)												45.1442 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	49.2514	47.9012	46.4268	44.5908	42.9533	41.2514	40.8970	42.3684	43.8777	45.6255	47.4778	49.1821 (44)
Energy content (annual)	78.0022	68.2106	71.3562	61.0425	57.8234	50.7234	49.4614	52.4610	54.1055	61.9134	67.6408	77.0073 (45)
Distribution loss (46)m = 0.15 x (45)m												749.7477
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 (46)
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	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												
WWHRS	66.3018	57.9791	60.6528	51.8862	49.1498	43.1149	42.0422	44.5918	45.9897	52.6264	57.4947	65.4562 (62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
Output from w/h	66.3018	57.9791	60.6528	51.8862	49.1498	43.1149	42.0422	44.5918	45.9897	52.6264	57.4947	65.4562 (64)
12Total per year (kWh/year)												637.2855 (64)
Electric shower(s)	37.9257	33.7921	36.8997	35.2129	35.8737	34.2200	35.3607	35.8737	35.2129	36.8997	36.2058	37.9257 (64a)
Heat gains from water heating, kWh/month	26.0569	22.9428	24.3881	21.7748	21.2559	19.3337	19.3507	20.1164	20.3007	22.3815	23.4251	25.8455 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	60.0354	66.4678	60.0354	62.0366	60.0354	62.0366	60.0354	60.0354	62.0366	60.0354	62.0366	60.0354 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	119.0269	120.2620	117.1495	110.5234	102.1592	94.2979	89.0462	87.8110	90.9235	97.5496	105.9139	113.7751 (68)
Pumps, fans	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007 (71)
Total internal gains	35.0227	34.1410	32.7797	30.2427	28.5697	26.8524	26.0090	27.0381	28.1954	30.0827	32.5349	34.7385 (72)
	257.7852	264.5711	253.6649	246.5030	234.4646	226.8872	218.7908	218.5848	224.8557	231.3679	244.1856	252.2493 (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				
North			4.0000	10.6334	0.5700	0.7000	0.7700	11.7608 (74)				
East			6.2000	19.6403	0.5700	0.7000	0.7700	33.6702 (76)				
West			3.8000	19.6403	0.5700	0.7000	0.7700	20.6365 (80)				
Solar gains	66.0675	128.7110	213.1461	316.5062	395.3469	408.5797	387.3556	327.3135	249.3980	152.8115	82.2226	54.4636 (83)
Total gains	323.8528	393.2821	466.8110	563.0091	629.8115	635.4668	606.1464	545.8983	474.2537	384.1794	326.4082	306.7129 (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
	32.4206	32.5145	32.6072	33.0494	33.1334	33.5305	33.5305	33.6051	33.3764	33.1334	32.9638	32.7883

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alpha	3.1614	3.1676	3.1738	3.2033	3.2089	3.2354	3.2354	3.2403	3.2251	3.2089	3.1976	3.1859
util living area	0.9828	0.9680	0.9359	0.8545	0.7217	0.5537	0.4206	0.4781	0.7135	0.9105	0.9709	0.9854 (86)
MIT	18.7437	19.0621	19.5546	20.1852	20.6438	20.8915	20.9664	20.9494	20.7483	20.1043	19.3195	18.7025 (87)
Th 2	19.6128	19.6162	19.6196	19.6352	19.6382	19.6519	19.6519	19.6545	19.6466	19.6382	19.6322	19.6260 (88)
util rest of house	0.9782	0.9596	0.9191	0.8175	0.6552	0.4556	0.2994	0.3506	0.6203	0.8786	0.9619	0.9815 (89)
MIT 2	17.6217	17.9367	18.4170	19.0171	19.4115	19.6033	19.6433	19.6400	19.5140	18.9651	18.2055	17.5899 (90)
Living area fraction									fLA = Living area / (4) =			0.5923 (91)
MIT	18.2863	18.6032	19.0908	19.7090	20.1414	20.3663	20.4270	20.4155	20.2451	19.6399	18.8653	18.2489 (92)
Temperature adjustment												0.0000
adjusted MIT	18.2863	18.6032	19.0908	19.7090	20.1414	20.3663	20.4270	20.4155	20.2451	19.6399	18.8653	18.2489 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9722	0.9517	0.9112	0.8197	0.6814	0.5094	0.3705	0.4248	0.6647	0.8787	0.9552	0.9761 (94)
Useful gains	314.8485	374.2812	425.3557	461.5080	429.1786	323.7028	224.5834	231.8939	315.2201	337.5595	311.7774	299.3885 (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	873.1098	852.9674	781.4978	661.9255	515.6255	348.0528	230.9965	241.8391	372.6283	552.1818	722.3577	867.1813 (97)
Space heating kWh	415.3464	321.6772	264.9697	144.3006	64.3165	0.0000	0.0000	0.0000	0.0000	159.6790	295.6178	422.4378 (98a)
Space heating requirement - total per year (kWh/year)												2088.3449
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	415.3464	321.6772	264.9697	144.3006	64.3165	0.0000	0.0000	0.0000	0.0000	159.6790	295.6178	422.4378 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2088.3449
Space heating per m2												(98c) / (4) = 53.5473 (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	567.3809	446.6616	457.7155	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8468	0.8972	0.8649	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	480.4356	400.7654	395.8680	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	722.6696	689.6034	620.3118	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	174.4085	214.8955	166.9862	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	43.6021	53.7239	41.7465	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												139.0725 (107)
Energy for space heating												53.5473 (99)
Energy for space cooling												3.5660 (108)
Total												57.1133 (109)
Fabric Energy Efficiency (DFEE)												57.1 (109)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	39.0000 (1b)	x 2.5000 (2b)	= 97.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	39.0000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n) =	97.5000 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.2051 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4551 (18)
Number of sides sheltered	1 (19)

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Shelter factor (20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.4210 (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	0.5368	0.5262	0.5157	0.4631	0.4526	0.3999	0.3999	0.3894	0.4210	0.4526	0.4736	0.4947	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													(23c)
Effective ac	0.6441	0.6385	0.6330	0.6072	0.6024	0.5800	0.5800	0.5758	0.5886	0.6024	0.6122	0.6223	(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			2.2000	1.0000	2.2000			(26)
TER Opening Type (Uw = 1.20)			7.5500	1.1450	8.6450			(27)
Heatloss Floor 1			39.0000	0.1300	5.0700			(28a)
EW	67.2500	9.7500	57.5000	0.1800	10.3500			(29a)
External Roof 1	39.0000		39.0000	0.1100	4.2900			(30)
Total net area of external elements Aum(A, m2)			145.2500					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	30.5550		(33)

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

186.8205 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E5 Ground floor (normal)	26.9000	0.1600	4.3040	
E16 Corner (normal)	12.5000	0.0900	1.1250	
E2 Other lintels (including other steel lintels)	9.5000	0.0500	0.4750	
E3 Sill	4.9000	0.0500	0.2450	
E4 Jamb	20.6000	0.0500	1.0300	
E10 Eaves (insulation at ceiling level)	26.9000	0.0600	1.6140	
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.5680	(36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	39.1230 (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	20.7226	20.5426	20.3662	19.5375	19.3825	18.6608	18.6608	18.5271	18.9388	19.3825	19.6961	20.0240	(38)
Heat transfer coeff	59.8456	59.6657	59.4892	58.6606	58.5055	57.7838	57.7838	57.6502	58.0618	58.5055	58.8192	59.1471	(39)
Average = Sum(39)m / 12 =													58.6598

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.5345	1.5299	1.5254	1.5041	1.5001	1.4816	1.4816	1.4782	1.4888	1.5001	1.5082	1.5166	(40)
HLP (average)													1.5041
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.3800 (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	20.4886	20.1843	19.7558	18.9658	18.3742	17.7182	17.3639	17.7894	18.2526	18.9546	19.7609	20.4194	(42b)
Hot water usage for other uses	28.7628	27.7168	26.6709	25.6250	24.5791	23.5332	23.5332	24.5791	25.6250	26.6709	27.7168	28.7628	(42c)
Average daily hot water use (litres/day)													45.1442 (43)
Daily hot water use	49.2514	47.9012	46.4268	44.5908	42.9533	41.2514	40.8970	42.3684	43.8777	45.6255	47.4778	49.1821	(44)
Energy conte	78.0022	68.2106	71.3562	61.0425	57.8234	50.7234	49.4614	52.4610	54.1055	61.9134	67.6408	77.0073	(45)
Energy content (annual)													749.7477
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													
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	66.3018	57.9791	60.6528	51.8862	49.1498	43.1149	42.0422	44.5918	45.9897	52.6264	57.4947	65.4562	(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	66.3018	57.9791	60.6528	51.8862	49.1498	43.1149	42.0422	44.5918	45.9897	52.6264	57.4947	65.4562	(64)
Total per year (kWh/year)													637.2855 (64)
Electric shower(s)	37.9257	33.7921	36.8997	35.2129	35.8737	34.2200	35.3607	35.8737	35.2129	36.8997	36.2058	37.9257	(64a)
Heat gains from water heating, kWh/month	26.0569	22.9428	24.3881	21.7748	21.2559	19.3337	19.3507	20.1164	20.3007	22.3815	23.4251	25.8455	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	60.6839	67.1858	60.6839	62.7067	60.6839	62.7067	60.6839	60.6839	62.7067	60.6839	62.7067	60.6839	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	119.0269	120.2620	117.1495	110.5234	102.1592	94.2979	89.0462	87.8110	90.9235	97.5496	105.9139	113.7751	(68)

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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007 (71)
Water heating gains (Table 5)	35.0227	34.1410	32.7797	30.2427	28.5697	26.8524	26.0090	27.0381	28.1954	30.0827	32.5349 (72)
Total internal gains	258.4337	265.2891	254.3134	247.1731	235.1131	227.5573	219.4394	219.2334	225.5258	232.0165	244.8557 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
North	2.1600	10.6334	0.6300	0.7000	0.7700	7.0194 (74)
East	3.3400	19.6403	0.6300	0.7000	0.7700	20.0477 (76)
West	2.0500	19.6403	0.6300	0.7000	0.7700	12.3048 (80)

Solar gains	39.3719	76.7027	127.0212	188.6222	235.6141	243.5037	230.8533	195.0651	148.6263	91.0650	48.9991	32.4568 (83)
Total gains	297.8056	341.9918	381.3346	435.7953	470.7271	471.0610	450.2926	414.2985	374.1522	323.0815	293.8548	285.3546 (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	33.8185	33.9205	34.0211	34.5017	34.5931	35.0252	35.0252	35.1064	34.8575	34.5931	34.4087	34.2179
alpha	3.2546	3.2614	3.2681	3.3001	3.3062	3.3350	3.3350	3.3404	3.3238	3.3062	3.2939	3.2812
util living area	0.9863	0.9775	0.9600	0.9120	0.8200	0.6692	0.5247	0.5794	0.7943	0.9381	0.9777	0.9881 (86)
MIT	18.7711	19.0199	19.4288	20.0072	20.4970	20.8257	20.9426	20.9197	20.6701	20.0285	19.3159	18.7436 (87)
Th 2	19.6617	19.6652	19.6685	19.6844	19.6874	19.7013	19.7013	19.7039	19.6959	19.6874	19.6814	19.6751 (88)
util rest of house	0.9826	0.9715	0.9488	0.8861	0.7650	0.5693	0.3867	0.4406	0.7118	0.9144	0.9707	0.9849 (89)
MIT 2	17.6823	17.9304	18.3345	18.9010	19.3463	19.6164	19.6851	19.6785	19.5092	18.9358	18.2370	17.6642 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.3272	18.5757	18.9827	19.5562	20.0279	20.3327	20.4299	20.4137	20.1968	19.5830	18.8760	18.3035 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.3272	18.5757	18.9827	19.5562	20.0279	20.3327	20.4299	20.4137	20.1968	19.5830	18.8760	18.3035 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9776	0.9651	0.9415	0.8831	0.7808	0.6208	0.4670	0.5202	0.7470	0.9121	0.9649	0.9803 (94)
Useful gains	291.1346	330.0457	359.0255	384.8687	367.5548	292.4344	210.2694	215.5264	279.4900	294.6722	283.5546	279.7396 (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	839.4660	815.9719	742.5849	625.0996	487.2273	331.2545	221.3079	231.3880	353.9910	525.5573	692.6549	834.1837 (97)
Space heating kWh	407.9585	326.5424	285.3682	172.9662	89.0363	0.0000	0.0000	0.0000	0.0000	171.7785	294.5522	412.5064 (98a)
Space heating requirement - total per year (kWh/year)	2160.7088											
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	407.9585	326.5424	285.3682	172.9662	89.0363	0.0000	0.0000	0.0000	0.0000	171.7785	294.5522	412.5064 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2160.7088											
Space heating per m ²	(98c) / (4) = 55.4028 (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	543.1679	427.6002	438.1412	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7596	0.8299	0.7926	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	412.6061	354.8501	347.2663	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	529.7804	506.7399	465.8155	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	84.3655	113.0060	88.2006	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	21.0914	28.2515	22.0502	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	71.3930 (107)											
Energy for space heating	55.4028 (99)											
Energy for space cooling	1.8306 (108)											
Total	57.2334 (109)											
Fabric Energy Efficiency (TFEE)	57.2 (109)											

Full SAP Calculation Printout



Property Reference	Swanbourne Road				Issued on Date	10/01/2025
Assessment Reference	Swanbourne Road		Prop Type Ref			
Property						
SAP Rating	78 C	DER	7.30	TER	16.80	
Environmental	96 A	% DER < TER				56.55
CO ₂ Emissions (t/year)	0.26	DFEE	57.11	TFEE	57.23	
Compliance Check	See BREL	% DFEE < TFEE				0.21
% DPER < TPER	14.80	DPER	76.51	TPER	89.80	
Assessor Details	Mr. Samuel Westover				Assessor ID	AX13-0001
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	39.0000 (1b)	2.5000 (2b)	97.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.0000		
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 97.5000 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	20.0000 / (5) = 0.2051 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0100 (17)
Infiltration rate	0.4556 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.4215 (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	0.5374	0.5268	0.5163	0.4636	0.4531	0.4004	0.4004	0.3898	0.4215	0.4531	0.4741	0.4952 (22b)
Effective ac	0.6444	0.6388	0.6333	0.6075	0.6026	0.5802	0.5802	0.5760	0.5888	0.6026	0.6124	0.6226 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.20)			14.0000	1.1450	16.0305		(27)
Front Door			2.2000	1.0000	2.2000		(26)
Heatloss Floor 1			39.0000	0.1000	3.9000	75.0000	2925.0000 (28a)
EW	67.2500	16.2000	51.0500	0.1700	8.6785	70.0000	3573.5000 (29a)
External Roof 1	39.0000		39.0000	0.0900	3.5100	9.0000	351.0000 (30)
Total net area of external elements Aum(A, m ²)			145.2500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.3190		(33)
Internal Wall 1			48.5000			9.0000	436.5000 (32c)

Heat capacity Cm = Sum (A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
(28)...(30) + (32) + (32a)...(32e) = 7286.0000 (34)
186.8205 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	26.9000	0.0610	1.6409
E16 Corner (normal)	12.5000	0.0420	0.5250
E2 Other lintels (including other steel lintels)	9.5000	0.3610	3.4295
E3 Sill	4.9000	0.0220	0.1078
E4 Jamb	20.6000	0.0170	0.3502
E10 Eaves (insulation at ceiling level)	26.9000	0.0570	1.5333
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0850	-0.2125

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Thermal bridges (Sum(L x Psi) calculated using Appendix K)
 Point Thermal bridges
 Total fabric heat loss (33) + (36) + (36a) = 41.6932 (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	20.7328	20.5524	20.3756	19.5451	19.3898	18.6664	18.6664	18.5325	18.9450	19.3898	19.7041	20.0327	(38)
Heat transfer coeff	62.4260	62.2456	62.0688	61.2384	61.0830	60.3597	60.3597	60.2257	60.6383	61.0830	61.3973	61.7259	(39)
Average = Sum(39)m / 12 =												61.2376	
HLP	1.6007	1.5960	1.5915	1.5702	1.5662	1.5477	1.5477	1.5442	1.5548	1.5662	1.5743	1.5827	(40)
HLP (average)												1.5702	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.3800 (42)
Hot water usage for mixer showers	71.0366	69.9691	68.4135	65.4371	63.2406	60.7911	59.3988	60.9426	62.6349	65.2650	68.3053	70.7645	(42a)
Hot water usage for baths	20.4886	20.1843	19.7558	18.9658	18.3742	17.7182	17.3639	17.7894	18.2526	18.9546	19.7609	20.4194	(42b)
Hot water usage for other uses	28.7628	27.7168	26.6709	25.6250	24.5791	23.5332	23.5332	24.5791	25.6250	26.6709	27.7168	28.7628	(42c)
Average daily hot water use (litres/day)												110.6376	(43)
Daily hot water use	120.2880	117.8703	114.8403	110.0279	106.1938	102.0424	100.2958	103.3110	106.5126	110.8905	115.7831	119.9466	(44)
Energy conte	190.5068	167.8457	176.5052	150.6227	142.9573	125.4731	121.2991	127.9207	131.3407	150.4773	164.9542	187.8074	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m	28.5760	25.1769	26.4758	22.5934	21.4436	18.8210	18.1949	19.1881	19.7011	22.5716	24.7431	28.1711	(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	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													
WWHRS	190.5068	167.8457	176.5052	150.6227	142.9573	125.4731	121.2991	127.9207	131.3407	150.4773	164.9542	187.8074	(62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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	190.5068	167.8457	176.5052	150.6227	142.9573	125.4731	121.2991	127.9207	131.3407	150.4773	164.9542	187.8074	(64)
Total per year (kWh/year)													
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	63.3435	55.8087	58.6880	50.0820	47.5333	41.7198	40.3319	42.5336	43.6708	50.0337	54.8473	62.4460	(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	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	60.0354	66.4678	60.0354	62.0366	60.0354	62.0366	60.0354	60.0354	62.0366	60.0354	62.0366	60.0354	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	119.0269	120.2620	117.1495	110.5234	102.1592	94.2979	89.0462	87.8110	90.9235	97.5496	105.9139	113.7751	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	(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)	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	(71)
Water heating gains (Table 5)	85.1391	83.0487	78.8817	69.5584	63.8889	57.9442	54.2096	57.1688	60.6539	67.2496	76.1768	83.9327	(72)
Total internal gains	310.9017	316.4787	302.7669	288.8186	272.7837	257.9789	246.9914	248.7155	257.3142	271.5349	290.8275	304.4435	(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
North			4.0000		10.6334		0.5700		0.7000		0.7700		11.7608 (74)
East			6.2000		19.6403		0.5700		0.7000		0.7700		33.6702 (76)
West			3.8000		19.6403		0.5700		0.7000		0.7700		20.6365 (80)
Solar gains	66.0675	128.7110	213.1461	316.5062	395.3469	408.5797	387.3556	327.3135	249.3980	152.8115	82.2226		54.4636 (83)
Total gains	376.9692	445.1897	515.9129	605.3248	668.1306	666.5586	634.3470	576.0290	506.7122	424.3464	373.0501		358.9071 (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	32.4206	32.5145	32.6072	33.0494	33.1334	33.5305	33.5305	33.6051	33.3764	33.1334	32.9638	32.7883	
alpha	3.1614	3.1676	3.1738	3.2033	3.2089	3.2354	3.2354	3.2403	3.2251	3.2089	3.1976	3.1859	
util living area													

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	0.9740	0.9560	0.9191	0.8327	0.6973	0.5332	0.4037	0.4566	0.6858	0.8887	0.9588	0.9775 (86)
MIT	19.3248	19.5545	19.9063	20.3469	20.6638	20.8320	20.8826	20.8719	20.7374	20.2967	19.7392	19.2943 (87)
Th 2	19.6128	19.6162	19.6196	19.6352	19.6382	19.6519	19.6519	19.6545	19.6466	19.6382	19.6322	19.6260 (88)
util rest of house												
	0.9674	0.9450	0.8989	0.7925	0.6297	0.4370	0.2866	0.3334	0.5914	0.8515	0.9466	0.9717 (89)
MIT 2	17.7154	18.0053	18.4422	18.9760	19.3214	19.4885	19.5227	19.5206	19.4134	18.9392	18.2538	17.6863 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	18.6687	18.9229	19.3094	19.7880	20.1165	20.2843	20.3281	20.3210	20.1976	19.7432	19.1336	18.6387 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6687	18.9229	19.3094	19.7880	20.1165	20.2843	20.3281	20.3210	20.1976	19.7432	19.1336	18.6387 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9615	0.9382	0.8935	0.7975	0.6550	0.4837	0.3466	0.3962	0.6327	0.8548	0.9410	0.9663	(94)
Useful gains	362.4717	417.6748	460.9689	482.7670	437.5929	322.4395	219.8869	228.2154	320.5946	362.7464	351.0279	346.8163	(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	896.9796	872.8647	795.0648	666.7646	514.1046	343.1009	225.0297	236.1441	369.7496	558.4969	738.8316	891.2435	(97)
Space heating kWh	397.6739	305.8876	248.5673	132.4782	56.9248	0.0000	0.0000	0.0000	0.0000	145.6384	279.2186	405.0538	(98a)
Space heating requirement - total per year (kWh/year)												1971.4427	
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	397.6739	305.8876	248.5673	132.4782	56.9248	0.0000	0.0000	0.0000	0.0000	145.6384	279.2186	405.0538	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1971.4427	
Space heating per m2										(98c) / (4) =		50.5498	(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 %)													249.9000 (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	397.6739	305.8876	248.5673	132.4782	56.9248	0.0000	0.0000	0.0000	0.0000	145.6384	279.2186	405.0538	(98)
Space heating efficiency (main heating system 1)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000	(210)
Space heating fuel (main heating system)	159.1332	122.4040	99.4667	53.0125	22.7790	0.0000	0.0000	0.0000	0.0000	58.2787	111.7321	162.0864	(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	190.5068	167.8457	176.5052	150.6227	142.9573	125.4731	121.2991	127.9207	131.3407	150.4773	164.9542	187.8074	(64)
Efficiency of water heater	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(216)
Fuel for water heating, kWh/month	108.7989	95.8571	100.8025	86.0209	81.6433	71.6579	69.2742	73.0558	75.0090	85.9379	94.2057	107.2572	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	11.5076	9.2318	8.3122	6.0899	4.7040	3.8432	4.2912	5.5778	7.2450	9.5059	10.7368	11.8274	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1													788.8926 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													175.1000
Water heating fuel used													1049.5204 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year													0.0000 (231)
Electricity for lighting (calculated in Appendix L)													92.8729 (232)
Energy saving/generation technologies (Appendices M, N and Q)													
PV generation													0.0000 (233)
Wind generation													0.0000 (234)
Hydro-electric generation (Appendix N)													0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (235)
Appendix Q - special features													
Energy saved or generated													-0.0000 (236)
Energy used													0.0000 (237)
Total delivered energy for all uses													1931.2859 (238)

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

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	788.8926	0.1553	122.5469 (261)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating (other fuel)	1049.5204	0.1416	148.5893 (264)
Space and water heating			271.1362 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	92.8729	0.1443	13.4044 (268)
Total CO ₂ , kg/year			284.5406 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			7.3000 (273)

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

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	788.8926	1.5751	1242.5827 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	1049.5204	1.5235	1598.9852 (278)
Space and water heating			2841.5679 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	92.8729	1.5338	142.4515 (282)
Total Primary energy kWh/year			2984.0194 (286)
Dwelling Primary energy Rate (DPER)			76.5100 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	39.0000 (1b)	x 2.5000 (2b)	= 97.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 97.5000 (5)

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.2051 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4551	(18)
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.4210 (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	0.5368	0.5262	0.5157	0.4631	0.4526	0.3999	0.3999	0.3894	0.4210	0.4526	0.4736	0.4947 (22b)
Effective ac	0.6441	0.6385	0.6330	0.6072	0.6024	0.5800	0.5800	0.5758	0.5886	0.6024	0.6122	0.6223 (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
TER Opaque door			2.2000	1.0000	2.2000		(26)
TER Opening Type (Uw = 1.20)			7.5500	1.1450	8.6450		(27)
Heatloss Floor 1			39.0000	0.1300	5.0700		(28a)
EW	67.2500	9.7500	57.5000	0.1800	10.3500		(29a)
External Roof 1	39.0000		39.0000	0.1100	4.2900		(30)
Total net area of external elements Aum(A, m ²)			145.2500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.5550		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K			186.8205 (35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	26.9000	0.1600	4.3040
E16 Corner (normal)	12.5000	0.0900	1.1250
E2 Other lintels (including other steel lintels)	9.5000	0.0500	0.4750
E3 Sill	4.9000	0.0500	0.2450

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E4 Jamb	20.6000	0.0500	1.0300
E10 Eaves (insulation at ceiling level)	26.9000	0.0600	1.6140
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.5680 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	39.1230 (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	20.7226	20.5426	20.3662	19.5375	19.3825	18.6608	18.6608	18.5271	18.9388	19.3825	19.6961	20.0240	(38)
Heat transfer coeff	59.8456	59.6657	59.4892	58.6606	58.5055	57.7838	57.7838	57.6502	58.0618	58.5055	58.8192	59.1471	(39)
Average = Sum(39)m / 12 =												58.6598	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.5345	1.5299	1.5254	1.5041	1.5001	1.4816	1.4816	1.4782	1.4888	1.5001	1.5082	1.5166	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.3800 (42)
Hot water usage for mixer showers	47.3578	46.6461	45.6090	43.6247	42.1604	40.5274	39.5992	40.6284	41.7566	43.5100	45.5369	47.1763 (42a)	
Hot water usage for baths	20.4886	20.1843	19.7558	18.9658	18.3742	17.7182	17.3639	17.7894	18.2526	18.9546	19.7609	20.4194 (42b)	
Hot water usage for other uses	28.7628	27.7168	26.6709	25.6250	24.5791	23.5332	23.5332	24.5791	25.6250	26.6709	27.7168	28.7628 (42c)	
Average daily hot water use (litres/day)												88.8064 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	96.6092	94.5473	92.0358	88.2155	85.1137	81.7787	80.4962	82.9968	85.6343	89.1355	93.0146	96.3584 (44)	
Distribution loss (46)m = 0.15 x (45)m	153.0053	134.6340	141.4555	120.7626	114.5793	100.5565	97.3532	102.7674	105.5956	120.9560	132.5164	150.8740 (45)	
Total = Sum (45)m =	22.9508	20.1951	21.2183	18.1144	17.1869	15.0835	14.6030	15.4151	15.8393	18.1434	19.8775	22.6311 (46)	
Water storage loss:													
Store volume												150.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												0.7527 (55)	
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)	
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month	199.6002	176.7197	188.0504	165.8545	161.1742	145.6483	143.9481	149.3623	150.6875	167.5509	177.6082	197.4689 (62)	
WWHRS	-21.6500	-19.1474	-20.0501	-16.6023	-15.4727	-13.2401	-12.4105	-13.1973	-13.6987	-16.1493	-18.2952	-21.2491 (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	177.9502	157.5723	168.0004	149.2522	145.7015	132.4082	131.5376	136.1650	136.9887	151.4016	159.3131	176.2199 (64)	
12Total per year (kWh/year)												1822.5107 (64)	
Electric shower(s)												1823 (64a)	
	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	88.1502	78.4344	84.3099	76.2270	75.3736	69.5085	69.6459	71.4461	71.1840	77.4938	80.1352	87.4415 (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	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	69.0009	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	60.6839	67.1858	60.6839	62.7067	60.6839	62.7067	60.6839	60.6839	62.7067	60.6839	62.7067	60.6839	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	119.0269	120.2620	117.1495	110.5234	102.1592	94.2979	89.0462	87.8110	90.9235	97.5496	105.9139	113.7751	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	29.9001	(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)													
	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	(71)
Water heating gains (Table 5)													
	118.4814	116.7178	113.3197	105.8709	101.3085	96.5396	93.6100	96.0297	98.8667	104.1583	111.2989	117.5289	(72)
Total internal gains													
	344.8925	350.8659	337.8534	325.8013	310.8519	297.2445	287.0404	288.2249	296.1972	309.0921	326.6197	338.6882	(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	
North					2.1600	10.6334	0.6300	0.7000	0.7700		7.0194 (74)	
East					3.3400	19.6403	0.6300	0.7000	0.7700		20.0477 (76)	
West					2.0500	19.6403	0.6300	0.7000	0.7700		12.3048 (80)	
Solar gains	39.3719	76.7027	127.0212	188.6222	235.6141	243.5037	230.8533	195.0651	148.6263	91.0650	48.9991	32.4568 (83)
Total gains	384.2643	427.5686	464.8746	514.4235	546.4660	540.7482	517.8936	483.2900	444.8235	400.1571	375.6188	371.1450 (84)

7. Mean internal temperature (heating season)

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Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	33.8185	33.9205	34.0211	34.5017	34.5931	35.0252	35.0252	35.1064	34.8575	34.5931	34.4087	34.2179
alpha	3.2546	3.2614	3.2681	3.3001	3.3062	3.3350	3.3350	3.3404	3.3238	3.3062	3.2939	3.2812
util living area	0.9721	0.9591	0.9341	0.8731	0.7661	0.6085	0.4665	0.5127	0.7270	0.8975	0.9568	0.9749 (86)
MIT	19.0232	19.2595	19.6445	20.1714	20.6009	20.8698	20.9596	20.9444	20.7537	20.2068	19.5448	18.9968 (87)
Th 2	19.6617	19.6652	19.6685	19.6844	19.6874	19.7013	19.7013	19.7039	19.6959	19.6874	19.6814	19.6751 (88)
util rest of house	0.9651	0.9489	0.9172	0.8397	0.7045	0.5098	0.3394	0.3833	0.6371	0.8630	0.9442	0.9686 (89)
MIT 2	17.4388	17.7372	18.2189	18.8660	19.3514	19.6230	19.6872	19.6824	19.5261	18.9268	18.1109	17.4139 (90)
Living area fraction	fLA = Living area / (4) =											0.5923 (91)
MIT	18.3772	18.6389	19.0633	19.6392	20.0915	20.3615	20.4409	20.4299	20.2532	19.6850	18.9602	18.3515 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3772	18.6389	19.0633	19.6392	20.0915	20.3615	20.4409	20.4299	20.2532	19.6850	18.9602	18.3515 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9562	0.9389	0.9078	0.8384	0.7251	0.5622	0.4137	0.4582	0.6786	0.8630	0.9354	0.9602 (94)
Useful gains	367.4276	401.4521	421.9900	431.2989	396.2401	304.0080	214.2293	221.4258	301.8485	345.3209	351.3574	356.3624 (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	842.4621	819.7388	747.3813	629.9693	490.9491	332.9201	221.9399	232.3231	357.2666	531.5213	697.6058	837.0196 (97)
Space heating kWh	353.4257	281.0887	242.0912	143.0426	70.4635	0.0000	0.0000	0.0000	0.0000	138.5331	249.2988	357.6090 (98a)
Space heating requirement - total per year (kWh/year)												1835.5527
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	353.4257	281.0887	242.0912	143.0426	70.4635	0.0000	0.0000	0.0000	0.0000	138.5331	249.2988	357.6090 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1835.5527
Space heating per m2												(98c) / (4) = 47.0655 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	353.4257	281.0887	242.0912	143.0426	70.4635	0.0000	0.0000	0.0000	0.0000	138.5331	249.2988	357.6090 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	382.9097	304.5381	262.2873	154.9758	76.3418	0.0000	0.0000	0.0000	0.0000	150.0901	270.0963	387.4420 (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	177.9502	157.5723	168.0004	149.2522	145.7015	132.4082	131.5376	136.1650	136.9887	151.4016	159.3131	176.2199 (64)
Efficiency of water heater (217)m	85.5682	85.3425	84.8784	83.9646	82.5265	79.8000	79.8000	79.8000	79.8000	83.8611	85.0597	79.8000 (216)
Fuel for water heating, kWh/month	207.9631	184.6351	197.9307	177.7562	176.5513	165.9251	164.8341	170.6329	171.6651	180.5386	187.2955	85.6126 (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	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	12.6089	10.1153	9.1077	6.6727	5.1542	4.2110	4.7018	6.1116	7.9384	10.4156	11.7644	12.9594 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-31.5454	-42.1733	-57.5889	-61.5147	-63.8719	-58.9124	-58.3039	-56.2763	-52.2840	-46.7752	-33.9115	-27.5650 (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	-25.5583	-52.6374	-102.5604	-151.1145	-197.0125	-196.8236	-194.3727	-165.7031	-123.0828	-74.0732	-33.7284	-20.2833 (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												1988.6811 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.8000
Water heating fuel used												2191.5614 (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)												101.7612 (232)

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

PV generation	-1927.6727 (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	

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Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	2440.3310 (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	1988.6811	0.2100	417.6230 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2191.5614	0.2100	460.2279 (264)
Space and water heating			877.8509 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	101.7612	0.1443	14.6873 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-590.7225	0.1356	-80.1264
PV Unit electricity exported	-1336.9502	0.1265	-169.1068
Total			-249.2332 (269)
Total CO2, kg/year			655.2343 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.8000 (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	1988.6811	1.1300	2247.2097 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2191.5614	1.1300	2476.4644 (278)
Space and water heating			4723.6741 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	101.7612	1.5338	156.0847 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-590.7225	1.5014	-886.8896
PV Unit electricity exported	-1336.9502	0.4643	-620.7757
Total			-1507.6654 (283)
Total Primary energy kWh/year			3502.1942 (286)
Target Primary Energy Rate (TPER)			89.8000 (287)

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Property Reference	Swanbourne Road				Issued on Date	10/01/2025	
Assessment Reference	Swanbourne Road			Prop Type Ref			
Property							
SAP Rating	78 C		DER	7.30		TER	16.80
Environmental	96 A		% DER < TER				56.55
CO ₂ Emissions (t/year)	0.26		DFEE	57.11		TFEE	57.23
Compliance Check	See BREL		% DFEE < TFEE				0.21
% DPER < TPER	14.80		DPER	76.51		TPER	89.80
Assessor Details	Mr. Samuel Westover					Assessor ID	AX13-0001
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	39.0000 (1b)	2.5000 (2b)	97.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.0000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	97.5000 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	20.0000 / (5) = 0.2051 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0100 (17)
Infiltration rate	0.4556 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.4215 (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	0.5374	0.5268	0.5163	0.4636	0.4531	0.4004	0.4004	0.3898	0.4215	0.4531	0.4741	0.4952 (22b)
Effective ac	0.6444	0.6388	0.6333	0.6075	0.6026	0.5802	0.5802	0.5760	0.5888	0.6026	0.6124	0.6226 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.20)			14.0000	1.1450	16.0305		(27)
Front Door			2.2000	1.0000	2.2000		(26)
Heatloss Floor 1			39.0000	0.1000	3.9000	75.0000	2925.0000 (28a)
EW	67.2500	16.2000	51.0500	0.1700	8.6785	70.0000	3573.5000 (29a)
External Roof 1	39.0000		39.0000	0.0900	3.5100	9.0000	351.0000 (30)
Total net area of external elements Aum(A, m ²)			145.2500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.3190		(33)
Internal Wall 1			48.5000			9.0000	436.5000 (32c)

Heat capacity Cm = Sum (A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
(28)...(30) + (32) + (32a)...(32e) = 7286.0000 (34)
186.8205 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	26.9000	0.0610	1.6409
E16 Corner (normal)	12.5000	0.0420	0.5250
E2 Other lintels (including other steel lintels)	9.5000	0.3610	3.4295
E3 Sill	4.9000	0.0220	0.1078
E4 Jamb	20.6000	0.0170	0.3502
E10 Eaves (insulation at ceiling level)	26.9000	0.0570	1.5333
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0850	-0.2125

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Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Point Thermal bridges
Total fabric heat loss

(33) + (36) + (36a) = 41.6932 (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	20.7328	20.5524	20.3756	19.5451	19.3898	18.6664	18.6664	18.5325	18.9450	19.3898	19.7041	20.0327	(38)
Heat transfer coeff	62.4260	62.2456	62.0688	61.2384	61.0830	60.3597	60.3597	60.2257	60.6383	61.0830	61.3973	61.7259	(39)
Average = Sum(39)m / 12 =												61.2376	
HLP	1.6007	1.5960	1.5915	1.5702	1.5662	1.5477	1.5477	1.5442	1.5548	1.5662	1.5743	1.5827	(40)
HLP (average)												1.5702	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.3800 (42)
Hot water usage for mixer showers													
71.0366	69.9691	68.4135	65.4371	63.2406	60.7911	59.3988	60.9426	62.6349	65.2650	68.3053	70.7645	(42a)	
Hot water usage for baths													
20.4886	20.1843	19.7558	18.9658	18.3742	17.7182	17.3639	17.7894	18.2526	18.9546	19.7609	20.4194	(42b)	
Hot water usage for other uses													
28.7628	27.7168	26.6709	25.6250	24.5791	23.5332	23.5332	24.5791	25.6250	26.6709	27.7168	28.7628	(42c)	
Average daily hot water use (litres/day)												110.6376 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
120.2880	117.8703	114.8403	110.0279	106.1938	102.0424	100.2958	103.3110	106.5126	110.8905	115.7831	119.9466	(44)	
Energy content (annual)	190.5068	167.8457	176.5052	150.6227	142.9573	125.4731	121.2991	127.9207	131.3407	150.4773	164.9542	187.8074 (45)	
Distribution loss (46)m = 0.15 x (45)m										Total = Sum (45)m =	1837.7101		
28.5760	25.1769	26.4758	22.5934	21.4436	18.8210	18.1949	19.1881	19.7011	22.5716	24.7431	28.1711	(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	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													
190.5068	167.8457	176.5052	150.6227	142.9573	125.4731	121.2991	127.9207	131.3407	150.4773	164.9542	187.8074	(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	190.5068	167.8457	176.5052	150.6227	142.9573	125.4731	121.2991	127.9207	131.3407	150.4773	164.9542	187.8074 (64)	
Electric shower(s)										Total per year (kWh/year) = Sum (64)m =	1837.7101	(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	0.0000 (64a)	
Heat gains from water heating, kWh/month	63.3435	55.8087	58.6880	50.0820	47.5333	41.7198	40.3319	42.5336	43.6708	50.0337	54.8473	62.4460 (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	82.8011	82.8011	82.8011	82.8011	82.8011	82.8011	82.8011	82.8011	82.8011	82.8011	82.8011	82.8011	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.1471	11.6772	9.4965	7.1895	5.3742	4.5371	4.9025	6.3725	8.5531	10.8602	12.6754	13.5125	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.6521	179.4955	174.8500	164.9603	152.4764	140.7432	132.9047	131.0612	135.7067	145.5964	158.0804	169.8136	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	44.6601	44.6601	44.6601	44.6601	44.6601	44.6601	44.6601	44.6601	44.6601	44.6601	44.6601	44.6601	(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)	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	(71)
Water heating gains (Table 5)	85.1391	83.0487	78.8817	69.5584	63.8889	57.9442	54.2096	57.1688	60.6539	67.2496	76.1768	83.9327	(72)
Total internal gains	351.1988	349.4818	338.4887	316.9687	296.9999	275.4850	264.2773	266.8631	277.1742	298.9667	322.1931	342.5193	(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			
North				4.0000	10.6334	0.5700	0.7000	0.7700	11.7608 (74)			
East				6.2000	19.6403	0.5700	0.7000	0.7700	33.6702 (76)			
West				3.8000	19.6403	0.5700	0.7000	0.7700	20.6365 (80)			
Solar gains	66.0675	128.7110	213.1461	316.5062	395.3469	408.5797	387.3556	327.3135	249.3980	152.8115	82.2226	54.4636 (83)
Total gains	417.2663	478.1928	551.6348	633.4748	692.3469	684.0646	651.6329	594.1765	526.5722	451.7782	404.4157	396.9829 (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	32.4206	32.5145	32.6072	33.0494	33.1334	33.5305	33.5305	33.6051	33.3764	33.1334	32.9638	32.7883		
alpha	3.1614	3.1676	3.1738	3.2033	3.2089	3.2354	3.2354	3.2403	3.2251	3.2089	3.1976	3.1859		
util living area	0.9661	0.9474	0.9059	0.8180	0.6824	0.5222	0.3940	0.4444	0.6695	0.8730	0.9495	0.9705	(86)	

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MIT	19.4088	19.6187	19.9662	20.3802	20.6791	20.8363	20.8841	20.8744	20.7493	20.3374	19.8010	19.3751 (87)
Th 2	19.6128	19.6162	19.6196	19.6352	19.6382	19.6519	19.6519	19.6545	19.6466	19.6382	19.6322	19.6260 (88)
util rest of house	0.9577	0.9347	0.8833	0.7760	0.6142	0.4271	0.2793	0.3237	0.5747	0.8325	0.9350	0.9631 (89)
MIT 2	17.8201	18.0840	18.5129	19.0118	19.3351	19.4912	19.5232	19.5216	19.4223	18.9838	18.3292	17.7874 (90)
Living area fraction									fLA = Living area / (4) =			0.5923 (91)
MIT	18.7611	18.9931	19.3737	19.8223	20.1312	20.2879	20.3293	20.3229	20.2083	19.7856	19.2010	18.7278 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7611	18.9931	19.3737	19.8223	20.1312	20.2879	20.3293	20.3229	20.2083	19.7856	19.2010	18.7278 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9511	0.9277	0.8786	0.7824	0.6403	0.4735	0.3381	0.3853	0.6167	0.8375	0.9293	0.9570 (94)
Useful gains	396.8801	443.6072	484.6809	495.6154	443.3356	323.8908	220.3155	228.9432	324.7479	378.3808	375.8354	379.9232 (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	902.7502	877.2311	799.0552	668.8641	515.0011	343.3198	225.0976	236.2578	370.3942	561.0808	742.9662	896.7421 (97)
Space heating kWh	376.3673	291.3953	233.8945	124.7391	53.3192	0.0000	0.0000	0.0000	0.0000	135.9289	264.3341	384.5132 (98a)
Space heating requirement - total per year (kWh/year)												1864.4915
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	376.3673	291.3953	233.8945	124.7391	53.3192	0.0000	0.0000	0.0000	0.0000	135.9289	264.3341	384.5132 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1864.4915
Space heating per m2										(98c) / (4) =		47.8075 (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 %)												249.9000 (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
	376.3673	291.3953	233.8945	124.7391	53.3192	0.0000	0.0000	0.0000	0.0000	135.9289	264.3341	384.5132 (98)
Space heating efficiency (main heating system 1)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000 (210)
Space heating fuel (main heating system)	150.6072	116.6047	93.5952	49.9156	21.3362	0.0000	0.0000	0.0000	0.0000	54.3933	105.7760	153.8668 (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	190.5068	167.8457	176.5052	150.6227	142.9573	125.4731	121.2991	127.9207	131.3407	150.4773	164.9542	187.8074 (64)
Efficiency of water heater	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000 (216)
Fuel for water heating, kWh/month	108.7989	95.8571	100.8025	86.0209	81.6433	71.6579	69.2742	73.0558	75.0090	85.9379	94.2057	107.2572 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	11.5076	9.2318	8.3122	6.0899	4.7040	3.8432	4.2912	5.5778	7.2450	9.5059	10.7368	11.8274 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												746.0951 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												175.1000
Water heating fuel used												1049.5204 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												92.8729 (232)
Energy saving/generation technologies (Appendices M, N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												1888.4883 (238)

10a. Fuel costs - using Table 12 prices

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	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	746.0951	16.4900	123.0311 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1049.5204	16.4900	173.0659 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	92.8729	16.4900	15.3147 (250)
Additional standing charges			0.0000 (251)
Total energy cost			311.4117 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.3346 (257)
SAP value		78.3658
SAP rating (Section 12)		78 (258)
SAP band		C

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	746.0951	0.1554	115.9301 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1049.5204	0.1416	148.5893 (264)
Space and water heating			264.5194 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	92.8729	0.1443	13.4044 (268)
Total CO2, kg/year			277.9238 (272)
CO2 emissions per m2			7.1300 (273)
EI value			95.5665
EI rating			96 (274)
EI band			A

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	39.0000 (1b)	2.5000 (2b)	97.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	39.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n)	97.5000 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.2051 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0100	(17)
Infiltration rate	0.4556	(18)
Number of sides sheltered	1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4215 (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	0.5374	0.4952	0.4847	0.4531	0.4531	0.4215	0.4215	0.4109	0.4215	0.4741	0.4636	0.4952 (22b)
Effective ac	0.6444	0.6226	0.6175	0.6026	0.6026	0.5888	0.5888	0.5844	0.5888	0.6124	0.6075	0.6226 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Windows (Uw = 1.20)			14.0000	1.1450	16.0305		(27)

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Front Door			2.2000	1.0000	2.2000			(26)
Heatloss Floor 1			39.0000	0.1000	3.9000	75.0000	2925.0000	(28a)
EW	67.2500	16.2000	51.0500	0.1700	8.6785	70.0000	3573.5000	(29a)
External Roof 1	39.0000		39.0000	0.0900	3.5100	9.0000	351.0000	(30)
Total net area of external elements Aum(A, m2)			145.2500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		34.3190			(33)
Internal Wall 1			48.5000			9.0000	436.5000	(32c)

Heat capacity Cm = Sum(A x k) (28) ... (30) + (32) + (32a) ... (32e) = 7286.0000 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 186.8205 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	26.9000	0.0610	1.6409
E16 Corner (normal)	12.5000	0.0420	0.5250
E2 Other lintels (including other steel lintels)	9.5000	0.3610	3.4295
E3 Sill	4.9000	0.0220	0.1078
E4 Jamb	20.6000	0.0170	0.3502
E10 Eaves (insulation at ceiling level)	26.9000	0.0570	1.5333
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0850	-0.2125

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.3742 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 41.6932 (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	20.7328	20.0327	19.8666	19.3898	19.3898	18.9450	18.9450	18.8040	18.9450	19.7041	19.5451	20.0327 (38)
Heat transfer coeff	62.4260	61.7259	61.5598	61.0830	61.0830	60.6383	60.6383	60.4972	60.6383	61.3973	61.2384	61.7259 (39)
Average = Sum(39)m / 12 =												61.2210

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.6007	1.5827	1.5785	1.5662	1.5662	1.5548	1.5548	1.5512	1.5548	1.5743	1.5702	1.5827 (40)
HLP (average)												1.5698
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.3800 (42)
Hot water usage for mixer showers													70.7645 (42a)
Hot water usage for baths													20.4194 (42b)
Hot water usage for other uses													28.7628 (42c)
Average daily hot water use (litres/day)													110.6376 (43)
Daily hot water use	120.2880	117.8703	114.8403	110.0279	106.1938	102.0424	100.2958	103.3110	106.5126	110.8905	115.7831	119.9466	(44)
Energy conte	190.5068	167.8457	176.5052	150.6227	142.9573	125.4731	121.2991	127.9207	131.3407	150.4773	164.9542	187.8074	(45)
Energy content (annual)													Total = Sum(45)m = 1837.7101
Distribution loss (46)m = 0.15 x (45)m	28.5760	25.1769	26.4758	22.5934	21.4436	18.8210	18.1949	19.1881	19.7011	22.5716	24.7431	28.1711	(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	190.5068	167.8457	176.5052	150.6227	142.9573	125.4731	121.2991	127.9207	131.3407	150.4773	164.9542	187.8074	(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	190.5068	167.8457	176.5052	150.6227	142.9573	125.4731	121.2991	127.9207	131.3407	150.4773	164.9542	187.8074	(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	63.3435	55.8087	58.6880	50.0820	47.5333	41.7198	40.3319	42.5336	43.6708	50.0337	54.8473	62.4460	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	82.8011	82.8011	82.8011	82.8011	82.8011	82.8011	82.8011	82.8011	82.8011	82.8011	82.8011	82.8011	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.1471	11.6772	9.4965	7.1895	5.3742	4.5371	4.9025	6.3725	8.5531	10.8602	12.6754	13.5125	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.6521	179.4955	174.8500	164.9603	152.4764	140.7432	132.9047	131.0612	135.7067	145.5964	158.0804	169.8136	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	44.6601	44.6601	44.6601	44.6601	44.6601	44.6601	44.6601	44.6601	44.6601	44.6601	44.6601	44.6601	(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)	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	(71)
Water heating gains (Table 5)	85.1391	83.0487	78.8817	69.5584	63.8889	57.9442	54.2096	57.1688	60.6539	67.2496	76.1768	83.9327	(72)
Total internal gains	351.1988	349.4818	338.4887	316.9687	296.9999	275.4850	264.2773	266.8631	277.1742	298.9667	322.1931	342.5193	(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
North	4.0000	13.8645	0.5700	0.7000	0.7700	15.3346 (74)

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East	6.2000	25.9136	0.5700	0.7000	0.7700	44.4249 (76)
West	3.8000	25.9136	0.5700	0.7000	0.7700	27.2282 (80)

Solar gains	86.9876	145.0325	238.7629	359.9334	428.1920	478.2607	442.8259	383.0866	295.9171	182.1344	107.3272	68.4298 (83)
Total gains	438.1864	494.5143	577.2516	676.9020	725.1919	753.7457	707.1032	649.9497	573.0913	481.1011	429.5203	410.9491 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	32.4206	32.7883	32.8768	33.1334	33.1334	33.3764	33.3764	33.4543	33.3764	32.9638	33.0494	32.7883
alpha	3.1614	3.1859	3.1918	3.2089	3.2089	3.2251	3.2251	3.2303	3.2251	3.1976	3.2033	3.1859
util living area	0.9543	0.9350	0.8818	0.7731	0.6186	0.4309	0.3119	0.3371	0.5721	0.8189	0.9258	0.9602 (86)
MIT	19.6044	19.7731	20.1189	20.4970	20.7524	20.8698	20.8957	20.8936	20.8198	20.5024	20.0247	19.5851 (87)
Th 2	19.6128	19.6260	19.6292	19.6382	19.6382	19.6466	19.6466	19.6493	19.6466	19.6322	19.6352	19.6260 (88)
util rest of house	0.9425	0.9190	0.8535	0.7234	0.5421	0.3345	0.2003	0.2174	0.4650	0.7616	0.9036	0.9497 (89)
MIT 2	18.0662	18.2831	18.7036	19.1424	19.4042	19.5080	19.5223	19.5247	19.4781	19.1638	18.6073	18.0528 (90)
Living area fraction	18.9773	19.1656	19.5419	19.9447	20.2028	20.3146	20.3358	20.3355	20.2728	19.9567	19.4468	18.9604 (92)
MIT	18.9773	19.1656	19.5419	19.9447	20.2028	20.3146	20.3358	20.3355	20.2728	19.9567	19.4468	18.9604 (92)
Temperature adjustment	18.9773	19.1656	19.5419	19.9447	20.2028	20.3146	20.3358	20.3355	20.2728	19.9567	19.4468	18.9604 (93)
adjusted MIT	18.9773	19.1656	19.5419	19.9447	20.2028	20.3146	20.3358	20.3355	20.2728	19.9567	19.4468	18.9604 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9359	0.9126	0.8515	0.7355	0.5753	0.3831	0.2578	0.2791	0.5169	0.7768	0.9000	0.9434 (94)
Useful gains	410.0903	451.2959	491.5256	497.8919	417.2104	288.7940	182.3025	181.4070	296.2095	373.7287	386.5588	387.6793 (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	847.5775	831.1771	753.6066	631.8869	464.4002	298.0143	184.0831	183.6389	319.7330	500.7971	676.4902	830.8556 (97)
Space heating kWh	325.4905	255.2801	194.9882	96.4764	35.1093	0.0000	0.0000	0.0000	0.0000	94.5389	208.7506	329.7232 (98a)
Space heating requirement - total per year (kWh/year)												1540.3573
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	325.4905	255.2801	194.9882	96.4764	35.1093	0.0000	0.0000	0.0000	0.0000	94.5389	208.7506	329.7232 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1540.3573
Space heating per m2										(98c) / (4) =		39.4963 (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 %)												249.9000 (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	325.4905	255.2801	194.9882	96.4764	35.1093	0.0000	0.0000	0.0000	0.0000	94.5389	208.7506	329.7232 (98)
Space heating efficiency (main heating system 1)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000 (210)
Space heating fuel (main heating system)	130.2483	102.1529	78.0265	38.6060	14.0493	0.0000	0.0000	0.0000	0.0000	37.8307	83.5337	131.9421 (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	190.5068	167.8457	176.5052	150.6227	142.9573	125.4731	121.2991	127.9207	131.3407	150.4773	164.9542	187.8074 (64)
Efficiency of water heater (217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000 (216)
Fuel for water heating, kWh/month	108.7989	95.8571	100.8025	86.0209	81.6433	71.6579	69.2742	73.0558	75.0090	85.9379	94.2057	107.2572 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	11.5076	9.2318	8.3122	6.0899	4.7040	3.8432	4.2912	5.5778	7.2450	9.5059	10.7368	11.8274 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												616.3895 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												175.1000
Water heating fuel used												1049.5204 (219)
Space cooling fuel												0.0000 (221)

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Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	92.8729 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	1758.7827 (238)

10a. Fuel costs - using BEDF prices (560)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	616.3895	26.0600	160.6311 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1049.5204	26.0600	273.5050 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	92.8729	26.0600	24.2027 (250)
Additional standing charges			0.0000 (251)
Total energy cost			458.3388 (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	616.3895	0.1560	96.1533 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1049.5204	0.1416	148.5893 (264)
Space and water heating			244.7426 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	92.8729	0.1443	13.4044 (268)
Total CO2, kg/year			258.1470 (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	616.3895	1.5775	972.3693 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1049.5204	1.5235	1598.9852 (278)
Space and water heating			2571.3545 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	92.8729	1.5338	142.4515 (282)
Total Primary energy kWh/year			2713.8061 (286)

SAP 10 EPC IMPROVEMENTS

Swanbourne Road

Current energy efficiency rating:	C 78
Current environmental impact rating:	A 96

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 2.8	-£ 80	-39 kg (15.0%)
U Solar photovoltaic panels	+ 7.8	-£ 188	-99 kg (45.0%)

Recommended measures	Typical annual savings	Energy efficiency impact	Environmental impact
Solar water heating	£80	0.99 kg/m²	B 81 A 96
Solar photovoltaic panels	£188	2.53 kg/m²	B 89 A 98
Total Savings	£268	3.52 kg/m²	

Potential energy efficiency rating:	B 89
Potential environmental impact rating:	A 98

Fuel prices for cost data on this page from database revision number 560 TEST (06 Jan 2025)
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	£458	£379	£80
Space heating	£161	£181	-£21
Water heating	£274	£173	£100
Lighting	£24	£24	£0
Generated (PV)	-£10	-£188	£188
Total cost of fuels	£458	£191	£268
Total cost of uses	£459	£190	£267
Delivered energy	45 kWh/m²	19 kWh/m²	26 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.1 tonnes	0.1 tonnes
CO2 emissions per m²	7 kg/m²	3 kg/m²	4 kg/m²

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Primary energy 70 kWh/m² 30 kWh/m² 39 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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	39.0000 (1b)	2.5000 (2b)	97.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.0000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 97.5000 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.2051 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0100 (17)
Infiltration rate	0.4556 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.4215 (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	0.5374	0.5268	0.5163	0.4636	0.4531	0.4004	0.4004	0.3898	0.4215	0.4531	0.4741	0.4952 (22b)
Effective ac	0.6444	0.6388	0.6333	0.6075	0.6026	0.5802	0.5802	0.5760	0.5888	0.6026	0.6124	0.6226 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.20)			14.0000	1.1450	16.0305		(27)
Front Door			2.2000	1.0000	2.2000		(26)
Heatloss Floor 1			39.0000	0.1000	3.9000	75.0000	2925.0000 (28a)
EW	67.2500	16.2000	51.0500	0.1700	8.6785	70.0000	3573.5000 (29a)
External Roof 1	39.0000		39.0000	0.0900	3.5100	9.0000	351.0000 (30)
Total net area of external elements Aum(A, m ²)			145.2500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.3190		(33)
Internal Wall 1			48.5000			9.0000	436.5000 (32c)
Heat capacity Cm = Sum (A x k)			(28)...(30) + (32) + (32a)...(32e) =				7286.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							186.8205 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E5 Ground floor (normal)				26.9000	0.0610	1.6409	
E16 Corner (normal)				12.5000	0.0420	0.5250	
E2 Other lintels (including other steel lintels)				9.5000	0.3610	3.4295	
E3 Sill				4.9000	0.0220	0.1078	
E4 Jamb				20.6000	0.0170	0.3502	
E10 Eaves (insulation at ceiling level)				26.9000	0.0570	1.5333	
E17 Corner (inverted - internal area greater than external area)				2.5000	-0.0850	-0.2125	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.3742 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	41.6932 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	20.7328	20.5524	20.3756	19.5451	19.3898	18.6664	18.6664	18.5325	18.9450	19.3898	19.7041	20.0327 (38)
Heat transfer coeff	62.4260	62.2456	62.0688	61.2384	61.0830	60.3597	60.3597	60.2257	60.6383	61.0830	61.3973	61.7259 (39)
Average = Sum(39)m / 12 =												61.2376

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.6007	1.5960	1.5915	1.5702	1.5662	1.5477	1.5477	1.5442	1.5548	1.5662	1.5743	1.5827 (40)
HLP (average)												1.5702
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

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Assumed occupancy												1.3800 (42)
Hot water usage for mixer showers	71.0366	69.9691	68.4135	65.4371	63.2406	60.7911	59.3988	60.9426	62.6349	65.2650	68.3053	70.7645 (42a)
Hot water usage for baths	20.4886	20.1843	19.7558	18.9658	18.3742	17.7182	17.3639	17.7894	18.2526	18.9546	19.7609	20.4194 (42b)
Hot water usage for other uses	28.7628	27.7168	26.6709	25.6250	24.5791	23.5332	23.5332	24.5791	25.6250	26.6709	27.7168	28.7628 (42c)
Average daily hot water use (litres/day)												110.6376 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	120.2880	117.8703	114.8403	110.0279	106.1938	102.0424	100.2958	103.3110	106.5126	110.8905	115.7831	119.9466 (44)
Distribution loss (46)m = 0.15 x (45)m	28.5760	25.1769	26.4758	22.5934	21.4436	18.8210	18.1949	19.1881	19.7011	22.5716	24.7431	28.1711 (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	190.5068	167.8457	176.5052	150.6227	142.9573	125.4731	121.2991	127.9207	131.3407	150.4773	164.9542	187.8074 (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)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.8000 (H2)
Collector linear heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0000 (H4)
Collector loop efficiency												0.9000 (H5)
Incidence angle modifier												1.0000 (H6)
Overshading factor												0.8000 (H8)
Overall heat loss coefficient of system												6.5000 (H10)
Heat loss coefficient of collector loop												3.9667 (H11)
Dedicated solar storage volume												75.0000 (H12)
Effective solar volume												75.0000 (H14)
Reference volume												225.0000 (H15)
Storage tank correction coefficient												1.3161 (H16)
Heat delivered to hot water												561.4388 (H24)
Heat delivered to space heating												0.0000 (H29)
Solar input												561.4388
Solar input	-0.0000	-16.3201	-55.3347	-73.5030	-92.9677	-84.3666	-82.7835	-74.5487	-53.3840	-28.2305	-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	190.5068	151.5256	121.1705	77.1197	49.9896	41.1065	38.5156	53.3719	77.9567	122.2468	164.9542	187.8074 (64)
											Total per year (kWh/year) = Sum(64)m =	1276.2714 (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	63.3435	55.8087	58.6880	50.0820	47.5333	41.7198	40.3319	42.5336	43.6708	50.0337	54.8473	62.4460 (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	82.8011	82.8011	82.8011	82.8011	82.8011	82.8011	82.8011	82.8011	82.8011	82.8011	82.8011	82.8011 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.1471	11.6772	9.4965	7.1895	5.3742	4.5371	4.9025	6.3725	8.5531	10.8602	12.6754	13.5125 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.6521	179.4955	174.8500	164.9603	152.4764	140.7432	132.9047	131.0612	135.7067	145.5964	158.0804	169.8136 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	44.6601	44.6601	44.6601	44.6601	44.6601	44.6601	44.6601	44.6601	44.6601	44.6601	44.6601	44.6601 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007 (71)
Water heating gains (Table 5)	85.1391	83.0487	78.8817	69.5584	63.8889	57.9442	54.2096	57.1688	60.6539	67.2496	76.1768	83.9327 (72)
Total internal gains	351.1988	349.4818	338.4887	316.9687	296.9999	275.4850	264.2773	266.8631	277.1742	298.9667	322.1931	342.5193 (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				
North			4.0000	10.6334	0.5700	0.7000	0.7700	11.7608 (74)				
East			6.2000	19.6403	0.5700	0.7000	0.7700	33.6702 (76)				
West			3.8000	19.6403	0.5700	0.7000	0.7700	20.6365 (80)				
Solar gains	66.0675	128.7110	213.1461	316.5062	395.3469	408.5797	387.3556	327.3135	249.3980	152.8115	82.2226	54.4636 (83)
Total gains	417.2663	478.1928	551.6348	633.4748	692.3469	684.0646	651.6329	594.1765	526.5722	451.7782	404.4157	396.9829 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	32.4206	32.5145	32.6072	33.0494	33.1334	33.5305	33.5305	33.6051	33.3764	33.1334	32.9638	32.7883
alpha	3.1614	3.1676	3.1738	3.2033	3.2089	3.2354	3.2354	3.2403	3.2251	3.2089	3.1976	3.1859
util living area	0.9661	0.9474	0.9059	0.8180	0.6824	0.5222	0.3940	0.4444	0.6695	0.8730	0.9495	0.9705 (86)
MIT	19.4088	19.6187	19.9662	20.3802	20.6791	20.8363	20.8841	20.8744	20.7493	20.3374	19.8010	19.3751 (87)
Th 2	19.6128	19.6162	19.6196	19.6352	19.6382	19.6519	19.6519	19.6545	19.6466	19.6382	19.6322	19.6260 (88)
util rest of house	0.9577	0.9347	0.8833	0.7760	0.6142	0.4271	0.2793	0.3237	0.5747	0.8325	0.9350	0.9631 (89)

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MIT 2	17.8201	18.0840	18.5129	19.0118	19.3351	19.4912	19.5232	19.5216	19.4223	18.9838	18.3292	17.7874 (90)
Living area fraction									FLA = Living area / (4) =			0.5923 (91)
MIT	18.7611	18.9931	19.3737	19.8223	20.1312	20.2879	20.3293	20.3229	20.2083	19.7856	19.2010	18.7278 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7611	18.9931	19.3737	19.8223	20.1312	20.2879	20.3293	20.3229	20.2083	19.7856	19.2010	18.7278 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9511	0.9277	0.8786	0.7824	0.6403	0.4735	0.3381	0.3853	0.6167	0.8375	0.9293	0.9570	(94)
Useful gains	396.8801	443.6072	484.6809	495.6154	443.3356	323.8908	220.3155	228.9432	324.7479	378.3808	375.8354	379.9232	(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	902.7502	877.2311	799.0552	668.8641	515.0011	343.3198	225.0976	236.2578	370.3942	561.0808	742.9662	896.7421	(97)
Space heating kWh	376.3673	291.3953	233.8945	124.7391	53.3192	0.0000	0.0000	0.0000	0.0000	135.9289	264.3341	384.5132	(98a)
Space heating requirement - total per year (kWh/year)												1864.4915	
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	376.3673	291.3953	233.8945	124.7391	53.3192	0.0000	0.0000	0.0000	0.0000	135.9289	264.3341	384.5132	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1864.4915	
Space heating per m2										(98c) / (4) =		47.8075	(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 %)													249.9000 (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	376.3673	291.3953	233.8945	124.7391	53.3192	0.0000	0.0000	0.0000	0.0000	135.9289	264.3341	384.5132	(98)
Space heating efficiency (main heating system 1)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000	(210)
Space heating fuel (main heating system)	150.6072	116.6047	93.5952	49.9156	21.3362	0.0000	0.0000	0.0000	0.0000	54.3933	105.7760	153.8668	(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	190.5068	151.5256	121.1705	77.1197	49.9896	41.1065	38.5156	53.3719	77.9567	122.2468	164.9542	187.8074	(64)
Efficiency of water heater	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(216)
Fuel for water heating, kWh/month	108.7989	86.5366	69.2007	44.0432	28.5492	23.4760	21.9963	30.4808	44.5213	69.8154	94.2057	107.2572	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	6.7945	6.1370	6.7945	6.5753	6.7945	6.5753	6.7945	6.7945	6.5753	6.7945	6.5753	6.7945	(231)
Lighting	11.5076	9.2318	8.3122	6.0899	4.7040	3.8432	4.2912	5.5778	7.2450	9.5059	10.7368	11.8274	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-35.4909	-51.0914	-72.4194	-76.5101	-74.8299	-64.1747	-63.1001	-62.1275	-58.5546	-55.9345	-39.1251	-30.5592	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1													746.0951 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													175.1000
Water heating fuel used													728.8814 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
pump for solar water heating													80.0000 (230g)
Total electricity for the above, kWh/year													80.0000 (231)
Electricity for lighting (calculated in Appendix L)													92.8729 (232)
Energy saving/generation technologies (Appendices M, N and Q)													
PV generation													-683.9174 (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													963.9320 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	746.0951	16.4900	123.0311	(240)

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Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	728.8814	16.4900	120.1925 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Pump for solar water heating	80.0000	16.4900	13.1920 (249)
Energy for lighting	92.8729	16.4900	15.3147 (250)
Additional standing charges			0.0000 (251)

Energy saving/generation technologies			
PV Unit electricity used in dwelling	-683.9174	16.4900	-112.7780
PV Unit electricity exported	0.0000	5.5900	0.0000
Total			-112.7780 (252)
Total energy cost			158.9524 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.6812 (257)
SAP value		88.9574
SAP rating (Section 12)		89 (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	746.0951	0.1554	115.9301 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	728.8814	0.1475	107.5415 (264)
Space and water heating			223.4716 (265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970 (267)
Energy for lighting	92.8729	0.1443	13.4044 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-683.9174	0.1362	-93.1614
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-93.1614 (269)
Total CO2, kg/year			154.8115 (272)
CO2 emissions per m2			3.9700 (273)
EI value			97.5304
EI rating			98 (274)
EI band			A

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	39.0000 (1b)	x 2.5000 (2b)	= 97.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	97.5000 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.2051 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0100 (17)
Infiltration rate	0.4556 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.4215 (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	0.5374	0.4952	0.4847	0.4531	0.4531	0.4215	0.4215	0.4109	0.4215	0.4741	0.4636	0.4952 (22b)
Effective ac	0.6444	0.6226	0.6175	0.6026	0.6026	0.5888	0.5888	0.5844	0.5888	0.6124	0.6075	0.6226 (25)

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3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K	
Windows (Uw = 1.20)			14.0000	1.1450	16.0305			(27)
Front Door			2.2000	1.0000	2.2000			(26)
Heatloss Floor 1			39.0000	0.1000	3.9000	75.0000	2925.0000	(28a)
EW	67.2500	16.2000	51.0500	0.1700	8.6785	70.0000	3573.5000	(29a)
External Roof 1	39.0000		39.0000	0.0900	3.5100	9.0000	351.0000	(30)
Total net area of external elements Aum(A, m ²)			145.2500					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	34.3190		(33)
Internal Wall 1			48.5000			9.0000	436.5000	(32c)

Heat capacity Cm = Sum(A x k)

(28)...(30) + (32) + (32a)...(32e) = 7286.0000 (34)

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

186.8205 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	26.9000	0.0610	1.6409
E16 Corner (normal)	12.5000	0.0420	0.5250
E2 Other lintels (including other steel lintels)	9.5000	0.3610	3.4295
E3 Sill	4.9000	0.0220	0.1078
E4 Jamb	20.6000	0.0170	0.3502
E10 Eaves (insulation at ceiling level)	26.9000	0.0570	1.5333
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0850	-0.2125

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

7.3742 (36)

Point Thermal Bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 41.6932 (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	20.7328	20.0327	19.8666	19.3898	19.3898	18.9450	18.9450	18.8040	18.9450	19.7041	19.5451	20.0327
Average = Sum(39)m / 12 =	62.4260	61.7259	61.5598	61.0830	61.0830	60.6383	60.6383	60.4972	60.6383	61.3973	61.2384	61.7259

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.6007	1.5827	1.5785	1.5662	1.5662	1.5548	1.5548	1.5512	1.5548	1.5743	1.5702	1.5827
HLP (average)												1.5698
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.3800 (42)
Hot water usage for mixer showers												
Hot water usage for baths	71.0366	69.9691	68.4135	65.4371	63.2406	60.7911	59.3988	60.9426	62.6349	65.2650	68.3053	70.7645 (42a)
Hot water usage for other uses	20.4886	20.1843	19.7558	18.9658	18.3742	17.7182	17.3639	17.7894	18.2526	18.9546	19.7609	20.4194 (42b)
Average daily hot water use (litres/day)	28.7628	27.7168	26.6709	25.6250	24.5791	23.5332	23.5332	24.5791	25.6250	26.6709	27.7168	28.7628 (42c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	120.2880	117.8703	114.8403	110.0279	106.1938	102.0424	100.2958	103.3110	106.5126	110.8905	115.7831	119.9466 (44)
Energy conte	190.5068	167.8457	176.5052	150.6227	142.9573	125.4731	121.2991	127.9207	131.3407	150.4773	164.9542	187.8074 (45)
Energy content (annual)										Total = Sum(45)m =		1837.7101
Distribution loss (46)m = 0.15 x (45)m	28.5760	25.1769	26.4758	22.5934	21.4436	18.8210	18.1949	19.1881	19.7011	22.5716	24.7431	28.1711 (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	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	190.5068	167.8457	176.5052	150.6227	142.9573	125.4731	121.2991	127.9207	131.3407	150.4773	164.9542	187.8074 (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)

Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.8000 (H2)
Collector linear heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0000 (H4)
Collector loop efficiency												0.9000 (H5)
Incidence angle modifier												1.0000 (H6)
Overshading factor												0.8000 (H8)

Overall heat loss coefficient of system												6.5000 (H10)
Heat loss coefficient of collector loop												3.9667 (H11)
Dedicated solar storage volume												75.0000 (H12)
Effective solar volume												75.0000 (H14)
Reference volume												225.0000 (H15)

Storage tank correction coefficient												1.3161 (H16)
Heat delivered to hot water												674.9271 (H24)
Heat delivered to space heating												0.0000 (H29)
Solar input												674.9271

Solar input	-5.7790	-22.7297	-64.7237	-84.8528	-100.3935	-97.3584	-93.2861	-87.5552	-66.5726	-40.5394	-11.1368	-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	184.7279	145.1160	111.7815	65.7698	42.5638	28.1146	28.0130	40.3654	64.7681	109.9380	153.8175	187.8074 (64)

Electric shower(s) Total per year (kWh/year) = Sum(64)m = 1162.7830 (64)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	63.3435	55.8087	58.6880	50.0820	47.5333	41.7198	40.3319	42.5336	43.6708	50.0337	54.8473	62.4460 (65)
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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	82.8011	82.8011	82.8011	82.8011	82.8011	82.8011	82.8011	82.8011	82.8011	82.8011	82.8011	82.8011 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.1471	11.6772	9.4965	7.1895	5.3742	4.5371	4.9025	6.3725	8.5531	10.8602	12.6754	13.5125 (67)

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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.6521	179.4955	174.8500	164.9603	152.4764	140.7432	132.9047	131.0612	135.7067	145.5964	158.0804	169.8136 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	44.6601	44.6601	44.6601	44.6601	44.6601	44.6601	44.6601	44.6601	44.6601	44.6601	44.6601	44.6601 (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)	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007	-55.2007 (71)
Water heating gains (Table 5)	85.1391	83.0487	78.8817	69.5584	63.8889	57.9442	54.2096	57.1688	60.6539	67.2496	76.1768	83.9327 (72)
Total internal gains	351.1988	349.4818	338.4887	316.9687	296.9999	275.4850	264.2773	266.8631	277.1742	298.9667	322.1931	342.5193 (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
North					4.0000	13.8645	0.5700	0.7000			0.7700	15.3346 (74)
East					6.2000	25.9136	0.5700	0.7000			0.7700	44.4249 (76)
West					3.8000	25.9136	0.5700	0.7000			0.7700	27.2282 (80)
Solar gains	86.9876	145.0325	238.7629	359.9334	428.1920	478.2607	442.8259	383.0866	295.9171	182.1344	107.3272	68.4298 (83)
Total gains	438.1864	494.5143	577.2516	676.9020	725.1919	753.7457	707.1032	649.9497	573.0913	481.1011	429.5203	410.9491 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)											
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	32.4206	32.7883	32.8768	33.1334	33.1334	33.3764	33.3764	33.4543	33.3764	32.9638	33.0494	32.7883
alpha	3.1614	3.1859	3.1918	3.2089	3.2089	3.2251	3.2251	3.2303	3.2251	3.1976	3.2033	3.1859
util living area	0.9543	0.9350	0.8818	0.7731	0.6186	0.4309	0.3119	0.3371	0.5721	0.8189	0.9258	0.9602 (86)
MIT	19.6044	19.7731	20.1189	20.4970	20.7524	20.8698	20.8957	20.8936	20.8198	20.5024	20.0247	19.5851 (87)
Th 2	19.6128	19.6260	19.6292	19.6382	19.6382	19.6466	19.6466	19.6493	19.6466	19.6322	19.6352	19.6260 (88)
util rest of house	0.9425	0.9190	0.8535	0.7234	0.5421	0.3345	0.2003	0.2174	0.4650	0.7616	0.9036	0.9497 (89)
MIT 2	18.0662	18.2831	18.7036	19.1424	19.4042	19.5080	19.5223	19.5247	19.4781	19.1638	18.6073	18.0528 (90)
Living area fraction	fLA = Living area / (4) = 0.5923 (91)											
MIT	18.9773	19.1656	19.5419	19.9447	20.2028	20.3146	20.3358	20.3355	20.2728	19.9567	19.4468	18.9604 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.9773	19.1656	19.5419	19.9447	20.2028	20.3146	20.3358	20.3355	20.2728	19.9567	19.4468	18.9604 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9359	0.9126	0.8515	0.7355	0.5753	0.3831	0.2578	0.2791	0.5169	0.7768	0.9000	0.9434 (94)
Ext temp.	410.0903	451.2959	491.5256	497.8919	417.2104	288.7940	182.3025	181.4070	296.2095	373.7287	386.5588	387.6793 (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	847.5775	831.1771	753.6066	631.8869	464.4002	298.0143	184.0831	183.6389	319.7330	500.7971	676.4902	830.8556 (97)
Space heating requirement - total per year (kWh/year)	325.4905	255.2801	194.9882	96.4764	35.1093	0.0000	0.0000	0.0000	0.0000	94.5389	208.7506	329.7232 (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 (98b)
Space heating kWh	325.4905	255.2801	194.9882	96.4764	35.1093	0.0000	0.0000	0.0000	0.0000	94.5389	208.7506	329.7232 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	325.4905	255.2801	194.9882	96.4764	35.1093	0.0000	0.0000	0.0000	0.0000	94.5389	208.7506	329.7232 (98c)
Space heating per m2	(98c) / (4) = 39.4963 (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 %)	249.9000 (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)	325.4905	255.2801	194.9882	96.4764	35.1093	0.0000	0.0000	0.0000	0.0000	94.5389	208.7506	329.7232 (98)
Space heating fuel (main heating system)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000 (210)
Space heating efficiency (main heating system 2)	130.2483	102.1529	78.0265	38.6060	14.0493	0.0000	0.0000	0.0000	0.0000	37.8307	83.5337	131.9421 (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 (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	184.7279	145.1160	111.7815	65.7698	42.5638	28.1146	28.0130	40.3654	64.7681	109.9380	153.8175	187.8074 (64)
Efficiency of water heater (217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000 (216)
Fuel for water heating, kWh/month	105.4985	82.8761	63.8387	37.5613	24.3083	16.0563	15.9983	23.0528	36.9892	62.7858	87.8455	107.2572 (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	6.7945	6.1370	6.7945	6.5753	6.7945	6.5753	6.7945	6.7945	6.5753	6.7945	6.5753	6.7945 (231)
Lighting	11.5076	9.2318	8.3122	6.0899	4.7040	3.8432	4.2912	5.5778	7.2450	9.5059	10.7368	11.8274 (232)

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Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-43.2465	-54.3216	-75.2116	-78.1120	-74.0278	-64.8716	-63.7515	-63.5890	-61.5146	-59.9419	-46.4171	-36.0600	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												616.3895	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												175.1000	
Water heating fuel used												664.0680	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
pump for solar water heating												80.0000	(230g)
Total electricity for the above, kWh/year												80.0000	(231)
Electricity for lighting (calculated in Appendix L)												92.8729	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-721.0651	(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												732.2652	(238)

10a. Fuel costs - using BEDF prices (560)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	616.3895	26.0600	160.6311	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	664.0680	26.0600	173.0561	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Pump for solar water heating	80.0000	26.0600	20.8480	(249)
Energy for lighting	92.8729	26.0600	24.2027	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-721.0651	26.0600	-187.9096	
PV Unit electricity exported	0.0000	5.8100	0.0000	
Total			-187.9096	(252)
Total energy cost			190.8283	(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	616.3895	0.1560	96.1533	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	664.0680	0.1489	98.8873	(264)
Space and water heating			195.0406	(265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970	(267)
Energy for lighting	92.8729	0.1443	13.4044	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-721.0651	0.1369	-98.7163	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-98.7163	(269)
Total CO2, kg/year			120.8257	(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	616.3895	1.5775	972.3693	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	664.0680	1.5510	1029.9439	(278)
Space and water heating			2002.3132	(279)
Pumps, fans and electric keep-hot	80.0000	1.5128	121.0240	(281)
Energy for lighting	92.8729	1.5338	142.4515	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-721.0651	1.5061	-1086.0038	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1086.0038	(283)
Total Primary energy kWh/year			1179.7850	(286)

Energy Report



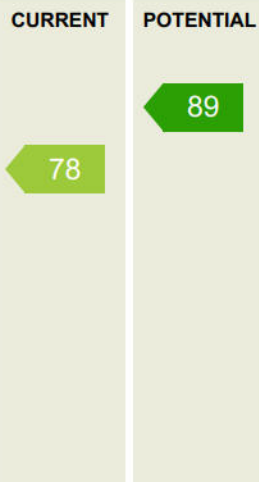
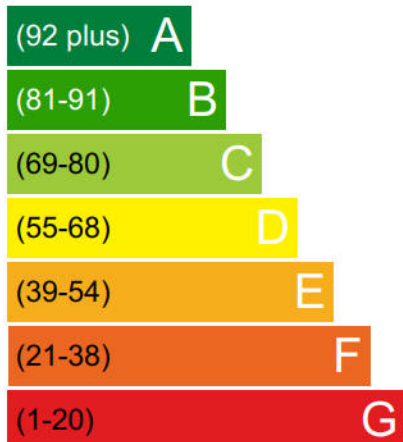
Dwelling Address	
Reference	Swanbourne Road-Swanbourne Road
Assessment Date	10/01/2025
Submission Date	
Property Type	Bungalow, Detached
Total Floor Area	39

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

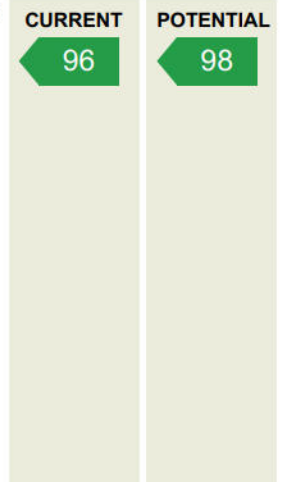
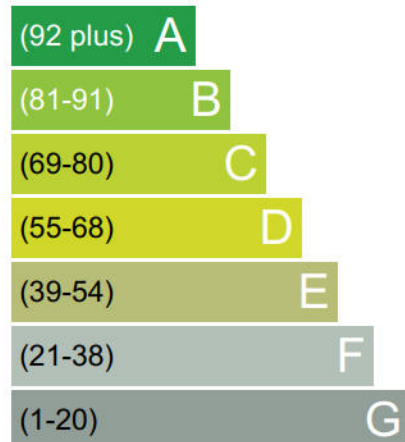
Energy Efficiency Rating

Most energy efficient - lower running costs

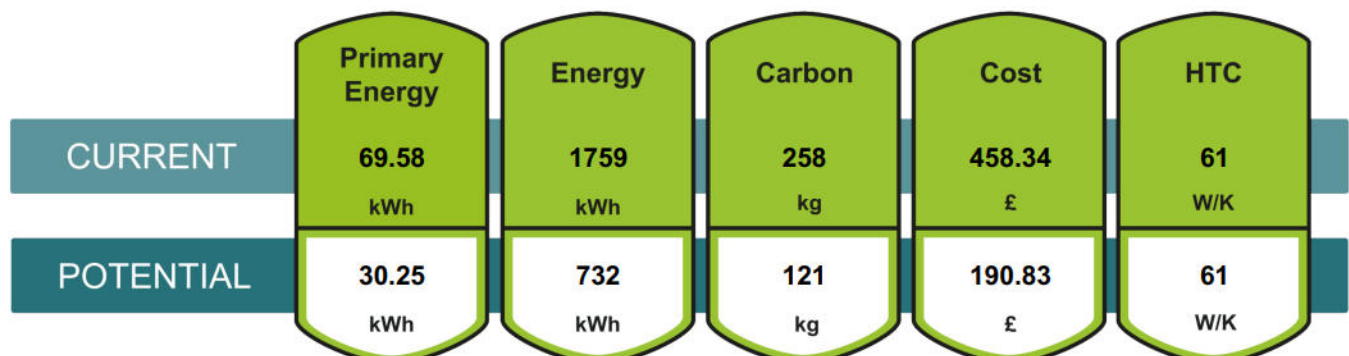


Carbon Dioxide (CO2) Emissions Rating

Very environmentally friendly - lower CO2 emissions



Additional ratings for your home



Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good
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Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.17 W/m ² K	Very Good
Roof	Average thermal transmittance 0.09 W/m ² K	Very Good
Floor	Average thermal transmittance 0.1 W/m ² K	Very Good
Windows	High performance glazing	Very Good
Main heating	Air source heat pump, underfloor, electric	Good
Main heating controls	Time and temperature zone control	Very Good
Secondary heating	None	
Hot water	From main system	Average
Lighting	Excellent lighting efficiency	Very Good
Air tightness	Air permeability [AP50] = 5.0 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	£80	B 81	£4,000 - £6,000	£80	A 96
Photovoltaic	£268	B 89	£3,500 - £5,500	£188	A 98

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		£24	£24	
Heating		£161	£181	
Hot Water		£274	£173	
New Technologies e.g. Impact of PV		£0	-(£188)	
TOTAL		£458	£191	

Estimated energy use and potential savings



Space Heating

616
kWh per year



Water Heating

1050
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.